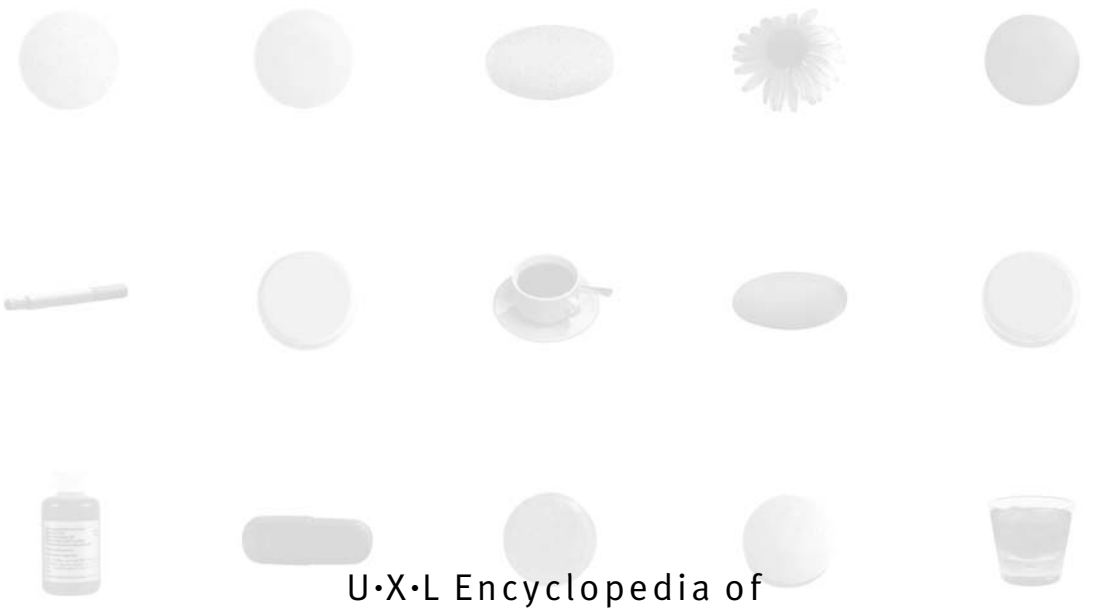
U·X·L Encyclopedia of Drugs & Addictive Substances

volume 5

Opium to Tranquilizers



U·X·L Encyclopedia of

Drugs & Addictive Substances

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Volume 1:
2C-B (Nexus) to Benzylpiperazine/Trifluoromethyl-phenylpiperazine

Barbara C. Bigelow, MAT
Kathleen J. Edgar, Project Editor

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Supps *see* **Creatine**
Symphytum officinale see **Herbal Drugs**
Synthetic heroin *see* **Fentanyl**
Syrup *see* **Codeine**

T

T-threes *see* **Codeine**
Tango & Cash *see* **Fentanyl**
Tar *see* **Marijuana**
Texas shoeshine *see* **Inhalants**
TFMPP *see* **Benzylpiperazine/Trifluoromethyl-phenylpiperazine**
Thai sticks *see* **Marijuana**
Thrust *see* **Amyl Nitrite** and **Inhalants**
Tic tac *see* **PCP (Phencyclidine)**
Tina *see* **Methamphetamine**
TNT *see* **Fentanyl**
Toilet water *see* **Inhalants**

Tombstone *see* **Fentanyl**
Toonies *see* **2C-B (Nexus)** and **Designer Drugs**
Tootsie roll *see* **Heroin**
Topi *see* **Mescaline**
Toxy *see* **Opium**
Toys *see* **Opium**
Tranks *see* **Benzodiazepines** and **Tranquilizers**
Tranx *see* **Tranquilizers**
Trash *see* **Methamphetamine**
Triple-C *see* **Dextromethorphan** and **Over-the-Counter Drugs**
Tschat *see* ***Catha Edulis***
Tussin *see* **Dextromethorphan**

U

Uppers *see* **Adderall, Amphetamines, Dextroamphetamine,** and **Over-the-Counter Drugs**
Utopia *see* **2C-B (Nexus)** and **Designer Drugs**

V

V35 *see* **GBL**
Valerian *see* **Herbal Drugs** and **Tranquilizers**
Valeriana officinalis see **Herbal Drugs**
Velvet *see* **Dextromethorphan**
Venus *see* **2C-B (Nexus)** and **Designer Drugs**
Verve *see* **GBL**
Vino *see* **Alcohol**
Virgin Mary's herb *see* ***Salvia Divinorum***
Virgin's seed *see* ***Salvia Divinorum***
Vitamin D *see* **Dextromethorphan**
Vitamin K *see* **Designer Drugs** and **Ketamine**
Vitamin R *see* **Ritalin and Other Methylphenidates**

W

Wack *see* **PCP (Phencyclidine)**
Water pills *see* **Diuretics**
Weed *see* **Marijuana**
West Coast *see* **Ritalin and Other Methylphenidates**
Wets *see* **PCP (Phencyclidine)**
When-shee *see* **Opium**
Whip-its *see* **Nitrous Oxide**
Whippets *see* **Inhalants** and **Nitrous Oxide**

Whippits *see* **Nitrous Oxide**
White mitsubishi *see* **PMA and PMMA**
White stuff *see* **Heroin** and **Morphine**
Whiteout *see* **Inhalants**
Windowpanes *see* **LSD (Lysergic Acid Diethylamide)**
Wolfies *see* **Rohypnol**

X

X *see* **Designer Drugs** and **Ecstasy (MDMA)**
XTC *see* **Designer Drugs** and **Ecstasy (MDMA)**

Y

Ya ba see **Methamphetamine**
Yellow jackets *see* **Barbiturates** and **Tranquilizers**
Yellow sunshine *see* **LSD (Lysergic Acid Diethylamide)**
Yellows *see* **Barbiturates**

Z

Ze *see* **Opium**
Zen *see* **LSD (Lysergic Acid Diethylamide)**
Zero *see* **Opium**
Zip *see* **Methamphetamine**
Zonked *see* **GHB**

Please Read—Important Information

The *U•X•L Encyclopedia of Drugs & Addictive Substances* is a medical reference product designed to inform and educate readers about a wide variety of drugs and controlled substances. Thomson Gale believes the product to be comprehensive, but not necessarily definitive. It is intended to supplement, not replace, consultation with a physician or other health care practitioner.

Although Thomson Gale has made substantial efforts to provide information that is accurate, comprehensive, and up-to-date, Thomson Gale makes no representations or warranties of any kind, including without limitation, warranties of merchantability or fitness for a particular purpose, nor does it guarantee the accuracy, comprehensiveness, or timeliness of the information contained in this product. Readers should be aware that the universe of medical knowledge is constantly growing and changing, and that differences of medical opinion exist among authorities. Readers are also advised to seek professional diagnosis and treatment of any possible substance abuse problem, and to discuss information obtained from this book with their health care provider.

Preface

Education is the most powerful tool an individual can have when facing decisions about drug use. The *U•X•L Encyclopedia of Drugs & Addictive Substances* puts clear, comprehensive, and current information on fifty-two drugs at readers' fingertips. The set was designed with middle-school students in mind but can serve as a useful resource for readers of all ages. Each of the entries in this five-volume encyclopedia offers insights into the history, usage trends, and effects of a specific drug or addictive substance.

What Does "Addiction" Mean?

According to the National Institute on Drug Abuse's *NIDA InfoFacts: Understanding Drug Abuse and Addiction,* dated March 2005, drug addiction is more than just "a lot of drug use." The term "addiction" is described as:

- an overpowering desire, craving, or need to take a certain drug
- a willingness to obtain the drug by any means
- a tendency to keep increasing the dose that is consumed
- a psychological and/or physical dependence on the effects of the drug
- an inability to stop using the drug without treatment
- an illness that has harmful effects on the individual and on society.

What Can Readers Expect to Find in This Encyclopedia?

Every entry in the *U•X•L Encyclopedia of Drugs & Addictive Substances* has been painstakingly researched and is based on data from the latest government and university studies on the use and abuse of drugs and other addictive substances. In fact, the results of certain studies were first released to the public while this project was being researched. We are pleased to be able to pass along to readers some of the most up-to-date information on drug use available as this project went to press.

Please note that every effort has been made to secure the most recent information available. Readers should bear in mind that many major studies take years to conduct. Also, several additional years may pass before the data from these studies are made available to the

public. As such, in some cases, the most recent information available in 2005 dated from 2001 or 2002. We've presented older statistics as well if they are of particular interest and no more recent data exist.

Some of the substances profiled in the *U•X•L Encyclopedia of Drugs & Addictive Substances* are legal. Examples of legal—but nevertheless addictive—substances are caffeine, nicotine, and certain over-the-counter medications. Many other substances described in this set are illicit, or illegal. Drugs that fall into this category include cocaine, ecstasy (MDMA), and heroin, among many others.

One of the leading concerns of the late 1990s and early 2000s was the spike in methamphetamine abuse. Methamphetamine, or "meth," is a highly addictive drug that can kill. It is interesting to note that methamphetamine is available by prescription for a limited number of medical uses. However, the bulk of the illicit meth that is sold on the streets is smuggled in from Mexico or manufactured by so-called "bathtub chemists" in the United States. This nickname is given to amateur drug makers working in illegal, makeshift labs. These drug makers are out to make a quick buck. They produce their drugs as cheaply as possible, often adding other dangerous substances or filler ingredients to their homemade concoctions. The risks involved in making and taking laboratory-produced mind-altering substances are discussed at length in this encyclopedia.

The Coining of a Brand-New Term: "Generation Rx"

Among the most notable trends in drug use during the first five years of the twenty-first century was the growing abuse of two types of substances: 1) inhalants, including glue, nitrous oxide, and spray paint, and 2) prescription drugs, especially painkillers and stimulants. Drugs such as oxycodone (OxyContin), Adderall, and methylphenidate (Ritalin) have been approved by the U.S. Food and Drug Administration (FDA) for legitimate uses when prescribed by a physician. Increasingly, however, these drugs have made their way from home medicine cabinets to schools and dance clubs. Because of the sizable increase in prescription drug abuse among young people, the term "Generation Rx" is frequently used to describe the teens of the early 2000s.

The magnitude of inhalant and prescription drug abuse problems first became apparent with the release of the 2004 Monitoring the Future (MTF) study results. MTF is a survey of drug use and attitudes conducted by the University of Michigan with funds from the National Institute on Drug Abuse (NIDA). In late April of 2005, the Partnership for a Drug-Free America released its 2004 Partnership Attitude Tracking Study (PATS). At that time, the extent of

Vicodin abuse, in particular, became apparent. Vicodin is the brand name of the prescription painkiller hydrocodone. To ensure that information on this growing Vicodin trend was available to readers of this encyclopedia, we have included an informative sidebar and other information on the drug within the Meperidine entry. Please consult the master index for a complete list of pages that address the topic of Vicodin.

Format

The *U•X•L Encyclopedia of Drugs & Addictive Substances* is arranged alphabetically by drug name over five volumes. Each entry follows a standard format and includes the following sections:

- What Kind of Drug Is It?
- Overview
- What Is It Made Of?
- How Is It Taken?
- Are There Any Medical Reasons for Taking This Substance?
- Usage Trends
- Effects on the Body
- Reactions with Other Drugs or Substances
- Treatment for Habitual Users
- Consequences
- The Law
- For More Information

Each entry also includes the official drug name, a list of street or alternative names for the drug, and the drug's classification according to the U.S. government's Controlled Substances Act (1970). Important glossary terms are highlighted in the text in small caps with the definitions of the words appearing in the margin.

Features

All entries contain informative sidebars on historical, social, legal, and/or statistical aspects of the drugs. This encyclopedia contains nearly 200 sidebars. In addition, the encyclopedia features more than 300 graphics, including black and white photos, maps, tables, and other illustrations.

The *U•X•L Encyclopedia of Drugs & Addictive Substances* also includes:

- Alternative Drug Names guide. As most students recognize drugs by their common rather than official names, this guide to street and other alternative names points students to the correct entry name.

- Chronology. This section presents important historical moments in the history of drugs, from the discovery of dried peyote buttons in c. 5000 BCE to the withdrawal of the prescription drug Palladone in 2005.
- Words to Know. This master glossary defines difficult terms to help students with words that are unfamiliar to them.
- Color insert. Included in each volume, the insert visually informs readers about various drug topics discussed in the set, such as natural sources of drugs, herbal and dietary supplements, older illicit drugs, prescription drugs, public service announcement posters, and the rave culture.
- Highlights of the U.S. Controlled Substances Act (CSA) of 1970. This section discusses the various drug schedules created by the U.S. government and what they mean.
- Where to Learn More. This bibliography presents important sources (books, periodicals, Web sites, and organizations) where more information on drugs and addictive substances can be obtained.
- Cumulative Index. The master index points readers to topics covered in all five volumes of the encyclopedia.

Special Thanks

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Comments and Suggestions

We welcome your comments on the *U•X•L Encyclopedia of Drugs & Addictive Substances* and suggestions for other topics to

consider. Please write: Editors, *U•X•L Encyclopedia of Drugs & Addictive Substances,* Thomson Gale, 27500 Drake Rd., Farmington Hills, MI 48331-3535; call toll free: 1-800-877-4253; fax to 248-699-8097; or send e-mail via http://www.gale.com.

Chronology

c. 5000 BCE Dried peyote buttons dating from this era are later found in Shumla Cave, Texas.

c. 4000 BCE Opium poppies are cultivated in the Fertile Crescent (now Iran and Iraq) by the ancient cultures of Mesopotamia.

1552 BCE An ancient Egyptian papyrus text from the city of Thebes lists 700 uses for opium.

c. 1300 BCE A Peruvian carving depicting a San Pedro cactus, a source of mescaline, is made on stone tablets.

c. 700 BCE Archaeological tablets record that Persians and Assyrians used cannabis as a drug.

c. 199 Galen (129–c. 199), a medical authority during late Antiquity and the Middle Ages, creates a philosophy of medicine, anatomy, and physiology that remains virtually unchallenged until the sixteenth and seventeenth centuries.

c. 200 Chinese surgeons boil hemp in wine to produce an anesthetic called *ma fei san.*

c. 400 Hemp is cultivated in Europe and in England.

600-900 Arabic traders introduce opium to China.

1000 In Coahuila, Mexico, corpses are buried with beaded necklaces of dried peyote buttons.

c. 1200 Peoples of pre-Hispanic America throughout the Inca Empire (1200–1553) chew coca leaves for their stimulating effects and view the plant as a divine gift of the Sun God.

c. 1300 Arabs develop the technique of roasting coffee beans (native to the Kaffa region of Ethiopia), and cultivation for medicinal purposes begins.

c. 1350 Germany bans the sale of alcohol on Sundays and other religious holidays.

c. 1500 Following the Spanish conquest of the Aztecs, unsuccessful attempts are made to prohibit the use of the "magic mushroom" (*Psilocybe* mushrooms) in Central America.

c. 1500 With the rise of national navies during the sixteenth century, hemp farming is encouraged in England and continental Europe to meet the demand for rope and naval rigging.

1524 Paracelsus (1493–1541), Swiss physician and alchemist, mixes opium with alcohol and names the resulting product laudanum.

1556 Andre Thevet brings tobacco seeds to France from Brazil, thus introducing tobacco to Western Europe. Jean Nico suggests that tobacco has medicinal properties in 1559 at the French court, and the plant is renamed nicotina in his honor. By 1565, tobacco seeds are brought to England, where smoking is later made popular by Sir Walter Raleigh.

1612 Tobacco cultivation begins in America and soon becomes a major New World crop. Exports to England begin in 1613, with the first shipment by John Rolfe.

1640 First distillery is established in the United States.

1772 Nitrous oxide is discovered by British scientist, theologian, and philosopher Joseph Priestly (1733–1804).

1775 William Withering, a British physician with a strong interest in botany, introduces the drug digitalis (Foxglove *Digitalis purpurea*) into common medical practice for the treatment of dropsy. Dropsy is a now-obsolete term for edema (fluid retention or swelling) due to heart failure.

1798 Government legislation is passed to establish hospitals in the United States devoted to the care of ill sailors. This initiative leads to the establishment of a Hygenic Laboratory that eventually grows to become the National Institutes of Health.

1799 Chinese emperor Kia King's ban on opium fails to stop the profitable British monopoly over the opium trade.

1799 British scientist Humphry Davy (1778–1829) suggests nitrous oxide can be used to reduce pain during surgery.

c. 1800 Records show that chloral hydrate is used in the "Mickey Finn" cocktail—a drink used to knock people out. The Mickey Finn was used by people wanting to abduct or lure sailors to serve on ships bound for sea.

1803 German scientist Friedrich Sertürner isolates morphine as the most active ingredient in the opium poppy.

1824 Performances in London of "M. Henry's Mechanical and Chemical Demonstrations" show the effects of nitrous oxide on audience volunteers.

1827 Caffeine from tea, originally named "theine," is isolated.

1828 Nicotine (C_{10} H_{14} N_2, beta-pyridyl-alpha-N methylpyrrolidine), a highly poisonous alkaloid, is first isolated from tobacco.

1829 Salicin, the precursor of aspirin, is purified from the bark of the willow tree.

1832 French chemist Michel-Eugène Chevreul (1786–1889) isolates creatine from muscle tissue.

1832 Pierre-Jean Robiquet (1780–1840) discovers codeine. Codeine is an alkaloid found in opium that is now used in prescription pain relievers and cough medicines.

1837 Edinburgh chemist and physician William Gregory discovers a more efficient method to isolate and purify morphine.

1839 The First Opium War begins between Britain and China. The conflict lasts until 1842. Imperial Chinese commissioner Lin Tse-Hsu seizes or destroys vast amounts of opium, including stocks owned by British traders. The Chinese pay compensation of more than 21 million silver dollars, and Hong Kong is ceded to Britain under the Treaty of Nanking.

1841 The anesthetic properties of ether are first used by Dr. Crawford W. Long as he surgically removes two tumors from the neck of an anesthetized patient.

1844 The first recorded use of nitrous oxide in U.S. dentistry occurs and involves Quincy Colton, a former medical student, and dentist Horace Wells.

1848 The hypodermic needle is invented, allowing for quicker delivery of morphine to the brain.

1856 The Second Opium War begins between Britain and China. The conflict lasts until 1860. Also known as the Arrow War, or the Anglo-French War in China, the war breaks out after a British-flagged ship, the *Arrow*, is impounded by China. France joins Britain in the war after the murder of a French missionary. China is again defeated and made to pay another large compensation. Under the Treaty of Tientsin, opium is again legalized.

1860 German chemist, Albert Niemann, separates cocaine from the coca leaf.

1861–1865 Morphine gains wide medical use during the American Civil War. Many injured soldiers return from the war as morphine addicts. Morphine addiction becomes known as the "soldiers' disease."

1862 The Department of Agriculture establishes the Bureau of Chemistry, the forerunner of the U.S. Food and Drug Administration (FDA).

1863 German chemist Adolf von Baeyer (1835–1917) discovers barbituric acid.

1864 Amyl nitrite is first synthesized. During the last decades of the twentieth century, amyl nitrite and similar compounds

(e.g., butyl, isobutyl, isoamyl, isopropyl, and cyclohexyl nitrates and nitrites) become the chemical basis of "poppers."

1864 German scientists Joseph von Mering (1849-1908) and Nobel prizewinner Emil Hermann Fischer (1852-1919) synthesize the first barbiturate.

1867 Thomas Lauder Brunton (1844–1916), a medical student in Scotland, discovers that amyl nitrite relieves angina by increasing blood flow to the heart. A few years later, nitroglycerine is discovered to have a similar dilating effect. Although both can still be prescribed for angina, nitroglycerine became more commonly prescribed because it is more easily administered and has fewer side effects.

1871 Companies in both the United States and the United Kingdom succeed in producing compressed and liquid nitrous oxide in cylinders.

1874 British chemist Alder Wright uses morphine to create diacetylmorphine (heroin), in an effort to produce a less addictive painkiller.

1879 The Memphis, Tennessee, public health agency targets opium dens by making it illegal to sell, own, or borrow "opium or any deleterious drug." Critics point out that it is unfair to deny opium to Chinese immigrants while allowing white citizens to freely purchase morphine. In fact, people could legally inhale, drink, or inject morphine at that time. It wasn't until 1909 that federal law outlawed smoking or possessing opium.

1882 Production of the drug barbital begins, and doctors start using the barbiturate in various treatments.

1887 Amphetamines are first synthesized.

1889 French-born scientist Charles Edouard Brown-Sequard (1817–1894) reports that he has injected himself with a compound taken from the testicles of dogs. He says the compound made him feel stronger and more energetic.

1891 *The British Medical Journal* reports that Indian hemp was frequently prescribed for "a form of insanity peculiar to women."

1893 The first diet pills (e.g., thyroid extracts) are marketed in United States.

1895 Heinrich Dreser, working for the Bayer Company in Germany, produces a drug he thinks is as effective as morphine in reducing pain, but without its harmful side effects. Bayer began mass production of diacetylmorphine, and in 1898 begins marketing

the new drug under the brand name "Heroin" as a cough sedative.

1896 More than 300 opium "dens" are in operation in New York City alone.

1897 German chemist Arthur Heffter identifies mescaline as the chemical responsible for peyote's hallucinogenic effects.

1898 German chemical company Bayer aggressively markets heroin as a cough cure for the rampant disease of the time, tuberculosis.

1901 Jokichi Takamine (1854–1922), Japanese American chemist, and T. B. Aldrich first isolate epinephrine from the adrenal gland. Later known by the trade name Adrenalin, it is eventually identified as a neurotransmitter.

1903 Barbiturate-containing Veronal is marketed as a sleeping pill.

1903 Barbiturates (a class of drugs with more effective sedative-hypnotic effects) replace the use of most sedative bromides.

1903 To determine the safety of additives and preservatives in foods and medicines, the U.S. government establishes a "poison squad," a group of young men who volunteer to eat foods treated with chemicals such as borax, formaldehyde, and benzoic acid. The poison squad was established by Dr. Harvey W. Wiley (1844–1930), head of the U.S. Bureau of Chemistry, the precursor to the FDA.

1906 The U.S. Congress passes the Pure Food and Drug Act.

1909 Congressional legislation stops U.S. imports of smokable opium or opium derivatives except for medicinal purposes.

1910 Britain signs an agreement with China to dismantle the opium trade. However, the profits made from its cultivation, manufacture, and sale are so enormous that no serious interruption occurs until World War II (1939–1945) closes supply routes throughout Asia.

1912 Casimir Funk (1884–1967), Polish American biochemist, coins the term "vitamine." Because the dietary substances he discovers are in the amine group, he calls all of them "life-amines" (using the Latin word *vita* for "life").

1912 Ecstasy, 3,4-Methylenedioxymethamphetamine (MDMA), is developed in Germany.

1912 Phenobarbital is introduced under the trade name Luminal.

1912 The U.S. Public Health Service is established.

1912 The U.S. Congress enacts the Shirley Amendment that prohibits false therapeutic claims in advertising or labeling medicines.

1913 The U.S. Congress passes the Gould Amendment requiring accurate and clear labeling of weights, measures, and numbers on food packages.

1914 The Harrison Narcotic Act bans opiates and cocaine in the United States. Their use as local anesthetics remains legal, however.

1916 Oxycodone is first developed in Germany and marketed under the brand name Eukodal.

1918 The Native American Church (NAC) is founded and combines Christian practices with the use of peyote rituals. Ultimately, the U.S. government exempts the NAC from its ban on peyote if the drug is used as part of a bona fide religious ceremony. This point remains a center of legal controversy in states that want to limit peyote use or outlaw it completely.

1919 The Eighteenth Amendment to the U.S. Constitution (ratified on January 29, 1919) begins the era of Prohibition in the United States. It prohibits the sale and consumption of alcohol in the nation.

1919 Methamphetamine is first manufactured in Japan.

1925 The League of Nations adopts strict rules governing the international heroin trade.

1926 Phencyclidine (PCP) is first synthesized.

1927 Albert Szent-Györgyi (1893–1986), Hungarian American physicist, discovers ascorbic acid, or vitamin C, while studying oxidation in plants.

1929 Scottish biochemist Alexander Fleming (1881–1955) discovers penicillin. He observes that the mold *Penicillium notatum* inhibits the growth of some bacteria. This is the first antibiotic, and it opens a new era of "wonder drugs" to combat infection and disease.

1930 The U.S. Food, Drug, and Insecticide Administration is renamed the U.S. Food and Drug Administration (FDA).

1932 Pharmaceutical manufacturer Smith, Kline and French introduces Benzedrine, an over-the-counter amphetamine-based inhaler for relieving nasal congestion.

1933 The Twenty-first Amendment to the U.S. Constitution repeals the Eighteenth Amendment and makes it legal to sell and consume alcohol in United States again.

1935 The Federal Bureau of Narcotics, forerunner of the modern Drug Enforcement Administration (DEA), begins a campaign that portrays marijuana as a drug that leads users to addiction,

violence, and insanity. The government produces films such as *Marihuana* (1935), *Reefer Madness* (1936), and *Assassin of Youth* (1937).

1935 The first Alcoholics Anonymous (AA) group is formed in Akron, Ohio.

1935 Testosterone is first isolated in the laboratory.

1936 The U.S. government begins to open a series of facilities to help deal with the rising number of opiate addicts in the nation.

1937 Amphetamine is used to treat a condition known as minimal brain dysfunction, a disorder later renamed attention-deficit/hyperactivity disorder (ADHD).

1937 Diethylene glycol, an elixir of sulfanilamide, kills 107 people, including many children. The mass poisoning highlights the need for additional legislation regarding drug safety.

1937 The Marijuana Tax Act effectively makes it a crime to use or possess the drug, even for medical reasons.

1938 The Federal Food, Drug, and Cosmetics Act gives regulatory powers to the FDA. It also requires that new drugs be clinically tested and proven safe.

1938 Meperidine is synthesized. Other synthetic opioids soon follow.

1938 Swiss chemist Albert Hofmann (1906–) at Sandoz Laboratories synthesizes LSD. After initially testing it on animals, Hofmann accidentally ingests some of the drug in 1943, revealing LSD's hallucinogenic properties.

1938 The Wheeler-Lea Act empowers the U.S. Federal Trade Commission to oversee non-prescription drug advertising otherwise regulated by the FDA.

1939 Ernest Chain (1906–1979) and H. W. Florey (1898–1968) refine the purification of penicillin, allowing the mass production of the antibiotic.

1939 Methadone, a synthetic opioid narcotic, is created in Germany. Originally named Amidon, early methadone was used mainly as a pain reliever.

1942 The Opium Poppy Control Act outlaws possession of opium poppies in United States.

1944 To combat battle fatigue during World War II, nearly 200 million amphetamine tablets are issued to American soldiers stationed in Great Britain during the war.

1944 The U.S. Public Health Service Act is passed.

1945 After World War II, anabolic-androgenic steroids (AASs) are given to many starving concentration camp survivors to help them add skeletal muscle and build up body weight.

1948 A U.S. Supreme Court ruling allows the FDA to investigate drug sales at the pharmacy level.

1948 The World Health Organization (WHO) is formed. The WHO subsequently becomes the principal international organization managing public health related issues on a global scale. Headquartered in Geneva, Switzerland, the WHO becomes, by 2002, an organization of more than 190 member countries. The organization contributes to international public health in areas including disease prevention and control, promotion of good health, addressing disease outbreaks, initiatives to eliminate diseases (e.g., vaccination programs), and development of treatment and prevention standards.

1949 The FDA publishes a "black book" guide about the toxicity of chemicals in food.

1950 A U.S. Court of Appeals rules that drug labels must include intended regular uses of the drug.

1951 The U.S. Durham-Humphrey Amendment defines conditions under which drugs require medical supervision and further requires that prescriptions be written only by a licensed practitioner.

1952 The tranquilizer Reserpine rapidly begins replacing induced insulin shock therapy (injecting patients with insulin until their blood sugar levels fall so low that they become comatose), electroconvulsive (ECT) therapy (inducing seizures by passing an electric current through the brain), and lobotomy (making an incision in the lobe of the brain) as treatments for certain types of mental illness.

1953 British novelist Aldous Huxley (1894–1963) publishes *The Doors of Perception*, a book in which he recounts his experiences with peyote.

1953 Jonas Salk (1915–1995) begins testing a polio vaccine comprised of a mixture of killed viruses.

1953 Narcotics Anonymous (NA) is founded.

1953 The U.S. Federal Security Agency becomes the Department of Health, Education, and Welfare (HEW).

1954 Veterinarians begin using piperazines, which are designed to rid the lower intestinal tract of parasitic worms.

1955 Scientists in India first synthesize methaqualone.

1956 The American Medical Association defines alcoholism as a disease.

1956 Dimethyltriptamine (DMT) is recognized as being hallucinogenic.

1957 Researchers John Baer, Karl Beyer, James Sprague, and Frederick Novello formulate the drug chlorothiazide, the first of the thiazide diuretics. This groundbreaking discovery marks a new era in medicine as the first safe and effective long-term treatment for chronic hypertension and heart failure.

1958 Aaron B. Lerner isolates melatonin from the pineal gland.

1958 The FDA publishes a list of substances generally recognized as safe.

1958 The Parke-Davis pharmaceutical company synthesizes and patents PCP. After testing, Parke-Davis sells the drug as a general anesthetic called Sernyl.

1958 The U.S. government passes food additives amendments that require manufacturers to establish safety and to eliminate additives demonstrated to cause cancer.

1959 Fentanyl, first synthesized in Belgium by Janssen Parmaceutica, is used as a pain management drug.

1960 The FDA requires warnings on labels of potentially hazardous household chemicals.

1960 Gamma butyrolactone (GBL) is first synthesized.

1960 GBH, a fast-acting central nervous system depressant, is developed as an alternative anesthetic (painkiller) for use in surgery because of its ability to induce sleep and reversible coma.

1961 Commencing a two-year study, Harvard professor Timothy Leary attempts to reform criminals at the Massachusetts Correctional Institute. The inmates are given doses of psilocybin and psychological therapy. Ultimately, the psilocybin-subjected inmates have the same rate of return to prison as the inmates who were not part of the study. In addition to this, they have more parole violations than the general parolees.

1961 Ketamine (originally CI581) is discovered by Calvin Stevens of Wayne State University in Detroit, Michigan.

1962 The American Medical Association publishes a public warning in its journal *JAMA* regarding the increasingly widespread use of LSD for recreational purposes.

1962 Thalidomide, a sleeping pill also used to combat morning sickness in pregnant women, is discovered to be the cause of widespread and similar birth defects in babies born in Great

Britain and western Europe. Earlier, Dr. Frances Kelsey of the FDA had refused to approve the drug for use in the United States pending further research. Due to her steadfast refusal, countless birth defects are prevented in the United States.

1962 The U.S. Congress passes the Kefauver-Harris Drug Amendments that shift the burden of proof of clinical safety to drug manufacturers. For the first time, drug manufacturers have to prove their products are safe and effective before they can be sold.

1964 The first Surgeon General's Report on Smoking and Health is released. The U.S. government first acknowledges and publicizes that cigarette smoking is a leading cause of cancer, bronchitis, and emphysema.

1965 At the height of tobacco use in the United States, surveys show 52 percent of adult men and 32 percent of adult women use tobacco products.

1965 Because of disturbing side effects including horrible nightmares, delusions, hallucinations, agitation, delirium, disorientation, and difficulty speaking, PCP use on humans is stopped in the United States. PCP continued to be sold as a veterinary anesthetic under the brand name Sernylan.

1965 The manufacture of LSD becomes illegal in the United States. A year later it is made illegal in the United Kingdom. The FDA subsequently classifies LSD as a Schedule I drug in 1970.

1965 The U.S. Congress passes the Drug Abuse Control Amendments—legislation that forms the FDA Bureau of Drug Abuse Control and gives the FDA tighter regulatory control over amphetamines, barbiturates, and other prescription drugs with high abuse potential.

1966 The FDA and the National Academy of Sciences begin investigation of the effectiveness of drugs previously approved because they were thought to be safe.

1966 The U.S. Narcotic Addiction Rehabilitation Act gives federal financial assistance to states and local authorities to develop a local system of drug treatment programs. Methadone clinic treatment programs begin to rise dramatically.

1967 A "Love-In" in honor of LSD is staged at Golden Gate Park in San Francisco, California. Before LSD was made illegal, more than 40,000 patients were treated with LSD as part of psychiatric therapy.

1967 News accounts depict illicit use of PCP, then sometimes known as the "Peace Pill," in the Haight-Ashbury district of San Francisco during the "Summer of Love." PCP reemerges in the early 1970s as a liquid, crystalline powder, and tablet.

1968 Psilocybin and *Psilocybe* mushrooms are made illegal in United States.

1970 The U.S. Congress passes the Controlled Substance Act (CSA). It puts strict controls on the production, import, and prescription of amphetamines. Many amphetamine forms, particularly diet pills, are removed from the over-the-counter market.

1970 Ketamine is used as a battlefield anesthetic agent during the Vietnam war (1954–1975).

1970 The U.S. Comprehensive Drug Abuse Prevention and Control Act classifies drugs in five categories based on the effect of the drug, its medical use, and potential for abuse.

1970 Widespread use of peyote is halted by the Comprehensive Drug Abuse Prevention and Control Act of 1970. During the 1950s and 1960s, peyote was legal throughout most of the United States. During the peak of the psychedelic era, dried peyote cactus buttons were readily available through mail-order catalogs.

1971 Cigarette advertising is banned from television and radio. The nonsmokers' rights movement begins.

1971 The United Kingdom passes the Misuse of Drugs Act.

1974 2C-B is first produced by American chemist and pharmacologist Alexander Shulgin.

1974 The first hospice facility opens in the United States.

1975 Anabolic-androgenic steroids (AASs) are added to the International Olympic Committee's list of banned substances.

1975 Rohypnol, developed by the pharmaceutical firm of Hoffmann-La Roche, is first sold in Switzerland as a sleeping aid for the treatment of insomnia. Reports begin surfacing that Rohypnol is abused as a recreational or "party" drug, often in combination with alcohol and/or other drugs. It also becomes known as a date rape drug.

1976 The FBI warns that "crack" cocaine use and cocaine addiction are on the rise in the United States.

1976 Oxycodone is approved by the FDA. Various formulations follow, including drugs that combine oxycodone with either aspirin or acetaminophen.

1976 The U.S. Congress passes the Proxmire Amendments to stop the FDA from regulating vitamin and mineral supplements as drugs based on their potency or strength. This legislation also prohibits the FDA from regulating the potency of vitamin and mineral supplements.

1978 The American Indian Religious Freedom Act is passed and protects the religious traditions of Native Americans, including the use of peyote.

1978 Because of escalating reports of abuse, PCP is withdrawn completely from the U.S. market. Since 1978, no legal therapeutic use of PCP exists.

1980 The FDA proposes removing caffeine from its Generally Recognized as Safe list. Subsequently, the FDA concludes in 1992 that, after reviewing the scientific literature, no harm is posed by a person's intake of up to 100 milligrams (mg) of caffeine per day.

1980 World Health Organization (WHO) classifies khat as a drug of abuse that may produce mild to moderate psychological dependency.

1981 Alprazolam (Xanax) is introduced and subsequently becomes the most widely prescribed benzodiazepine.

1982 The FDA issues regulations for tamper-resistant packaging after seven people die in Chicago from ingesting Tylenol capsules laced with cyanide. The following year, the federal Anti-Tampering Act is passed, making it a crime to tamper with packaged consumer products.

1983 The U.S. Congress passes the Orphan Drug Act, which allows the FDA to research and market drugs necessary for treating rare diseases.

1984 Methaqualone (Quaalude, Sopor), a nonbarbiturate hypnotic that is said to give a heroin-like high without drowsiness, is banned in the United States.

1984 Nicotine gum is introduced.

1985 The FDA approves synthetic THC, or dronabinol (Marinol), to help cancer patients undergoing chemotherapy.

1985 Ecstasy (MDMA) becomes illegal in the United States.

1985 The United Kingdom passes the Intoxicating Substances (Supply) Act, making it an offense to supply a product that will be abused. Subsequent legislation, the Cigarette Lighter Refill (safety) Regulations, passed in 1999, regulates the sale of purified liquefied petroleum gas, mainly butane. Butane is the

substance most often involved in inhalant deaths in the United Kingdom.

1986 The United Kingdom passes the Medicines Act.

1986 The U.S. Congress passes the Anti-Drug Abuse Act. This federal law includes mandatory minimum sentences for first-time offenders with harsher penalties for possession of crack cocaine than powder cocaine.

1986 The U.S. Surgeon General's report focuses on the hazards of environmental tobacco smoke to nonsmokers.

1987 The legal drinking age is raised to 21 years in United States.

1988 Canadian sprinter Ben Johnson (1961–) tests positive for anabolic-androgenic steroids (AASs) at the Seoul Olympic games and forfeits his gold medal to the second-place finisher, American Carl Lewis (1961–).

1990 The FDA bans the use of GHB, a drug related to GBL, a central nervous system depressant with sedative-hypnotic and hallucinogenic properties.

1990 The U.S. Supreme Court decision in *Employment Division v. Smith* says that the religious use of peyote by Native Americans is not protected by the First Amendment.

1991 Anabolic-androgenic steroids (AASs) are listed as Schedule III drugs in accord with the U.S. Controlled Substances Act (CSA).

1991 Nicotine skin patches are introduced.

1992 The Karolinska Institute publishes a study that finds subjects who take creatine supplements can experience a significant increase in total muscle creatine content. Creatine is thrust onto the global athletic scene as British sprinters Linford Christie and Sally Gunnel win Olympic gold in Barcelona after reportedly training with the aid of creatine supplementation. Subsequently, a lack of well-designed clinical studies of creatine's long-term effects combined with loose regulatory standards for creatine supplement products causes some athletic associations, including the U.S. Olympic Committee (USOC), to caution against its use without banning it outright.

1993 2C-B becomes widely known as a "rave" drug in United States.

1993 The first news accounts that cite the use of Rohypnol as a "date rape" drug are published. Rohypnol becomes one of more than 20 drugs that law enforcement officials assert are used in committing sexual assaults.

1993 The U.S. Religious Freedom Restoration Act and the American Indian Religious Freedom Act Amendments (AIRFA) restore the rights of Native Americans to use peyote in religious ceremonies.

1994 Cigarette industry secrets are revealed causing a storm of controversy. The list of some 700 potential additives shows 13 additives that are not allowed to be used in food.

1994 The U.S. Congress passes the Dietary Supplement Health and Education Act (DSHEA) in an effort to standardize the manufacture, labeling, composition, and safety of botanicals, herbs, and nutritional supplements. It expressly defines a dietary supplement as a vitamin, a mineral, an herb or other botanical, an amino acid, or any other "dietary substance." The law prohibits claims that herbs can treat diseases or disorders, but it allows more general health claims about the effect of herbs on the "structure or function" of the body or about the "well-being" they induce. Under the Act, supplement manufacturers are allowed to market and sell products without federal regulation. As a result, the FDA bears the burden of having to prove an herbal is unsafe before it can restrict its use.

1995 2C-B is classified as a Schedule I drug under the U.S. Controlled Substances Act (CSA).

1995 A study published by the *British Journal of Urology* asserts that khat (*Catha edulis*) chewing inhibits urine flow, constricts blood vessels, and promotes erectile dysfunction.

1995 A study by the Rand Corporation finds that every dollar spent in drug treatment saves society seven dollars in crime, policing, incarceration, and health services.

1995 The National Household Survey on Drug Abuse finds inhalants to be the second most commonly abused illicit drug by American youth ages 12–17 years, after marijuana.

1996 Anabolic-androgenic steroids (AASs) and other performance-enhancing drugs are added to the United Kingdom Misuse of Drugs Act.

1996 Nicotine nasal spray is introduced.

1996 The U.S. Drug-Induced Rape Prevention and Punishment Act makes it a felony to give an unsuspecting person a drug with the intent of committing violence, including rape. The law also imposes penalties of large fines and prison sentences of up to 20 years for importing or distributing more than one gram of date-rape drugs.

1997 2C-B is banned in Great Britain.

1997 The FDA proposes new rules regarding some ephedra dietary supplements and seeks to regulate certain products containing the drug. The FDA claims that certain ephedrine alkaloids resemble amphetamine, which stimulates the heart and nervous system. Congress rejects the FDA's attempt to subject ephedra products to regulation. In 2000, an ephedra study published in the *New England Journal of Medicine* shows a link between heart attacks, strokes, seizures, and mental side effects (including anxiety, tremulousness, and personality changes) with ephedra intake. Other possible mental side effects associated with ephedra are depression and paranoid psychosis.

1997 The FDA investigates the link between heart valve disease in patients using the Fen-Phen drug combination for weight loss. The FDA notes that the Fen-Phen treatment had not received FDA approval.

1997 The Institute of Medicine (IOM), a branch of the National Academy of Sciences, publishes the report *Marijuana: Assessing the Science Base*, which concludes that cannabinoids show significant promise as analgesics, appetite stimulants, and antiemetics. It states that further research into producing such medicines was warranted.

1997 Oregon voters approve the Death with Dignity Act, allowing terminally ill people to receive prescriptions for lethal doses of drugs to end their lives.

1997 Rohypnol is banned in the United States.

1997 The *Journal of the American Medical Association (JAMA)* publishes a study indicating that ginkgo dietary supplements might be useful in treating Alzheimer's disease, sparking additional research interest.

1997 The National Institutes of Health (NIH) estimate that approximately 600,000 people in the United States are opiate-dependent, meaning they use an opiate drug daily or on a frequent basis.

1998 A study at the Psychiatric University Hospital in Zurich, Switzerland, demonstrates that psilocybin produces a psychosis-like syndrome in healthy humans that is similar to early schizophrenia.

1998 Amendments made to the U.S. Higher Education Act make anyone convicted of a drug offense ineligible for federal student loans for one year up to an indefinite period of time. Such convictions may also render students ineligible for state aid.

1998 The nicotine inhaler (Nicotrol Inhaler) is introduced.

1998 The tobacco industry settles lengthy lawsuits by making a historic agreement with the States' Attorneys General called the Master Settlement Agreement (MSA). In exchange for protection from further lawsuits, the industry agrees to additional advertising restrictions and to reimburse the states billions of dollars over 25 years to pay for smoking-related illnesses.

1998 The U.S. Drug Free Communities Act offers federal money to communities to help educate citizens on the dangers on methamphetamine use and production.

1998 The U.S. Speed Trafficking Life in Prison Act increases penalties for the production, distribution, and use of methamphetamine.

1999 The Drug Enforcement Administration (DEA) lists GBL as a scheduled (controlled) substance.

1999 The FDA lists ketamine as a Schedule III drug.

1999 National Household Survey on Drug Abuse (NHSDA) estimates that a third of the American population (then an estimated 72 million people) had tried marijuana at least once.

1999 DEA agents seize 30 gallons (113.5 liters) of a dimethyltriptamine (DMT) tea called "hoasca" from the office of the O Centro Espirita Beneficiente Uniao do Vegetal (UDV), a New Mexico-based religious organization with approximately 500 members. The organization subsequently sued the U.S. Government, alleging a violation of their constitutional right of freedom of religion.

2000 The *Journal of Pharmacy and Pharmacology* concludes that khat (*Catha edulis*), like amphetamines and ibuprofen, can relieve pain.

2000 The National Cancer Institute (NCI) estimates that 3,000 lung cancer deaths, and as many as 40,000 cardiac deaths per year among adult nonsmokers in the United States can be attributed to passive smoke or environmental tobacco smoke (ETS).

2000 The U.S. Congress considers but does not pass the Pain Relief Promotion Act, which would have amended the Controlled Substances Act to say that relieving pain or discomfort—within the context of professional medicine—is a legitimate use of controlled substances. The bill died in the Senate.

2000 The U.S. Congress Ecstasy Anti-proliferation Act increases federal sentencing guidelines for trafficking and possessing with

intent to sell ecstasy (MDMA). It drastically increases jail terms for fewer numbers of pills in personal possession.

2000 The U.S. Congress passes a transportation spending bill that includes creating a national standard for drunk driving for adults at a 0.08 percent blood alcohol concentration (BAC) level. States are required to adopt this stricter standard by 2004 or face penalties. By 2001, more than half the states adopt this stricter standard.

2000 U.S. President William J. Clinton (1946–) signs the Hillory J. Farias and Samantha Reid Date-Rape Drug Prohibition Act into law.

2001 The *American Journal of Psychiatry* publishes studies providing evidence that methamphetamine can cause brain damage that results in slower motor and cognitive functioning—even in users who take the drug for less than a year.

2001 *International Journal of Cancer* researchers assert that khat (*Catha edulis*) chewing, especially when accompanied by alcohol and tobacco consumption, may cause cancer.

2001 National Football League (NFL) joins the National Collegiate Athletic Association (NCAA) and the International Olympic Committee (IOC) in issuing a ban on ephedrine use. The NFL ban on ephedrine prohibits NFL players and teams from endorsing products containing ephedrine or companies that sell or distribute those products.

2001 National Institute of Drug Abuse (NIDA) research reveals that children exposed to cocaine prior to birth sustained long-lasting brain changes. Eight years after birth, children exposed to cocaine prior to birth had detectable brain chemistry differences.

2001 A thoroughbred race horse wins a race at Suffolk Downs in Massachusetts but then tests positive for BZP (also known as Equine Ecstasy).

2001 The U.S. Supreme Court rules (unanimously) in *United States vs. Oakland Cannabis Buyers' Cooperative* that the cooperatives permitted under California law to sell medical marijuana to patients who had a physician's approval to use the drug were unconstitutional under federal law.

2002 Companies begin developing drink coasters and other detection kits that allow consumers to test whether drinks have been drugged. If date-rape drugs are present, a strip on the testing kit changes color when a drop of the tampered drink is placed on it.

2002 A Florida physician is convicted of manslaughter for prescribing OxyContin to four patients who died after overdosing on the powerful opiate. News reports allege that he is the first doctor ever convicted in the death of patients whose deaths were related to OxyContin use.

2002 Health Canada, the Canadian health regulatory agency, requests a voluntary recall of products containing both natural and chemical ephedra.

2002 The U.S. military's use of go-pills (dextroamphetamine) comes under fire after two U.S. Air Force pilots are involved in a friendly fire incident in Afghanistan. Four Canadian soldiers are killed and eight wounded when one of the American pilots bombs them from his F-16 after mistaking them for the enemy.

2002 In the aftermath of the September 11, 2001, terrorist attacks on the United States, the U.S. government dramatically increases funding to stockpile drugs and other agents that can be used to counter a bioterror attack.

2002 Several states, including Connecticut and Minnesota, pass laws that ban teachers from recommending psychotropic drugs, especially Ritalin, to parents.

2002 A U.S. federal district court judge rejects a U.S. Justice Department attempt to overturn Oregon's physician-assisted suicide law. The Justice Department had claimed that the state law violated the federal Controlled Substances Act.

2002-2003 During the severe acute respiratory syndrome (SARS) scare, many people visit Chinese herbalists to purchase a mixture of herbs to help protect them from the disease.

2003 More than 2,200 pounds (998 kilograms) of khat are seized at the Dublin Airport in Ireland. The bundles were being sent to New York from London.

2003 The FDA approves the use of Prozac in depressed children as young as seven years old.

2003 The U.S. government implements the Reducing Americans' Vulnerability to Ecstasy Act.

2003 Steve Bechler, a pitcher with the Baltimore Orioles, collapses during a preseason workout in Florida and dies the next day. His death is linked to the use of ephedra.

2003 More than 3,500 children in the United States are involved in meth lab incidents during the year.

2004 Australian police begin stopping motorists randomly to conduct saliva tests to check for various illegal drugs, including marijuana and amphetamines.

2004 Adderall XR is approved by the FDA for use by adults with ADHD.

2004 The FDA announces that "black box" labeling of antidepressants will become mandatory.

2004 The federal court case regarding the O Centro Espirita Beneficiente Uniao do Vegetal religious sect concludes with the group winning the right to use an hallucinogenic tea in its religious services.

2004 The FDA bans the use of ephedra in the United States following reports of more than 150 deaths linked to the supplement.

2004 The Warner Bros. movie *Scooby-Doo 2: Monsters Unleashed* contains a scene showing Shaggy taking a hit of nitrous oxide off a whipped cream can. The scene angers many parents who have lost children due to inhalant abuse.

2004-2005 BZP is still being sold over-the-counter in New Zealand as an herbal party pill. In 2005, the DEA officially classifies BZP as a Schedule I drug in the United States.

2004-2005 After the fall of the Taliban government in Afghanistan in late 2001, opium poppy production begins to soar by 2004. Street heroin becomes purer and available in larger quantities. Prices reach a twenty-year low.

2005 Baseball players and managers are called to testify before Congress about steroid use in the Major Leagues.

2005 The Partnership for a Drug-Free America releases a study showing that prescription drug abuse among teens is growing rapidly. Teens are dubbed "Generation Rx."

2005 The U.S. Supreme Court agrees to hear a case involving Oregon's physician-assisted suicide law.

2005 Utah-based Nutraceutical International successfully challenges the FDA ban on ephedra in federal court. U.S. judge Tena Campbell rules that the FDA has failed to prove that the company's ephedra-based product is unsafe.

2005 The FDA launches a pilot program using high-tech radio frequency identification (RFID) tags to track the movement of bottles of the most addictive prescription painkillers.

2005 The Canadian government joins several European nations (most notably the Netherlands) in a pilot program to give free heroin to heroin addicts to help them stabilize their lives,

eventually overcome addiction, and prevent them from contracting diseases by sharing dirty needles.

2005 The U.S. Supreme Court rules against the use of medical marijuana. At the time of the ruling, ten states allow medical marijuana to be used by cancer, AIDS, and other patients suffering severe pain when prescribed by a physician.

2005 The FDA issues a public health advisory about the use of fentanyl skin patches after receiving reports that people have died or experienced serious side effects after overdosing on the drug.

2005 The new opiate drug Palladone is pulled off the market for further research by its maker, Purdue Pharma.

2005 Oregon lawmakers vote to make over-the-counter cold and allergy remedies containing pseudoephedrine available by prescription only beginning in mid-2006. The move is taken to make it harder for illegal methamphetamine "cooks" to obtain the ingredient. A dozen other states move the product "behind the counter."

Words to Know

A

acetaminophen: Pronounced uh-SEE-tuh-MINN-uh fenn; a non-aspirin pain reliever, such as Tylenol.

acetylcholine: Pronounced uh-settle-KOH-leen; a neurotransmitter that forms from a substance called choline, which is released by the liver.

acquired immunodeficiency syndrome (AIDS): An infectious disease that destroys the body's immune system, leading to illness and death.

active ingredient: The chemical or substance in a compound known or believed to have a therapeutic, or healing, effect.

adenosine triphosphate (ATP): An important energy-carrying chemical, created with the assistance of creatine.

adrenaline: Pronounced uh-DREN-uh-linn; a natural stimulant produced by the human body; also known as epinephrine (epp-ih-NEFF-run).

adverse reactions: Side effects, or negative health consequences, reported after taking a certain substance.

aerobic exercises: Exercises performed to increase heart health and stamina, such as jogging, biking, and swimming, usually lasting between twenty minutes and an hour.

aerosol: Gas used to propel, or shoot out, liquid substances from a pressurized can.

alchemists: Those who study or practice medieval chemical science aimed at discovering a cure for all illnesses.

alcoholism: A disease that results in habitual, uncontrolled alcohol abuse; alcoholism can shorten a person's life by damaging the brain, liver, and heart.

alkaloid: A nitrogen-containing substance found in plants.

Alzheimer's disease: A brain disease that usually strikes older individuals and results in memory loss, impaired thinking, and personality changes; symptoms worsen over time.

amines: Organic (or carbon-containing) chemical substances made from ammonia.

amino acids: Any of a group of chemical compounds that form the basis for proteins.

ammonia: A strong-smelling colorless gas made of nitrogen and hydrogen; often used as a cleaning agent in its liquid form.

amnesia: The loss of memory.

amphetamines: Pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake.

anabolic agents: Substances that promote muscle growth.

anaerobic exercise: Short, strenuous exercises that require sudden bursts of strength, such as weight lifting and batting a baseball.

analgesics: Pain relievers or the qualities of pain relief.

analogs: Drugs created in a laboratory, having a slightly different chemical composition than a pharmaceutical, yet having the same effects on the brain as the pharmaceutical.

anemia: A blood condition that results in the decreased ability of the blood to transport enough oxygen throughout the body.

anesthesiologists: Medical doctors trained to use medications to sedate a surgery patient.

anesthetic: A substance used to deaden pain.

angina pectoris: Pronounced an-JINE-uh peck-TOR-ess; a feeling of suffocation and pain around the heart that occurs when the blood supply to the heart is not adequate.

anhedonia: Pronounced ann-heh-DOE-nee-uh; the inability to experience pleasure from normally enjoyable life events.

anorectics: Pronounced ah-nuh-RECK-ticks; diet pills that cause a loss of appetite; they were developed to replace amphetamines.

anorexia: Pronounced ah-nuh-REK-see-uh; a severe eating disorder characterized by an intense fear of gaining weight, a refusal to eat, a distorted sense of self-image, and excessive weight loss.

antagonist: Pronounced ann-TAG-uh-nist; a drug that opposes the action of another drug.

anthelmintic: Pronounced ant-hel-MINN-tick; a substance that helps destroy and expel parasitic worms, especially worms located in the intestines.

antidote: A remedy to reverse the effects of a poison.

antihistamines: Drugs that block *histamine,* a chemical that causes nasal congestion related to allergies.

antioxidant: A chemical that neutralizes free radicals (chemicals with an unpaired electron) that can damage other cells.

antitussants: Pronounced an-ty-TUH-sihvs; medicines that quiet coughs.

anxiety: A feeling of being extremely overwhelmed, restless, fearful, and worried.

anxiety disorders: A group of mental disorders or conditions characterized in part by extreme restlessness, uncontrollable feelings of fear, excessive worrying, and panic attacks.

aphrodisiac: Pronounced aff-roh-DEE-zee-ack; a drug or other substance that excites or increases sexual desire.

arthritis: Painful swelling of joints caused by abnormal bone growth or wear and tear on the joint.

asphyxiation: Death or unconsciousness caused by one of three things: 1) a lack of adequate oxygen, 2) the inhalation of physically harmful substances, or 3) the obstruction of normal breathing.

asthma: Pronounced AZ-muh; a lung disorder that interferes with normal breathing.

ataxia: Pronounced uh-TAKS-ee-uh; loss of control of muscle coordination.

attention-deficit/hyperactivity disorder (ADHD): A disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning.

autism: Pronounced AW-tizm; a psychological disorder, usually diagnosed in children, that affects emotional development, social interactions, and the ability to communicate effectively.

***ayahuasca*:** One of several teas of South American origin used in religious ceremonies, known to contain dimethyltryptamine (DMT); also a plant.

B

barbiturates: Pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers."

bathtub chemists: Inexperienced and illegal drug makers who concoct homemade drugs; also referred to as "kitchen chemists" or "underground chemists."

behavior modification: A type of therapy that changes behavior by substituting desired responses for undesired ones.

benzodiazepines: A type of drug used to treat anxiety.

binge drinking: Consuming a lot of alcohol in a short period of time.

bipolar disorder: A psychological disorder that causes alternating periods of depression and extreme elevation of mood.

black market: The illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market."

boils: Large pimples that are inflamed and filled with pus.

bone marrow: Soft tissue in the center of bones where blood cell formation occurs.

bronchitis: An illness that affects the bronchial tubes in the lungs, leading to shortness of breath and coughing.

bronchodilator: A drug that relaxes breathing muscles, allowing air to flow more easily through the tubes that lead to the lungs.

bufotenine: The component of venom from the toad genus *Bufo* that contains dimethyltryptamine (DMT).

bulimia: Pronounced bull-EEM-eeh-yuh; an eating disorder that involves long periods of bingeing on food, followed by self-induced vomiting and abuse of laxatives.

C

cancer: Out-of-control cell growth leading to tumors in the body's organs or tissues.

cannabinoids: Chemical compounds found in cannabis plants and in small amounts in the brains of humans and animals.

carbon monoxide: A poisonous gas with no odor; carbon monoxide is released when cigarettes burn.

carcinogens: Chemicals that can cause cancer in the body.

cardiovascular illnesses: Illnesses involving the heart and blood vessels.

carries: Doses of methadone given to users to take home for another day.

chemotherapy: A medically supervised regimen of drugs used to kill cancer cells in the body. The drugs have potential side effects including nausea, vomiting, and other reactions.

cholesterol: Pronounced kuh-LESS-tuhr-ol; an essential substance made of carbon, hydrogen, and oxygen that is found in animal cells and body fluids; in high amounts, it may be deposited in blood vessels, resulting in dangerous blockages of blood flow.

cirrhosis: Pronounced sir-OH-sis; destruction of the liver, possibly leading to death.

clinical trials: Scientific experiments that test the effect of a drug in humans.

club drugs: Mostly synthetic, illegal substances found at raves and nightclubs, including the drugs ecstasy, GHB, ketamine, LSD, methamphetamines, PCP, and Rohypnol.

coca paste: An impure freebase made from coca leaves and used mainly in South America; coca paste is smoked and is highly addictive.

cocaethylene: A substance formed by the body when cocaine and alcohol are consumed together; it increases the chances of serious adverse reactions or sudden death from cocaine.

cognitive behavioral therapy (CBT): A type of therapy that helps people recognize and change negative patterns of thinking and behavior.

coma: A state of unconsciousness from which a person cannot be aroused by noise or other stimuli.

congestive heart failure (CHF): Inability of the heart to circulate, or pump, the blood throughout the body with sufficient force.

constipation: An inability to have a bowel movement.

control group: In a drug test, the group that does *not* receive the drug being tested.

controlled substance analog: Any chemical compound that acts on the body the same way a controlled substance does.

coroner: An official who investigates unexplained deaths.

corticosteroids: Pronounced kor-tih-koh-STEH-roydz; medications widely prescribed to treat inflammation.

crack cocaine: A highly addictive, smokable freebase cocaine made by combining powder cocaine with water and sodium bicarbonate.

cravings: Overwhelming urges to do something, such as take an illegal drug.

Crohn's disease: A serious disease of the intestines that causes inflammation, along with severe pain, diarrhea, nausea, and sometimes extreme weight loss.

cutting: Adding other ingredients to a powdered drug to stretch the drug for more sales.

cyanide: A poisonous chemical compound that shuts down the respiratory system, quickly killing people who have been exposed to it.

cyanosis: Bluish or purplish skin caused by a lack of oxygen in the blood.

D

decongestant: A drug that relieves nasal congestion.

dehydration: An abnormally low amount of fluid in the body.

delirium: A mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating.

delusions: False, unshakable beliefs indicating severe mental difficulties; "delusional" refers to the inability to distinguish between what is real and what seems to be real.

dementia: Pronounced dih-MENN-shuh; a brain disorder that causes a reduction in a person's intellectual functioning, most often affecting memory, concentration, and decision-making skills.

dependent: When a user has a physical or psychological need to take a certain substance in order to function.

depressants: Substances that slow down the activity of an organism or one of its parts.

depression: A mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts.

designer drugs: Harmful and addictive substances that are manufactured illegally in homemade labs.

detoxification: Often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances.

diabetes: A serious disorder that causes problems with the normal breakdown of sugars in the body.

dietary supplements: Products including vitamins, herbal extractions, and synthetic amino acids sold for specific uses such as weight loss, muscle building, or prevention of disease.

dilate: Expand or open up.

dissociation: A psychological syndrome in which the mind seems detached from the body; sometimes referred to as an "out of body" experience.

dissociative anesthetics: Pronounced dih-SOH-shee-uh-tiv ANN-ess-THET-iks; drugs that cause users to feel as if their minds are separated from their bodies.

diuretic: Pronounced die-er-EH-tik; substances that reduce bodily fluids by increasing the production of urine.

divination: The mystical experience of seeing into the future, witnessing a hidden truth, or gaining a deep insight.

doctor shopping: A practice in which an individual continually switches physicians so that he or she can get enough of a prescription drug to feed an addiction; this makes it difficult for physicians to track whether the patient has already been prescribed the same drug by another physician.

dopamine: Pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain.

dysphoria: Pronounced diss-FOR-ee-yuh; an abnormal feeling of anxiety, discontent, or discomfort; the opposite of euphoria.

E

edema: Pronounced ih-DEEM-uh; water buildup in the body's tissues that causes swelling.

electrolytes: Charged atoms such as sodium, potassium, chloride, calcium, and magnesium that conduct electrical impulses in the body, and therefore are essential in nerve, muscle, and heart function.

elixirs: Pronounced ih-LIK-suhrs; medicines made of drugs in a sweetened alcohol solution.

emaciated: Pronounced ee-MASE-ee-ate-ed; very thin and sickly looking.

endocrine system: The bodily system made of glands that secrete hormones into the bloodstream to control certain bodily functions.

endogenous: Pronounced en-DAH-juh-nuss; produced within the body.

endorphins: A group of naturally occurring substances in the body that relieve pain and promote a sense of well-being.

enkephalins: Pronounced en-KEFF-uh-linz; naturally occurring brain chemicals that produce drowsiness and dull pain.

enzymes: Substances that speed up chemical reactions in the body.

ephedrine: Pronounced ih-FEH-drinn; a chemical substance that eases breathing problems.

epilepsy: A disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness.

epinephrine: Pronounced epp-ih-NEFF-run; a hormone that increases heart rate and breathing; also called adrenaline.

ergot: Pronounced URH-got; a fungus that grows on grains, particularly rye, and contains lysergic acid, a chemical used to make LSD.

esophagus: The muscular tube connecting the mouth to the stomach.

essential amino acid: An amino acid that is only found in food; amino acids make up proteins.

estrogen: A hormone responsible for female reproductive traits.

ethanol: The colorless flammable liquid in alcoholic drinks; ethanol is the substance that gets people drunk.

ether: A flammable liquid used as an anesthetic.

euphoria: Pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria.

expectorant: A cough remedy used to bring up mucus from the throat or bronchial tubes; expectorants cause users to spit up thick secretions from their clogged breathing passages.

F

fetal alcohol effects (FAE): The presence of some—but not all—of the symptoms of fetal alcohol syndrome (FAS).

fetal alcohol syndrome (FAS): A pattern of birth defects, learning deficits, and behavioral problems affecting the children of mothers who drank heavily while pregnant.

fix: A slang term referring to a dose of a drug that the user highly craves or desires.

forensics: The scientific analysis of physical evidence.

freebase: Term referring to the three highly addictive forms of cocaine that can be smoked: 1) coca paste, which is made from processed coca leaves, 2) freebase, which is made with powder cocaine, ammonia, and ether, and 3) crack, which is made with powder cocaine and sodium bicarbonate.

fry sticks: Marijuana cigarettes laced with formaldehyde, a chemical used to keep dead tissues from decaying.

G

general anesthetic: Anesthetics that cause a loss of sensation in the entire body, rather than just a specific body part, and bring on a loss of consciousness.

glaucoma: An eye disease that causes increased pressure within the eyeball and can lead to blindness.

glycerin: A syrupy form of alcohol.

Golden Triangle: The highlands of Southeast Asia, including parts of Burma, Laos, Vietnam, and Thailand, where opium poppies are grown illegally.

gynecomastia: Pronounced GY-nuh-koh-MASS-tee-uh; the formation of female-type breasts on a male body.

H

hallucinations: Visions or other perceptions of things that are not really present.

hallucinogen: A substance that brings on hallucinations, which alter the user's perception of reality.

hangover: An uncomfortable set of physical symptoms caused by drinking too much alcohol; symptoms include headache, upset stomach, and trembling feelings and are caused by an expansion of blood vessels in the brain.

hashish: Concentrated, solidified cannabis resin.

heat exhaustion: A condition that results from physical exertion in extreme heat; symptoms range from clammy and cool skin, tiredness, nausea, weakness, confusion, and vision problems to a possible loss of consciousness.

heat stroke: A condition resulting from longtime exposure to high temperatures; symptoms include an inability to sweat, a very high body temperature, and, eventually, passing out.

hemp: Cannabis plant matter used to make fibers.

hepatitis: A group of viruses that infect the liver and cause damage to that organ.

herniated disk: A rupture of a spinal disk that puts painful pressure on nerves in the spinal column.

high: Drug-induced feelings ranging from excitement and joy to extreme grogginess.

hippocampus: A part of the brain that is involved in learning and memory.

histamines: Pronounced HISS-tuh-meenz: chemicals released by the body during an allergic reaction; they cause: 1) an increase in gastric secretions, 2) the dilation, or opening up of capillaries, 3) constriction of the muscles around the airway, and 4) a decrease in blood pressure.

hormone: (from the Greek word *hormo,* meaning "to set in motion") a chemical messenger that is formed in the body and transported by the blood to a certain target area, where it affects the activity of cells.

hospice: A special clinic for dying patients where emphasis is placed on comfort and emotional support.

huffing: Inhaling through the mouth, often from an inhalant-soaked cloth.

hydrocarbon: A compound containing only two elements: carbon and hydrogen; hydrocarbons are found in petroleum and natural gas.

hydrochloride: A chemical compound composed of the elements hydrogen and chlorine, often in the form of a crystallized salt.

hyperkalemia: A dangerous build-up of excess potassium in the body.

hypertension: Long-term elevation of blood pressure.

hyperthermia: A dangerous rise in body temperature.

hypogonadism: Pronounced high-poh-GO-nad-izm; a lack of activity in the male testicles, which can be caused by low testosterone levels.

hypokalemia: A loss of potassium in the body.

hyponatremia: Pronounced HY-poh-nuh-TREE-mee-uh; a potentially fatal condition brought on by drinking too much water; can cause swelling of the brain or sodium imbalance in the blood and kidneys.

hypothalamus: A region of the brain that secretes hormones.

hypoxia: A dangerous condition brought on by an inadequate amount of oxygen circulating throughout the body.

I

illicit: Unlawful.

impulsive behavior: (sometimes called impulsivity) Acting quickly, often without thinking about the consequences of one's actions.

incontinence: The loss of bladder and/or bowel control.

infertility: The inability to have children.

inflammation: A physical reaction to injury, infection, or exposure to an allergen characterized by redness, pain or swelling.

ingest: To take in for digestion.

inhalant: A chemical that gives off fumes or vapors that are sniffed, or breathed in.

inhibitions: Inner thoughts that keep people from engaging in certain activities.

insomnia: Difficulty falling asleep or an inability to sleep.

intermediaries: Chemical compounds that are intended for use in the manufacture of more complex substances.

intoxicating: Causing drunkenness, but not necessarily from alcohol; the loss of physical or mental control due to the use of any drug is termed "intoxication."

intramuscular: Injected into a muscle.

intravenous: Injected into a vein.

intubation: Putting a plastic tube into the lungs through the nose and throat, thus opening the airway of a person unable to breathe independently.

K

kidney: The body's urine-producing organ.

L

laxatives: Drugs that help produce bowel movements.

levomethorphan: A synthetic substance that mimics the behavior of opiates such as heroin, morphine, or codeine; levomethorphan is the parent drug of dextromethorphan.

lipase: A substance that speeds up the breakdown of fats in the body.

local anesthetic: A painkiller applied directly to the skin or mucus membranes.

loop of Henle: The U-shaped part of the nephron (tiny filtering unit of the kidney) where reabsorption processes take place.

M

mania: A mental disorder characterized by intense anxiety, aggression, and delusions.

menopause: A hormonal process associated with aging in females that results in an inability to become pregnant; also known as the "change of life."

menstrual cycle: Commonly referred to as a woman's "period"; the monthly discharge of blood and other secretions from the uterus of nonpregnant females.

metabolism: The process by which food is converted to energy that the body uses to function.

methylation: Pronounced meh-thuh-LAY-shun; the process of synthesizing or transforming codeine from morphine.

microgram: A millionth of a gram; there are 28 grams in 1 ounce.

miscarry: When a pregnancy ends abruptly because a woman is physically unable to carry the fetus (unborn baby) until it is able to survive on its own.

morphine: An addictive opiate that is used to kill pain and bring on relaxation and sleep.

mucus: A secretion released by the body to prevent germs and allergens from entering the bloodstream.

multiple sclerosis: A progressive illness that affects muscle tissue, leading to pain and inability to control body movements.

muscle dysmorphia: Pronounced muh-SUL diss-MORE-fee-uh; a mental disorder leading to a desire for larger and larger muscles.

mycologist: A person who studies mushrooms.

N

narcolepsy: A sleep disorder characterized by daytime tiredness and sudden attacks of sleep.

narcotic: A painkiller that may become habit-forming; in a broader sense, any illegally purchased drug.

nausea: Upset stomach, sometimes with vomiting.

nephrons: Tiny working units of the kidney; each kidney has more than a million nephrons.

neurological: Related to the body's nervous system.

neuron: A cell in the central nervous system that carries nerve impulses.

neurotransmitter: A substance that helps spread nerve impulses from one nerve cell to another.

nitrite: A negatively charged molecule of nitrogen and oxygen.

nitroglycerin: A heavy, oily, highly explosive liquid that—when used in very small doctor-prescribed amounts—relieves the pain of angina pectoris in heart patients.

nitrous oxide: A gas given to surgical patients to induce sleep.

norepinephrine: Pronounced nor-epp-ih-NEFF-run; a natural stimulant produced by the human body.

noxious: Physically harmful.

nurse anesthetist: (full title is certified registered nurse anesthetist, or CRNA) Nurses who receive special training in the administration of anesthesia.

O

obsessive-compulsive disorder (OCD): An anxiety disorder that causes people to dwell on unwanted thoughts, act on unusual urges, and perform repetitive rituals such as frequent hand washing.

obstetrician: A physician specializing in the birthing process.

opiate: Any drug derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain.

opioid: A substance created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine.

opium dens: Darkly lit establishments, often in the Chinatown section of big cities, where people went to smoke opium; many dens had beds, boards, or sofas upon which people could recline while experiencing the effects of the drug.

organic: A term used to describe chemical compounds that contain carbon.

osteoporosis: A loss in bone density resulting in thinned and fragile bones.

ovulation: The release of an egg from an ovary.

P

panic attacks: Unexpected episodes of severe anxiety that can cause physical symptoms such as shortness of breath, dizziness, sweating, and shaking.

paranoia: Abnormal feelings of suspicion and fear.

parasitic infections: Infection with parasites, which are organisms that must live with, in, or on other organisms to survive.

Parkinson's disease: An incurable nervous disorder that worsens with time and occurs most often after the age of fifty; it is generally caused by a loss of dopamine-producing brain cells; symptoms include overall weakness, partial paralysis of the face, trembling hands, and a slowed, shuffling walk.

passive smoking: Inhaling smoke from someone else's burning cigarette.

pesticide: A chemical agent designed to kill insects, plants, or animals that threaten gardens, crops, or farm animals.

phenethylamine: A type of alkaloid, or nitrogen-containing molecule.

phenylketonuria: Pronounced fenn-uhl-keet-uh-NORR-ee-yuh; an inherited disorder that interferes with the breakdown of a certain protein called phenylalanine (fenn-uhl-AL-uh-neen). Phenylalanine is found in milk, eggs, and other foods. Without treatment, this protein builds up in the bloodstream and causes brain damage.

phlegm: Pronounced FLEM; thick, germ-filled mucus secreted by the respiratory system.

phobias: Extreme and often unexplainable fears of certain objects or situations.

piperazines: Pronounced pih-PAIR-uh-zeens; chemical compounds made of carbon, hydrogen, and nitrogen that are used medically to destroy worms and other parasites in humans and animals.

placebo: Pronounced pluh-SEE-boh; a "sugar pill" or "dummy pill" that contains no medicine.

placebo effect: A psychological effect noted by researchers in which patients' conditions improve if they *believe* they are taking a medication that will relieve their symptoms.

pneumonia: A disease of the lung, usually brought on by infection, that causes inflammation of the lung tissue, fluid buildup inside the lungs, lowered oxygen levels in the blood, and difficulty breathing.

postmortem examinations: Examining the body after death; also called an autopsy.

postpartum depression: A form of depression that affects more than one in ten new mothers; symptoms include sadness, anxiety, irritability, tiredness, interrupted sleep, a loss of enjoyment or desire to do anything, and guilt over not being able to care properly for their babies.

post-traumatic stress disorder (PTSD): An illness that can occur after experiencing or witnessing life-threatening events, such as serious accidents, violent assaults, or terrorist attacks; symptoms include reliving the experience through nightmares and flashbacks, having problems sleeping, and feeling detached from reality.

potent: Powerful.

powder cocaine: (cocaine hydrochloride) an addictive psychoactive substance derived from coca leaves; it is either snorted into the nose or mixed with water and injected into the veins.

premenstrual syndrome: Symptoms that occur in some women about a week before the start of their monthly period and may include irritability, fatigue, depression, and abdominal bloating.

propellant: A gas that pushes out the contents of a bottle, can, or cylinder.

prostate: A male reproductive gland.

pseudoephedrine: Pronounced SUE-doh-ih-FEH-drinn; a chemical similar to ephedrine that is used to relieve nasal congestion.

psychedelic: The ability to produce hallucinations or other altered mental states.

psychoactive: Mind-altering; a psychoactive substance alters the user's mental state or changes one's behavior.

psychological addiction or psychological dependence: The belief that a person needs to take a certain substance in order to function, whether that person really does or not.

psychosis: Pronounced sy-KOH-sis; a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined.

psychostimulant: Pronounced SY-koh-STIM-yew-lent; a stimulant that acts on the brain.

psychotherapy: The treatment of emotional problems by a trained therapist using a variety of techniques to improve a patient's outlook on life.

psychotic behavior: A dangerous loss of contact with reality, sometimes leading to violence against self or others.

psychotropic: Having an effect on the mind.

pulmonary hypertension: A life-threatening condition of continuous high blood pressure in the blood vessels that supply the lungs.

Q

quarantined: Isolated in order to prevent the spread of disease.

R

raves: Overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use.

receptors: Group of cells that receive stimuli.

recreational drug use: Using a drug solely to achieve a high, not to treat a medical condition.

respiratory depression: A slowed breathing rate; severe cases can cause a person to slip into a coma or even stop breathing entirely.

retina: A sensory membrane in the eye.

rhabdomyolysis: Pronounced rabb-doh-my-OLL-uh-sis; destruction of muscle tissue leading to paralysis.

rush: A feeling of euphoria or extreme happiness and well-being.

S

schizophrenia: A mental disease characterized by a withdrawal from reality and other intellectual and emotional disturbances.

screw music: An engineered music inspired by codeine use that uses existing songs but slows them down and makes certain segments repetitive.

secondhand smoke: The smoke from a cigarette user and breathed in by someone nearby.

sedation: Drowsiness or lowered levels of activity brought on by a drug.

sedative: A drug used to treat anxiety and calm people down.

sedative-hypnotic agents: Drugs that depress or slow down the body.

self-mutilation: Deliberately cutting or injuring oneself in some way.

senility: Pronounced suh-NILL-ih-tee; a condition associated with old age; symptoms include a decrease in the ability to think clearly and make decisions.

serotonin: A combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator.

shaman: Spiritual leader who cures the sick and uncovers hidden truths.

sinsemilla: Literally, "without seeds"; buds from female marijuana plants carrying the highest concentration of THC.

sodium bicarbonate: A fizzy, liquid, over-the-counter antacid taken by mouth to relieve upset stomachs.

sodium pentathol: A drug given to surgical patients to induce sleep, usually administered by injection.

solvent: A substance, usually liquid, that dissolves another substance.

speed: The street name for amphetamines.

speedball: A combination of cocaine (a stimulant) and heroin (a depressant); this combination increases the chances of serious adverse reactions and can be more toxic than either drug alone.

steroids: Drugs that mimic the actions of testosterone, a hormone found in greater quantities in males than in females, and help build muscle mass and strength.

stimulant: A substance that increases the activity of a living organism or one of its parts.

stroke: A loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain.

sudden sniffing death (SSD) syndrome: Death that occurs very quickly after inhaled fumes take the place of oxygen in the lungs; SSD is most often caused by butane, propane, and aerosol abuse.

suffocate: Unable to breathe; death caused by a blockage of air to the lungs.

sulfuric acid: A strong and oily compound made of hydrogen, sulfur, and oxygen; it is capable of eating away at other substances.

suppository: Medicine that is delivered through the anus.

sympathomimetics: Pronounced SIMM-path-oh-muh-MEH-ticks; medications similar to amphetamines but less powerful and with less potential for addiction.

synapses: Junctions between two nerve cells where signals pass.

synthetic: Made in a laboratory.

T

tactile: Pronounced TAK-tuhl; relating to the sense of touch.

testicular atrophy: Pronounced tess-TIK-you-lar AH-truh-fee; the shrinking of the male testicles, which sometimes results from overdoses of testosterone or anabolic-androgenic steroids.

testosterone: Pronounced tess-TOS-tuhr-own; a hormone—found in greater quantities in males than in females—that is responsible for male traits and the male sex drive.

THC: The main active ingredient in cannabis.

thebaine: pronounced thee-BAIN; one of the active alkaloids in opium, used to create synthetic painkillers.

theobromine: Pronounced THEE-uh-BROH-meen; a xanthine found in cacao (kah-KOW) beans (the source of chocolate).

theophylline: Pronounced thee-AFF-uh-lun; a xanthine found in tea leaves.

thyroid: An important gland, or group of cells, in the body that secretes chemical messengers called hormones; these hormones control metabolism, the process by which food is converted to energy that the body uses to function.

tics: Repetitive, involuntary jerky movements, eye blinking, or vocal sounds that patients cannot suppress on their own.

tinctures: Combinations of an active drug and a liquid alcohol.

tolerance: A condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced.

toluene: Pronounced TOL-yuh-ween; a household and industrial solvent common in many inhaled substances, including model airplane glue, spray paint, correction fluid, paint thinners, and paint removers.

Tourette's syndrome: A severe tic disorder that causes distress and significant impairment to those affected by it.

toxic: Harmful, poisonous, or capable of causing death.

trafficking: Making, selling, or distributing a controlled drug.

trance: A sleep-like state in which important body functions slow down.

tranquilizers: Drugs such as Valium and Librium that treat anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens).

traumatic: Dangerous, life-threatening, and difficult to forget.

trip: An intense and usually very visual experience produced by an hallucinogenic drug.

tuberculosis: Pronounced tuh-burk-yuh-LOH-siss; a highly contagious disease of the lungs.

tryptamine compound: A crystalline compound of carbon, hydrogen, and nitrogen that is made in plant and animal tissues.

U

ulcers: The breakdown of mucus membranes, usually in the stomach.

V

vapors: Gas or fumes that can be irritating or physically harmful when inhaled.

venom: A liquid poison created by an animal for defense against predators or for killing prey.

W

withdrawal: The process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the

accompanying physiological effects of terminating use of an addictive drug.

X

xanthine: Pronounced ZAN-thene; a compound found in animal and plant tissue.

Highlights of the U.S. Controlled Substances Act (CSA) of 1970

The Controlled Substances Act (CSA) is part of a larger piece of legislation called the Comprehensive Drug Abuse Prevention and Control Act of 1970. It provides the legal basis for the U.S. government to fight the ongoing war against drugs.

Under the CSA, all drugs are categorized into one of five "schedules." A substance's scheduling is based on three factors: 1) its medicinal value; 2) its possible harmfulness to human health; and 3) its potential for abuse or addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use, while Schedule V is the classification used for the least dangerous drugs.

Schedule I Drugs

- have no known medical use in the United States
- have a very high potential for abuse
- are too dangerous to be used even under medical supervision

Drugs classified as Schedule I include 2C-B (Nexus), dimethyltryptamine (DMT), ecstasy (MDMA), GHB, heroin, LSD, mescaline, PMA, and psilocybin.

Schedule II Drugs

- are accepted for medical use in the United States
- may cause severe psychological and/or physical dependence
- have a high potential for abuse

Drugs classified as Schedule II include Adderall, cocaine, hydromorphone, methylphenidates such as Concerta and Ritalin, morphine, and oxycodone.

Schedule III Drugs

- are accepted for medical use in the United States
- may lead to moderate psychological and/or physical dependence
- are less likely to be abused than drugs categorized as Schedule I or Schedule II

Drugs classified as Schedule III include certain barbiturates such as aprobarbital (Alurate), butabarbital (Butisol), and butalbital

(Fiorinal and Fioricet), as well as muscle-building steroids and testosterone.

Schedule IV Drugs

- are accepted for medical use in the United States
- may lead to limited psychological and/or physical dependence
- have a relatively low potential for abuse

Drugs classified as Schedule IV include various benzodiazepines, including alprazolam (Xanax) and diazepam (Valium).

Schedule V Drugs

- are accepted for medical use in the United States
- are less likely to cause psychological and/or physical dependence than drugs in any other Schedule
- have a low potential for abuse

Drugs classified as Schedule V include various over-the-counter medicines that contain codeine.

Source: Compiled by Thomson Gale staff from data reported in "Controlled Substances Act," U.S. Drug Enforcement Administration (DEA), http://www.usdoj.gov/dea/agency/csa.htm (accessed September 4, 2005); and "Controlled Substance Schedules," U.S. Department of Justice, Drug Enforcement Administration (DEA) Office of Diversion Control, http://www.deadiversion.usdoj.gov/schedules/alpha/alphabetical.htm (accessed September 4, 2005).

2C-B (Nexus)

Official Drug Name: 4-bromo-2,5-dimethoxyphenethylamine (BROH-moh dy-meth-OCK-sy-FENN-eh-THY-luh-meen); almost always referred to by the shortened name 2C-B
Also Known As: Afro, bees, bromo, cloud-9, eve, nexus, toonies, utopia, and venus; Nexus is the street name used most frequently for 2C-B
Drug Classifications: Schedule 1, hallucinogen

What Kind of Drug Is It?

2C-B is an illegal and dangerous drug that has raised many concerns among medical experts and law enforcement officials worldwide. Its official name, 4-bromo-2,5-dimethoxyphenethylamine, is so difficult to pronounce that it is almost always referred to by its shortened name, 2C-B, or by the street name "nexus." 2C-B is usually sold as a tablet, a capsule, or a white powder. By 2004, however, it began appearing on the streets as both a red pill and an orange powder.

2C-B abuse is most common among teenagers and young adults who attend all-night dance parties, known as RAVES, on a regular basis. It is often taken in combination with other so-called rave or club drugs such as ecstasy (MDMA), GHB, ketamine, LSD (lysergic acid diethylamide), and methamphetamine. (Entries on these drugs are available in this encyclopedia.)

It is important to note that 2C-B is a synthetic drug; in other words, it cannot be grown in a garden or dug up from the ground. This drug is produced solely in illegal labs, has no known medical use, and cannot even be obtained with a doctor's prescription. 2C-B is used for just one reason, and that reason is to get high. It is very similar in chemical makeup to AMPHETAMINES. Amphetamines are stimulants, meaning that they increase the activity of a living organism or one of its parts.

2C-B is a PSYCHOACTIVE SUBSTANCE that affects the behavior and mental state of those who use it. 2C-B is also considered a psychedelic drug and a hallucinogen. Psychedelic drugs and hallucinogens produce HALLUCINATIONS, or strange sights and sounds, in users' heads. In a report filed in late December of 2004, *ABC News* writer Marc Lallanilla called synthetic hallucinogens like 2C-B "a new class of drugs [that are] getting increased attention from police and partiers alike."

Overview

According to the U.S. Department of Justice, the Drug Enforcement Administration (DEA) first came across 2C-B in 1979. The DEA noted in its Drug Intelligence Brief "An Overview of Club

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

psychoactive substance: a substance that alters the user's mental state or changes behavior

hallucinations: visions or other perceptions of things that are not really present

2C-B Basics

2C-B has been illegal since 1995, when it was classified as a Schedule I drug under the Controlled Substances Act (CSA, 1970). Few state and federal agencies track 2C-B use specifically. Rather, it is lumped in with statistics on club drugs or hallucinogens. 2C-B is often sold and used in combination with other club drugs. It is also sometimes sold as ecstasy (MDMA), especially at raves.

Drugs" (2000) that 2C-B first gained a following among drug users in Germany and Switzerland. However, the drug's effects soon began to "appeal to the U.S. rave culture" as well. These effects include increasing the user's awareness of things seen and heard, "increased sexual desire, and heightened senses of taste and touch."

By 2000, 2C-B had become a considerable concern to U.S. drug officials. At that time, significant seizures of the drug had occurred in nearly twenty states. Among the largest were raids carried out in Richmond, Virginia, and the Washington, D.C., area. By 2002, use of the drug was reported nationwide. Drug officials said they did not expect to see this trend reverse for years.

2C-B's Inventor

American chemist Alexander T. "Sasha" Shulgin (1925–) first produced 2C-B in 1974. Over the next year or so, he and his wife did extensive testing of the drug by using it themselves and recording the results. Shulgin has discovered or synthesized more than 150 drugs, most of them hallucinogens. He has angered U.S. law enforcement agencies for documenting his personal experiences while using drugs. In addition, Shulgin has published the chemical formulas "for almost every mind-bending drug known to humankind," wrote Dennis Romero in the *Los Angeles Times.*

Dr. Shulgin began his controversial career in chemistry in the 1960s. He conducted research at the University of California at San Francisco and worked as a senior research chemist at Dow Chemical. He received a license from the DEA to study seized drugs and "give expert testimony in drug trials," Romero noted. However, this did not "allow him to invent the stuff, though," continued Romero. "A few drugs Shulgin invented, substances with names like STP and 2C-B, escaped to the streets of San Francisco." STP, also called DOM, is another psychedelic hallucinogen.

What Is It Made Of?

Five elements are used to make 2C-B: carbon, hydrogen, nitrogen, oxygen, and bromine. The chemical element bromine is a deep red liquid. It is highly explosive, strong smelling, extremely caustic (burning and corrosive), and poisonous.

Raves are all-night dance parties featuring loud techno music. Illegal drugs, such as 2C-B, are often part of the rave culture. *© Houston Scott/Corbis Sygma.*

Many scientific terms can be applied to 2C-B. First of all, it is considered an ORGANIC chemical compound because it contains carbon. It also falls under the definition of an ALKALOID. The root word PHENETHYLAMINE in 2C-B's official name refers to the phenethylamine group of alkaloids, which also includes ephedrine, methamphetamine, and mescaline. (Entries on ephedra, methamphetamine, and mescaline are available in this encyclopedia.) The chemical properties of 2C-B most closely resemble those of mescaline, a powerful drug that can cause convulsions and is well known for its hallucinogenic properties. According to the DEA, 2C-B is ten times more powerful than the popular club drug ecstasy (MDMA).

organic: a term used to describe chemical compounds that contain carbon

alkaloids: nitrogen-containing substances found in plants

phenethylamine: a type of alkaloid, or nitrogen-containing molecule

How Is It Taken?

2C-B is most often taken by mouth and is available in pill, capsule, or powder form. In powder form, it is usually mixed with

Bromine is one of the chemical elements used to make 2C-B. A deep red liquid, bromine is highly explosive, strong smelling, extremely caustic (burning and corrosive), and poisonous. *Andrew Lambert Photography/Photo Researchers, Inc.*

a drink, but it also can be inhaled through the nose. Users report that snorting 2C-B is painful. The effects of the drug are increased when it is inhaled rather than swallowed.

2C-B is sometimes combined with ecstasy (MDMA) and called a "party pack." Or, it is mixed with LSD and referred to as a "banana split." The average dose of 2C-B sold on the street is 10 to 20 milligrams and costs 10 to 30 dollars each. Because 2C-B is an ILLICIT drug produced only in illegal labs, it is not possible to determine the accuracy of any dose.

Are There Any Medical Reasons for Taking This Substance?

2C-B has no known medical use.

Usage Trends

In the middle and late 1980s, 2C-B became an alternative or replacement for ecstasy (MDMA). Ecstasy was classified as an illegal drug in the United States in 1985. Switching one drug for another without the user's knowledge is a common and very dangerous practice in the world of synthesized drugs. "Drug quality may vary significantly," stated the authors of the Drug Intelligence Brief "An Overview of Club Drugs." "Substitute drugs often are sold when suppliers are unable to provide the drug currently in demand." This increases the likelihood of an overdose in unsuspecting users.

2C-B was not really used as a street drug in its own right until the early 1990s. It was sold in adult book and video stores, drug paraphernalia stores called "head" shops, bars, and nightclubs. Drug enforcement officials noticed the trend in 2C-B abuse and set out to stop it. Even before 2C-B was officially classified as an illegal drug in the United States in 1995, DEA agents closed 2C-B manufacturing laboratories in California and Arizona. In late 2004, 2C-B resurfaced in central New York. *News 10 Now* reporter Sarah Buynovsky referred to it as "a new and dangerous drug." She added that "2C-B is often homemade in labs and [is] difficult to track down."

illicit: unlawful

Illicit drugs like 2C-B are produced in illegal labs. Drugmakers often use abandoned, boarded-up houses as places to create their product.
AP/Wide World Photos.

The 2004 Monitoring the Future (MTF) Study

The results of the 2004 Monitoring the Future (MTF) study, conducted by the University of Michigan (U of M), were released to the public on December 21, 2004. The study is sponsored by research grants from the National Institute on Drug Abuse (NIDA). Since 1991, U of M has tracked patterns of drug use and attitudes toward drugs among students in the eighth, tenth, and twelfth grades. (Prior to that, from 1975 to 1990, the MTF survey was limited to twelfth graders.)

The 2004 MTF survey found that, overall, hallucinogen use among students at all three grade levels was down slightly. Still, the percentage of teens that had tried hallucinogens at least once remained very high—a trend that began in the mid-1980s. 2C-B use is not tracked specifically in the MTF survey, but is grouped in with statistics for "hallucinogens other than LSD." According to MTF charts for 2003 to 2004, about 1.7 percent of tenth and twelfth graders admitted to using hallucinogens at least once a month. About 4 percent of tenth graders and 6 percent of twelfth graders reported hallucinogen use "in the last twelve months."

The perceived availability of hallucinogens (the ease with which seniors said they would be able to get the drugs) was very high as well. About half of those surveyed said it would be "fairly easy" or "very

Who Abuses 2C-B?

Experts in the field of drug research regularly gather information available on certain drugs to create a profile of a typical user. Based on these studies, the typical 2C-B user is usually white but sometimes Hispanic and has a medium to high family income level. The user is roughly eighteen to twenty-six years old, resides in an urban area, and regularly attends all-night dance parties or raves. Use of hallucinogens like 2C-B is reportedly higher among males than females. A user of 2C-B is also very likely to abuse other drugs.

easy" to obtain hallucinogens. It is important to stress, however, that these respondents were not basing their answers specifically on the availability of 2C-B, but on hallucinogens in general.

The MTF survey does not track drug use among people after their high school years. As of 2005, data on 2C-B usage in the general population revealed that "the typical user is a young, white, college-educated and Web-savvy person," noted Lallanilla in his *ABC News* report. A large number of 2C-B users also take other drugs, which increases their risks for physical and mental side effects.

Effects on the Body

The most noticeable physical effects of 2C-B use are anxiety, agitation, facial flushing, sweating, muscle clenching, poor coordination, shaking, chills, tremors, dilated or enlarged pupils, and increased blood pressure and heart rate. Feelings of fear, anger, and distress are often sparked by 2C-B.

Drugs like 2C-B "have law enforcement and health officials concerned because their long-term health effects are virtually unknown," Lallanilla pointed out. 2C-B is capable of producing varying effects in humans based on the dosage taken. In fact, increasing the dose by just a few milligrams can make an enormous difference in what occurs in the user's body.

Although there are reports of negative effects at any dosage, a dose of 2C-B in the 4- to 5-milligram range typically makes users feel calm, relaxed, and more aware of their bodies and their emotions. At slightly higher doses of 8 to 10 milligrams, users usually appear drunk and may experience mild hallucinations.

Effects of Higher Doses

The intensity of the visual effects increases when more 2C-B is taken. Doses of 20 to 40 milligrams reportedly produce very vivid hallucinations. Solid objects appear to crawl and change shape. Geometric patterns can pop up on plain surfaces. Colors become more intense, and moving objects seem to leave trails of color behind them. In addition, music seems to take on a visual dimension, with users experiencing unusual blends of sights and sounds. Doses higher than 40 milligrams can bring on extremely frightening

Psychedelic drugs like 2C-B produce hallucinations and distort reality, making it hard for the user to know what is real and what is not.

Gusto/Photo Researchers, Inc.

hallucinations that occur with the eyes open or closed. Users have reported terrifying panic attacks after seeing gruesome 2C-B-induced images. Feelings of anger, PARANOIA, and generalized terror may also occur.

The effects of 2C-B usually become noticeable about fifteen to twenty minutes after the drug is taken. They reach their peak after an hour or so. Typically the effects of the drug do not begin to decrease until three or four hours after ingestion. They can last for up to twelve hours, depending on the strength of the dose taken. Some users have reported having unusual dreams up to three nights after taking 2C-B. Others claim that the mood-altering effects of the drug can remain some five to six days after coming down from an intense 2C-B high.

"Many who try 2C-B find it intensely disagreeable," wrote Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use, and Abuse.* "Diarrhea, cramping, and gas are common, and some have complained of allergic-type reactions with cough and runny nose. Some users feel anxious or have frightening thoughts or visions." 2C-B appears to bind to SEROTONIN receptors in

paranoia: abnormal feelings of suspicion and fear

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

Bad Trips

A 2C-B user can have strong feelings of anxiety or fear while "tripping," or experiencing the physical and mental disturbances brought on by the drug. The hallucinatory effects can be intense enough to make users feel that they are losing control or going crazy. When negative feelings dominate the experience, it is commonly called a "bad trip." The reasons for these frightening experiences are not known. Such trips are particularly common among first-time users.

In *A Brief History of Drugs: From the Stone Age to the Stoned Age,* Antonio Escohotado warned that 2C-B "induces terror when overdosed" and has been known to "generate many bad trips." Having a bad trip can cause the user to panic, which can lead to even more dangerous behavior. Sometimes, the fear-provoking effects of 2C-B can last for eight to twelve hours. That is a very long time to be terrified. Medical attention and physical restraint are sometimes required if the user becomes violent.

the brain, which is why it has hallucinogenic properties. Serotonin is a NEUROTRANSMITTER or "messenger" substance that carries information throughout the body. When the normal flow of serotonin is interrupted, it becomes difficult for people to distinguish between what is real and what appears to be real. Some people have become terrified of losing their minds or dying while on 2C-B.

Reactions with Other Drugs or Substances

Little is known about 2C-B's effects when taken with alcohol or other drugs. That poses a big problem for paramedics and emergency room doctors and nurses because users typically take 2C-B along with a variety of other dangerous substances. It is much harder to treat a person who has overdosed when a mixture of drugs is involved. 2C-B is frequently used in combination with other illicit club drugs, particularly amphetamines, ecstasy (MDMA), GHB, ketamine, and methamphetamine. Users often say that 2C-B heightens or increases the effects of other drugs.

2C-B is especially dangerous for people with DIABETES, EPILEPSY, or heart problems. It is also dangerous for pregnant women and their unborn children, and for people taking certain types of antidepressants.

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

psychological addiction: the belief that a person needs to take a certain substance in order to function

Treatment for Habitual Users

Frequent use of 2C-B can result in a PSYCHOLOGICAL ADDICTION. Psychological dependence can develop quickly. The treatment program for heavy users of 2C-B is the same as for users of other hallucinogens. A combination of therapy methods is used, including individual counseling, group therapy, and sometimes medication.

Consequences

Studies and surveys conducted in the United States, Canada, and the United Kingdom indicate that 2C-B users are likely to abuse other drugs as well. Taken alone, hallucinogens have a powerful

2C-B is usually sold as a tablet, a capsule, or a white powder. This vial of 2C-B powder contains 22.5 mg of the drug. *Photo by Erowid, © 2001 Erowid.org.*

effect on the brain. They distort the way a person's five senses work, affect the memory, and even change the user's perceptions of time and space. People who use drugs like 2C-B often have a hard time concentrating, communicating, or telling the difference between what is real and what is not. 2C-B is capable of disrupting a person's ability to think, communicate, and act sensibly.

Users of 2C-B will develop a tolerance to the drug over time. If they increase the dose they take, they face a greater risk of having a bad TRIP or disturbing flashbacks of an earlier trip. Since 2C-B is hallucinogenic, it impairs mental functions. This greatly increases the risk of accidents among users and can also lead users to engage in unsafe sex or violent behavior.

The Law

Possession of 2C-B is illegal in the United States, Canada, and the United Kingdom. 2C-B is also considered an illegal substance in Japan and various European countries, including France, the Netherlands, Germany, and Sweden.

One key fact every reader should know about 2C-B is that it is an illicit drug: it cannot, under any circumstances, be used legally. It is considered unsafe even when taken under medical supervision (and it cannot be administered legally by anyone, including physicians).

In the United States, the Controlled Substances Act (CSA) of 1970 called for all federally regulated drug substances to be categorized into one of five schedules. These schedules are based on a substance's medicinal value, possible harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous

trip: an intense and usually very visual experience produced by an hallucinogenic drug

drugs that have no recognized medical use. 2C-B is a Schedule I drug. "Once a drug has been designated a Schedule I Controlled Substance, it becomes very difficult for researchers to obtain permission to study that drug," explained Gahlinger. That is one of the reasons why "very little is known about . . . 2C-B."

A drug's schedule plays a major role in determining penalties for illegal possession or sale of the drug. In the United States, a person convicted of possessing and/or selling a Schedule I drug such as 2C-B can face a lengthy prison term and hundreds of thousands of dollars in fines. Repeat offenders receive even harsher punishment. The United Kingdom regulates 2C-B under the Medicines Act. In Canada, 2C-B is a scheduled drug under the Controlled Drugs and Substances Act. Japan's Health and Welfare Ministry ruled the drug had no legitimate medical uses and banned it in 1998 under the Narcotics Control Law. In 2000, the World Health Organization (WHO) recommended that 2C-B be placed under international control because its use poses a "substantial" public health and social problem.

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See also: Ecstasy (MDMA); Ephedra; GHB; Ketamine; LSD (lysergic acid diethylamide); Mescaline; Methamphetamine

Adderall

Official Drug Name: Adderall (ADD–ur–all), Adderall XR; a mixed amphetamine sulfate (am–FETT–uh–meen SUL–fate)
Also Known As: Speed, uppers
Drug Classifications: Schedule II, stimulant

What Kind of Drug Is It?

Adderall and Adderall XR are amphetamines (pronounced am-FETT-uh-meens), which are drugs that increase mental alertness. Adderall is manufactured by Shire Pharmaceuticals Group, a drug company headquartered in the United Kingdom with offices throughout the UK, the United States, Canada, and parts of Europe. Amphetamines are stimulants, or substances that increase the activity of a living organism or one of its parts.

In the 2003 edition of their book *Drugs 101: An Overview for Teens,* Margaret O. Hyde and John F. Setaro defined stimulants as "drugs used to increase alertness, relieve fatigue, [and make users] feel stronger and more decisive."

Adderall tablets are blue or orange, depending on the dosage, and are imprinted with the letters "AD." Adderall extended–release capsules are also blue or orange, depending on the dosage, and are imprinted with the name "Adderall XR." One side of each capsule is transparent. Both the tablets and the capsules are marked with a number (for instance, 5, 10, or 20) to identify the strength of the medication in milligrams.

Overview

The active ingredients in Adderall are used to treat symptoms of ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD), NARCOLEPSY, and sometimes obesity. In the 1960s, the drug was marketed under the name Obetrol. The U.S. Food and Drug Administration (FDA) approved a new formulation of the drug, known as Adderall, for the treatment of ADHD in early 1996.

ADHD is a disorder that begins during childhood. However, in many cases, it is not diagnosed until adulthood. It is very difficult for people with ADHD to focus their attention and control their behavior. Children with ADHD are easily distracted and have difficulty concentrating, especially on schoolwork. They may also talk excessively, interrupt conversations, and have trouble waiting their turn. In many cases, people with ADHD display IMPULSIVE BEHAVIOR, which frequently continues into adulthood.

attention-deficit/hyperactivity disorder (ADHD): a disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning

narcolepsy: a rare sleep disorder characterized by daytime tiredness and sudden attacks of sleep

impulsive behavior: (sometimes called impulsivity) acting quickly, often without thinking about the consequences of one's actions

More About ADHD

The terms *hyper* and *hyperactive* are often used negatively when referring to people with ADHD. Such terms are stereotypes—labels, often negative, used to describe all people within a certain group regardless of whether they are true about everyone or not. It is important to note, however, that not everyone who talks a lot has ADHD. Not everyone who fidgets or gets antsy has ADHD. Not everyone who taps a pencil when taking a test has ADHD.

The truth is that ADHD affects people in completely different ways. Some of the symptoms are described in a booklet on the disorder published by the National Institute of Mental Health (NIMH). The authors note that some children with ADHD may "appear to be daydreaming, 'spacey,' easily confused, [or] slow moving" rather than overly active. Either way, the authors explain, it is important to realize that "many normal children may have these symptoms, but at a low level, or the symptoms may be caused by another disorder." The NIMH stressed the need for children with symptoms of "hyperactivity-impulsivity" or "inattention" to "receive a thorough examination and appropriate diagnosis by a well–qualified professional."

Adderall helps manage the symptoms of ADHD by increasing the release of DOPAMINE. Dopamine is a NEUROTRANSMITTER. It acts on the part of the brain responsible for filtering incoming information, making choices, judging behavior, and deciding when and how to act.

Speed

Amphetamines are drugs that give people more energy. This allows users to do more and stay awake longer without getting tired. This effect of "speeding up" people's actions explains how amphetamines came to be known by the street names "speed" and "uppers."

What Is It Made Of?

Amphetamines like Adderall do not occur naturally; they cannot be grown in a garden or dug up from the ground. Rather, amphetamines are synthetic, or manufactured, substances that consist of the elements carbon, hydrogen, and nitrogen.

The composition of amphetamine pills or capsules is actually a combination of various types of crystalline compounds called amphetamine *salts.* Adderall is a chemical compound that contains equal parts of four different amphetamine and dextroamphetamine salts. For this reason, it is referred to as a *mixed amphetamine.* (The only difference between amphetamine and dextroamphetamine is a few molecules of dextrose, which is a type of sugar.) (Entries on amphetamines and dextroamphetamine are also available in this encyclopedia.)

dopamine: pronounced DOPE–uh–meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

Many children with attention-deficit/hyperactivity disorder (ADHD) are given Adderall, Ritalin, or other drugs to control their behavior. Symptoms of ADHD include: acting impulsively, acting hyper or out of control, or having difficulty concentrating or focusing on something. *Photo by Steve Liss/Time Life Pictures/Getty Images.*

How Is It Taken?

Adderall comes in both tablet and capsule form and is taken by mouth. Adderall tablets can be prescribed for patients as young as three years old. Adderall XR is the name given to the "extended release" form of the drug. It is recommended for use only in patients age six and older.

People who take Adderall tablets by prescription need to take two or three pills each day, one at a time, approximately four to six hours apart. Adderall XR is a once-a-day treatment for ADHD. The key to this extended relief formula lies in the two different types of tiny ball-shaped granules packaged in each capsule. These granules are known as amphetamine beads. Half of the beads in Adderall XR begin working immediately after their release from the capsule. The

other half takes several hours to dissolve. This bead mixture "extends" the effect of the drug throughout the day, relieving the symptoms of ADHD for a full twelve hours. It is very important that the full contents of the capsule are taken at the same time to ensure the proper timing of the drug's release.

The starting dose of Adderall for new patients is 5 to 10 milligrams daily. The maximum dose is 30 milligrams per day. It takes about 30 to 60 minutes for a prescription-strength dose of Adderall to begin working on the symptoms of ADHD.

What's the Difference between ADD and ADHD?

According to the Attention Deficit Disorder Association's Fact Sheet on ADHD, "the difference is mainly one of terminology, which can be confusing at times. . . . Many people use the term ADD as a generic term for all types of ADHD. . . . Whether we call it ADD or ADHD, however, we are all basically referring to the same thing."

Are There Any Medical Reasons for Taking This Substance?

The FDA has approved the use of mixed amphetamine salts to treat ADHD and the sleep disorder narcolepsy. As of 2005, the main medical use for Adderall was as a treatment for ADHD. In *Internal Medicine Alert,* William T. Elliott and James Chan stated that mixed amphetamine salts like Adderall are as effective as Ritalin and other methylphenidates in the treatment of ADHD in children, adolescents, and adults. (An entry on Ritalin and other methylphenidates is also available in this encyclopedia.)

Amphetamines are successful in the treatment of ADHD because they help improve the user's ability to concentrate. Drugs like Adderall and Adderall XR have been shown to increase performance accuracy, improve short-term memory, speed up reaction time, aid in solving mathematical problems, and even increase problem-solving abilities in games. In November of 2004, the Washington Neuropsychological Institute released the results of a series of tests involving simulated driving experiences in nineteen- to twenty-five-year-old ADHD patients. *Asia Africa Intelligence Wire* reported that Adderall XR was shown to improve driver safety for up to twelve hours in the young adults who took it before participating in the driving experiment.

In 2003, Jessi Castro, a high school student in Miami, wrote a letter to *Time* magazine about her experience with ADHD and Adderall. She credited her straight-A success in school to Adderall. "I may be naturally smart," she wrote, "but I never could have applied myself as much without it [Adderall]."

The pressure to do well on college entrance exams, such as the SAT, has prompted some students to use prescription drugs like Adderall illegally. Such students claim the drug helps them focus and concentrate better.

Photo by John Nordell/The Christian Science Monitor via Getty Images.

Adderall and Narcolepsy

Adderall has also relieved the symptoms of narcolepsy, an unusual condition that causes people to fall asleep quickly and unexpectedly. A narcoleptic's sleep is often brief but quite deep and usually unplanned. The possibility of falling into an uncontrollable

sleep at any time makes everyday life very difficult. Thus, ordinary activities such as driving can be very dangerous for people with narcolepsy.

Like all amphetamines, Adderall speeds up bodily functions. In fact, one of the most common side effects reported among Adderall users is an inability to sleep. Although this side effect can be troublesome for patients taking Adderall to treat the symptoms of ADHD, it produces a much-desired feeling of alertness in people with narcolepsy. By decreasing the frequency and severity of narcoleptic sleeping episodes, Adderall allows people with this condition more freedom to engage in the activities of normal daily life.

Adderall and Weight Loss

Adderall was originally manufactured and prescribed as a weight loss drug called Obetrol. Amphetamines tend to decrease feelings of hunger in people who take them, making them an often-abused drug among dieters. Amphetamine use for weight loss can be very dangerous. Most doctors agree that the best way to regulate weight is through moderate exercise and a healthy diet. Drugs like Adderall are only available with a doctor's prescription and are rarely used legally for weight control.

ADHD: Not Just Kids' Stuff

According to a 2004 *Pharma Business Week* article, "Up to 65 percent of children with ADHD may still exhibit symptoms into adulthood and an estimated 4.4 percent of the U.S. adult population is affected by ADHD." Based on U.S. Census Bureau information released on January 7, 2005, 4.4 percent of the adult population adds up to more than 8.8 million people over the age of eighteen.

In September of 2004, Adderall XR was approved for use by adults with ADHD. Results of a U.S. survey cited by *Pharma Business Week* revealed that "adults with ADHD are twice as likely to be divorced or separated and have had almost twice as many jobs . . . compared to adults without ADHD. Importantly, 43 percent of adults with ADHD report that they lost or left one or more jobs due in some part to their ADHD symptoms." In addition, survey takers found that adults with ADHD run a greater risk of depression, antisocial behavior, and low educational achievement.

Usage Trends

The use of Adderall among overstressed high school and college students became a problem in the early 2000s. "In the past,

"What's It Like to Have ADD?"

Author and physician Edward M. Hallowell has ADD himself. In the article "What's It Like to Have ADD?," available on the *Attention Deficit Disorder Association* Web site, he describes his experiences:

> It's like driving in the rain with bad windshield wipers. Everything is smudged and blurred and you're speeding along, and it's really frustrating not being able to see very well. Or, it's like listening to a radio station with a lot of static and you have to strain to hear what's going on. Or, it's like trying to build a house of cards in a dust storm. You have to build a structure to protect yourself from the wind before you can even start on the cards.
>
> In other ways it's like being super-charged all the time. You get one idea and you have to act on it, and then, what do you know, but you've got another idea before you've finished up with the first one, and so you go for that one, but of course a third idea intercepts the second, and you just have to follow that one, and pretty soon people are calling you disorganized and impulsive and all sorts of impolite words that miss the point completely. Because you're trying really hard. . . .
>
> Plus which, you're spilling over all the time. You're drumming your fingers, tapping your feet, humming a song, whistling, looking here, looking there, scratching, stretching, doodling, and people think you're not paying attention or that you're not interested, but all you're doing is spilling over so that you can pay attention. I can pay a lot better attention when I'm taking a walk or listening to music or even when I'm in a crowded, noisy room than when I'm still and surrounded by silence. . . .
>
> The adult syndrome of ADD, so long unrecognized, is now at last bursting upon the scene. Thankfully, millions of adults who have had to think of themselves as defective or unable to get their acts together, will instead be able to make the most of their considerable abilities. It is a hopeful time indeed.

pick-me-ups like coffee, Diet Coke, or over-the-counter caffeine pills have been popular choices among students to get an extra buzz for studying," wrote Jillian Foley in *America's Intelligence Wire* in December 2004. "But in recent years, some . . . students have started turning to Adderall . . . to help them study, take tests, and write papers." But why would so many students without ADHD want to take a medicine for a disorder they do not have? Nicholas Zamiska offered an explanation in the November 8, 2004 issue of the *Wall Street Journal.* He explained that "studies conducted by the National Institutes of Health in the late 1970s found that low-dose stimulants increase concentration and alertness in everyone, not just people with attention disorders."

"The effects that make [Adderall] appealing to many students include decreased drowsiness and increased attentiveness for hours," wrote Omid Fatemi in *America's Intelligence Wire* in 2004. "[B]ut Adderall is a prescription drug for a reason." Many of the students

Prescription drugs like Adderall and Ritalin are taken illegally by some students. They claim that the drugs help them get better grades. Other students believe that taking such drugs is cheating. They note that hard work and study is the path to follow for better grades. *© Jose Luis Pelaez, Inc./Corbis.*

who use the drug know very little about the way it works, how it interacts with other drugs, and how easy it is to overdose. Side effects, Fatemi stated, range "from stomach pain to insomnia to an irregular heartbeat, and it can even cause brain damage." More and more media reports describe how Adderall is being used for academic success in increasingly competitive school environments. Many members of the educational community predict that the issue will need to be addressed head on in the coming years.

Effects on the Body

Technically, Adderall is a PSYCHOSTIMULANT. As Dr. Robert Hart explained in an article for *Drug Topics* by pharmacist Katie Rodgers, "Psychostimulants, in a sense, put your foot on the brake and help with the stopping." This is what makes them so effective in the

psychostimulant: pronounced SY–koh STIM–yew–lent; a stimulant that acts on the brain

treatment of ADHD. Patients who take Adderall are better able to ignore distractions and focus solely on the task at hand, whatever that task may be.

The most frequently observed side effect of Adderall is difficulty sleeping. Adderall can also cause nervousness, dizziness, restlessness, rapid heart rate, headache, stomachache, nausea, decreased appetite, weight loss, dry mouth, and skin rashes. A study cited in the *Journal of the American Academy of Child and Adolescent Psychiatry* (2001) showed that younger patients are more likely to experience a loss of appetite when taking Adderall than older ones. In addition, as noted in *Psychopharmacology Update* in 2005, Adderall and other psychostimulants used in the treatment of ADHD may cause users to develop jitters, motor tics (repeated blinking or tapping of feet or fingers, for example), and/or vocal tics (such as frequent throat clearing).

A two-year study showed reductions in both the average height and the average weight of preteens taking Adderall for their ADHD, according to Sherry Boschert in *Pediatric News.* Results of the study indicate that higher dosages of Adderall affected the growth rate more than lower doses did. Overall, however, the children's growth was slowed by about one-half inch per year. Adderall tends to decrease the appetite, so some scientists believe that the children who take it are not eating as well as they should. This could play a role in their slower gains in height and weight. "No one knows whether these children might catch up in growth during adolescence or if stopping the medication would lead to catch-up growth," noted Boschert. "And no one knows if the growth lag could be modified by good nutrition."

Dangers

"Taking Adderall for ADHD when you do not have ADHD can have serious consequences," noted Jillian Foley in *America's Intelligence Wire*. The human body needs sleep in order to function properly. Sleep deprivation is just one of the many dangers associated with amphetamine use. Frequent use can result in a PSYCHOLOGICAL ADDICTION, which can develop quickly, especially in people who already show signs of depression. Overdose of amphetamines can result in fever, convulsions, HALLUCINATIONS, and even death.

A *Psychopharmacology Update* article published in January 2005 warned that Adderall can increase the severity of "behavior disturbances and thought disorder in psychotic patients." Psychotic patients suffer from one or more forms of PSYCHOSIS, which disrupts

psychological addiction: the belief that a person needs to take a certain substance in order to function

hallucinations: visions or other perceptions of things that are not really present

psychosis: pronounced sy–KOH–sis; a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined

Is It Cheating?

By the early 2000s, Adderall abuse among high school and college students had become a significant problem. "Overall, prescriptions for stimulants have risen to 2.6 million a month in 2004, from 1.6 million in 2000," according to a *Wall Street Journal* article. About 850,000 of those prescriptions are for Adderall. Students without ADHD reportedly find it fairly easy to get the drug from fellow students who have a prescription for it.

High school students of the early twenty-first century seemed to face increasing pressure to perform well on standardized tests. Many students feel like their "entire future may be riding on the results," explained Frances Mejia in an article for *CNNfyi.com*. The results of these tests weigh heavily in the college admissions process. Higher scores on standardized tests like the SAT and the ACT improve students' chances of being able to attend the schools of their choice. "[P]art of a [high school guidance] counselor's role these days is not only to prepare a student for the test academically, but also emotionally."

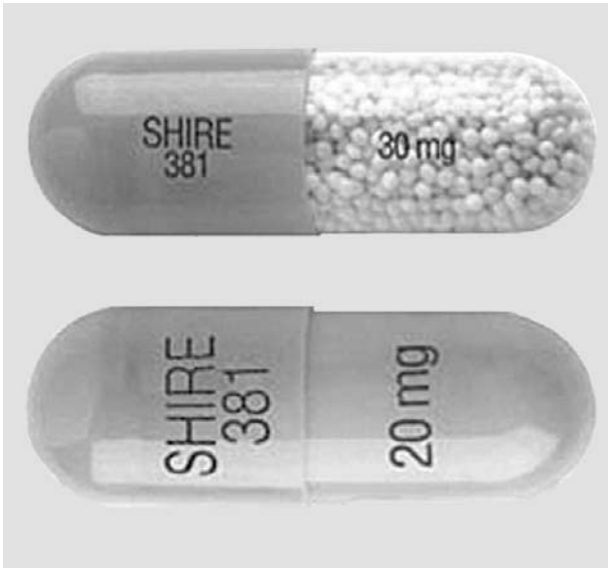
Some high school students admit taking Adderall in the hopes of improving their performance. They reported a jump of up to 200 points in their overall SAT scores. One twelfth grader interviewed in the *Wall Street Journal* claimed that Adderall helped her get her highest-ever SAT score in March of 2004. "It's a crazy kind of feeling of confidence, looking at a problem and saying I can do this in five seconds," she recalled.

Reports like this raise questions about drug use, academic fairness, and the law. Are students who deliberately use drugs like Adderall to improve their school performance guilty of cheating? Can they get into legal trouble for their actions? What about the students who do not take any performance-enhancing drugs? Will the Adderall-taking students gain an academic edge over their drug-free peers? High schools usually suspend students caught using other drugs on school grounds. However, a guidance counselor from Bethesda, Maryland's Chevy Chase High School sees a different trend with Adderall use to boost standardized test scores. He told the *Wall Street Journal* that as of 2004, the school had "never suspended or otherwise punished a student for using a prescription drug to help on an SAT."

the way the mind functions. As a result, people suffering from a psychotic episode can become completely withdrawn from reality.

Reactions with Other Drugs or Substances

Children taking a doctor-prescribed dosage of Adderall or Adderall XR for ADHD should be given their dose early in the day and should avoid high-fat breakfasts. In the early 2000s, medical researchers were investigating the possibility that high-fat foods might delay how quickly the drug is absorbed throughout the body. It has also been noted in several medical journals, including



Adderall 20 mg and 30 mg capsules.

Psychopharmacology Update, that some fruit juices may interfere with the release of Adderall into the system.

Adderall should not be used by people with depression or suicidal tendencies or by people taking medicine to control their high blood pressure. In late 2004 the FDA called for changes in how boxes of Adderall XR were labeled. New labels warn that "misuse of amphetamine may cause sudden death and serious cardiovascular adverse events." This means that people who take Adderall XR without a doctor's prescription run the risk of suffering serious heart damage and could even die.

Treatment for Habitual Users

In the question-and-answer section of a fact sheet titled "Evidence–based Medication Management for Children and Adolescents with ADHD," researchers reported significant findings. The authors note: "Multiple studies that have followed children with ADHD for 10 years or more support the conclusion that the clinical use of stimulant medications does not increase the risk of later substance abuse." In fact, when children with ADHD receive the appropriate drug treatment, their risk of later drug or alcohol problems is the same as that of any other non-ADHD individual. The researchers further stated that "although there is potential for abuse when misused, psychostimulant medications do not cause addictions to develop in those being treated appropriately."

Regular users who stop taking Adderall should be taken off the drug slowly and are advised to do so under the care of a physician. Long periods of sleep, increased irritability, and severe depression can result if users discontinue Adderall suddenly rather than gradually.

Consequences

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

Abuse of Adderall can lead to TOLERANCE and psychological dependence. This means that, over time, the frequent user will begin to feel that he or she needs more and more of the drug to function effectively. "For now," wrote Sheena Smith in *America's*

Intelligence Wire in late December of 2004, "there is little regulation concerning the illegal use of Adderall."

The Law

Adderall is a controlled substance. Its use is regulated by certain federal laws. The Controlled Substances Act (CSA) of 1970 called for the assignment of all controlled drug substances into one of five categories called schedules. These schedules are based on a substance's medicinal value, harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use.

Amphetamines like Adderall fall under Schedule II, dangerous drugs with genuine medical uses that also have a high potential for abuse and addiction.

Possessing amphetamines without a medical doctor's prescription is against the law and can result in imprisonment and stiff fines. People convicted of distributing amphetamines—selling or giving away prescribed drugs—face lengthy prison terms and fines of up to $2 million.

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See also: Amphetamines; Dextroamphetamine; Ritalin and Other Methylphenidates

Alcohol

Official Drug Name: Ethyl alcohol, ethanol, grain alcohol
Also Known As: Booze, hooch, moonshine, sauce, spirits (for alcohol in general); brew, suds (for beer); vino (for wine)
Drug Classifications: Not classified, depressant

What Kind of Drug Is It?

Alcohol is an ancient drug. Beer and wine jugs well over 5,000 years old have been excavated from archaeological sites in southwest Asia and northern Africa. Prehistoric peoples are thought to have produced the first alcoholic beverages by accident. This occurred when mixtures of water, a bit of fungus, and wild berries left alone in the sun turned into alcohol through a process known as FERMENTATION.

Alcohol acts as a depressant. A depressant is a substance that slows down the activity of an organism or one of its parts. At the same time, drinking alcohol also lowers one's INHIBITIONS. When this happens, someone might act more recklessly than he or she would normally.

Overview

Through the ages, alcohol has been used as an all-purpose drug: a painkiller, an antiseptic, a disinfectant, a teething aid for babies, a SEDATIVE, a battlefield medicine, and a drowner of sorrows. It is also associated with celebrations: offering a toast to a newly married couple is a common tradition.

During the Middle Ages (c. 500–c. 1500), alcohol became something of a status symbol among Europe's upper classes. Wine production became very important to the economies of Italy and France throughout the Renaissance period, which spanned the fourteenth through the early seventeenth centuries. Meanwhile, in the New World, the first distillery opened in 1640 in what would later become the state of New York. In the 1700s, home brewing processes were replaced largely by the commercial manufacture of beer and wine in Europe.

Laws banning the sale of alcoholic beverages date back to the fourteenth century, when Germany banned the sale of alcohol on Sundays and other religious holidays. Even earlier, Switzerland instituted laws requiring drinking establishments to close at certain times to combat public drunkenness. The United States has seen historical increases and decreases in alcohol use as well. High periods of alcohol consumption coincided with periods of war: during the American Civil War (1861–1865), World War I (1914–1918), and

fermentation: a chemical reaction that breaks down food

inhibitions: inner thoughts that keep people from engaging in certain activities

sedative: a drug used to treat anxiety and calm people down

During the Prohibition era in the United States, people found various ways to conceal and transport alcohol. The image on the left shows how a woman of the era might dress to go out in public. The image on the right shows that she is actually hiding two tins of alcohol strapped to her legs under her overcoat. *© Underwood & Underwood/Corbis.*

World War II (1939–1945), drinking increased among Americans. These peaks in alcohol usage were interrupted by so-called "dry" periods in U.S. history—times when the consumption of alcohol dropped to very low levels throughout the nation.

The Era of Prohibition in the United States

The longest span of dry years in the United States occurred during PROHIBITION, which lasted from 1920 to 1933. At that time,

Prohibition: a ban on the manufacture and sale of alcoholic beverages

Nearly 80 percent of high school students have consumed alcohol illegally. The legal drinking age is twenty-one throughout the United States. *Photo by Lezlie Light.*

many Americans viewed alcohol as a destructive force in society. Crime, poverty, gambling, prostitution, and declining family values were blamed on alcohol consumption. A ban on the manufacture and sale of all alcoholic beverages in the United States began on January 16, 1920, with the passage of the Eighteenth Amendment to the Constitution. However, Prohibition did not stop all drinking in the United States. Some people produced alcohol in illegal stills, especial in rural areas. The brew created in these stills was often referred to as Moonshine. The liquor was then sold on the BLACK MARKET. Other people brewed alcoholic beverages at home, hoping to not get caught.

During Prohibition, some people even went to other countries, such as Canada, to buy alcohol and smuggle it back into the United States. Smugglers used all sorts of methods to hide the illegal drink. They hid it under false floors in trucks, under their clothing, and even in vials placed within walking sticks or canes. Prohibition proved to be highly unpopular. Thirteen years after it

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

had begun, Prohibition ended and alcohol was once again deemed a legal substance in the United States.

Alcohol consumption rose considerably in the early and middle 1980s, when many states lowered the drinking age to eighteen. Because of the increase in the number of teen deaths tied to drinking and driving, the legal drinking age was raised to twenty-one throughout the nation in 1987. The rate of alcohol consumption dipped in the 1990s, but alcohol remains the most commonly used legal drug. Consumption of alcohol by young people is very high.

Much could be written on the topic of alcohol as an addictive substance. The following entry attempts to provide as much relevant information as possible for the scope and intended audience of this encyclopedia.

No Nutritional Value

Alcohol contains what are called "empty calories." Beer, wine, wine coolers, and liquor have no nutritional value, but they still cause weight gain. Drinking alcohol is bad for the skin as well as the waistline. It increases the number and severity of acne breakouts. It is also known for causing bad breath among users.

What Is It Made Of?

The chemical composition for ETHANOL or ethyl alcohol, otherwise known as alcohol, is C_2H_5OH. That means it is composed of two atoms of carbon, one atom of oxygen, and six atoms of hydrogen. Ethanol is a colorless liquid that is highly flammable. Aside from being an ingredient in alcoholic beverages, it is used in fuels, solvents, disinfectants, and preservatives.

Pure alcohol is too strong to drink by itself. It must be diluted with water and other substances to create alcoholic beverages. Ethyl alcohol is the only alcohol considered safe to drink. Other alcohols such as methanol (also called wood alcohol) and isopropyl alcohol (pronounced EYE-so-PROPE-uhl; also called rubbing alcohol) are not used in beverages. They are highly toxic (poisonous) to the body. Methanol, in particular, can cause blindness and even death if swallowed.

Types of Alcoholic Beverages

Wines and beers are produced by fermenting fruits, vegetables, and grains. Fermentation occurs when sugar in berries or grains is combined with yeast, which is a fungus. A fungus is a sort of recycler that dissolves nutrients and changes them. A chemical reaction takes place as yeast cells eat up the sugars in food. Those sugars are changed into carbon dioxide and alcohol. Wine is formed when

ethanol: the colorless flammable liquid in alcoholic drinks; ethanol is the substance that gets people drunk

Hard Liquors

The difference between hard liquors lies in the grains or vegetables that are used to make them. Rye, corn, and barley are used to make whiskey. Vodka is distilled from potatoes, rye, or wheat. Scotch is derived from malted barley. Gin is a combination of distilled spirits (alcohol) flavored with juniper berries. Rum is made from molasses.

Adding carbonated drinks to hard liquor—mixing rum with cola or whiskey with ginger ale, for instance—produces a drink that seems stronger than liquor mixed with plain water. Carbonation speeds up the absorption of alcohol into the bloodstream.

the combination of sugar, yeast, and berries reaches an alcohol concentration point between 9 and 15 percent. Similarly, when sugar, yeast, and grains such as barley are combined and reach an alcohol concentration of 3 to 6 percent, beer is made and fermentation stops.

Hard liquor is produced by a process called DISTILLATION, which adds an extra step to the fermentation process. In distillation, liquids that have already been fermented are boiled to remove the alcohol. At the boiling point, the alcohol separates from the fermented liquid to create a vapor. The vapor is captured and then held separately in a cooling tube until it turns back into a liquid. The resulting alcohol, now removed from the original fermented liquid, becomes hard liquor when mixed with water.

Alcohol makes up 50 percent of distilled liquors such as whiskey, rum, vodka, scotch, and gin. The percentage of alcohol in hard liquor is used to determine the "PROOF" number printed on every bottle. Proof is determined by doubling the percentage of pure alcohol in a liquor and then dropping the percentage sign. For instance, whiskey that is 50 percent alcohol is said to be 100 proof.

Liqueurs (pronounced lick-OARZ) are distilled from grain and mixed with fruit, herbs, spices, and sugary syrups. They are extremely sweet and very high in alcohol content. They are intended to be drunk in very small quantities, usually as an "after dinner" drink. Popular liqueurs include Cointreau (pronounced KWANN-troh), Tia Maria, and Drambuie (pronounced dram-BOO-ee).

Sweet and powerful drinks like brandy and port are made from distilled wine, which increases the alcohol content of 12 percent to two to three times that amount. "The original idea of distillers," wrote Andrew Weil and Winifred Rosen in *From Chocolate to Morphine,* "was to concentrate wine to a smaller volume to make it easier to ship it in barrels overseas. At the end of the voyage the brandy was to be diluted with water back to an alcohol content of 12 percent. What happened . . . was that when people got their hands on what was in the barrels, no one waited to add water. Suddenly a new and powerful form of alcohol flooded the world."

distillation: the separation of liquids by a process of evaporation

proof: the measure of the strength of an alcoholic beverage

How Is It Taken?

Alcohol is swallowed, usually in a liquid form. It is also swallowed in gel form in semi-solid "Jell-O shots." These Jell-O shots are medicine-cup-sized mixtures of gelatin and hard liquor, such as vodka, which are chilled before serving. The high sugar content in the gelatin hides the taste of the alcohol, making Jell-O shots particularly dangerous. Fruit punch spiked with hard liquor can have the same powerful effect. Users could accidentally consume far more alcohol than they intended in a short period of time.

According to Ron Weathermon and David W. Crabb in *Alcohol Research & Health,* a standard drink is defined as one 12-ounce can of beer or bottle of wine cooler, one 5-ounce glass of wine, or 1.5 ounces of distilled liquor. Each of these drinks contains the equivalent of 1 ounce of pure alcohol.

The facts about youth & alcohol

Alcohol use is widespread among today's teenagers

- Nearly 70% of 8th graders perceive alcoholic beverages as "fairly easy" or "very easy" to get.
- By the time they complete high school nearly 80% of teenagers have consumed alcohol, 30% report having been drunk in the past month, and 29% report having 5 or more drinks in a row in the past two weeks.

Alcohol use increases substantially from middle to high school

- Approximately 20% of 8th graders report having recently (within the past 30 days) consumed alcohol compared to 35% of 10th graders and almost 50% of 12th graders.
- A little over 20% of 8th graders report having been drunk at least once in their life compared to almost 45% of 10th graders and 60% of 12th graders.

The consequences of underage drinking

- A person who begins drinking as a young teen is four times more likely to develop alcohol dependence than someone who waits until adulthood to use alcohol.
- During adolescence significant changes occur in the body, including the formation of new networks in the brain. Alcohol use during this time may affect brain development.
- Motor vehicle crashes are the leading cause of death among youth ages 15 to 20, and the rate of fatal crashes among alcohol-involved drivers between 16 and 20 years old is more than twice the rate for alcohol-involved drivers 21 and older. Alcohol use also is linked with youthful deaths by drowning, suicide, and homicide.
- Alcohol use is associated with many adolescent risk behaviors, including other drug use and delinquency, weapon carrying and fighting, and perpetrating or being the victim of date rape.

SOURCE: "The Facts About Youth & Alcohol," National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD [Online] http://www.niaaa.nih.gov/publications/PSA/factsheet.pdf#search='the%20facts%20about%20youth%20&%20alcohol' [accessed May 24, 2005]

Are There Any Medical Reasons for Taking This Substance?

"Alcohol actually blocks some of the messages trying to get to the brain," according to the *TeensHealth* Web site. That is the primary reason it has been used for thousands of years to suppress pain, treat injuries and infections, and prepare people for surgery. In the past, alcohol has been used as an ANESTHETIC, a sedative, and even a treatment for a lung disease called typhus.

Research in the 1990s showed that moderate amounts of alcohol could help reduce the risk of heart attacks. Abuse of alcohol, however, has been connected to heart disease. "Between the extremes of heavy and light drinking lies a 'gray area' that is not completely understood," explained Cynthia Kuhn and her coauthors in their book *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy.* "Moreover, this gray area appears to be rather small. That is, while an average of one-half to one drink per day may be healthy for your heart, it is perfectly clear that an average of two drinks per day significantly increases your risk of dying from heart disease or cancer." As of 2005, there were no known therapeutic uses for alcohol.

anesthetic: a substance used to deaden pain

Usage Trends

"Next to tobacco and caffeine, alcohol is the world's most popular drug," wrote Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use, and Abuse.* Peer pressure, depression, and a need to fit in are all factors leading to alcohol use by teens.

Alcoholism Defined

There is a difference between alcohol abuse and ALCOHOLISM. In 1956, the American Medical Association defined alcoholism as a disease. Alcoholism is described as a loss of control over drinking—a preoccupation with drinking despite negative consequences to one's physical, mental, and emotional makeup as well as one's work and family life. Problem drinkers might start out by abusing alcohol occasionally without being addicted to it. However, Kuhn pointed out that "continued exposure to alcohol changes the brain in ways that produce dependence." Therefore, anyone who drinks heavily over a long period of time "will become physically dependent on the drug."

According to the National Council on Alcoholism and Drug Dependence (NCADD), about 18 million Americans have alcohol problems. Excessive drinkers are generally defined as: 1) men who consume more than two drinks per day, every day, or more than three drinks at a time; and 2) women who consume more than one drink per day, every day, or more than three drinks at a time. Women used to make up one-third of the problem drinking population, but they are quickly catching up to men in terms of abuse. In general, if a woman and a man consume the same amount of alcohol, the woman will become more intoxicated in a shorter period of time. And because of their physical makeup, women are more likely than men to damage their hearts, livers, and brains due to drinking. An increased risk of breast cancer has also been linked to drinking.

Problem drinkers can be rich or poor, young or old, male or female. They come from all racial and ethnic backgrounds. Although anyone can become an alcoholic, a child with an alcoholic parent runs a greater risk of developing the disease of alcoholism than a child of non-alcoholic parents.

Young People and Alcohol

New York Times contributor Howard Markel wrote, "Because the brains of teenagers are still developing, many experts believe they are at greater risk for becoming addicted." According to the National Institutes of Health (NIH), young people who begin drinking before the age of thirteen are four times more likely to develop an addiction to alcohol than people who begin drinking at age twenty-one.

alcoholism: a disease that results in habitual, uncontrolled alcohol abuse; alcoholism can shorten a person's life by damaging the brain, liver, and heart

Before she can enter the prom, a student is given a breathalyzer test by the school's principal in Grant, Nebraska. All students, faculty, and chaperones had to pass the test before they were allowed into the dance. *AP/Wide World Photos.*

The results of the 2004 Monitoring the Future (MTF) study were released to the public on December 21, 2004. Conducted by the University of Michigan (U of M), the MTF was sponsored by research grants from the National Institute on Drug Abuse (NIDA). Since 1991, U of M has tracked patterns of alcohol and drug use, as well as attitudes toward alcohol and drugs, among students in the eighth, tenth, and twelfth grades. (Prior to that, from 1975 to 1990, the MTF survey was limited to twelfth graders.)

The 2004 MTF survey results indicate that alcohol use among students in the eighth and tenth grades has fallen each year since 2001. Researchers noted, however, that "drinking and drunkenness did not continue to decline" among twelfth graders in 2004. According to MTF charts for 2003 to 2004, about three in every ten high school seniors reported "being drunk in the past 30 days." The ease with which seniors said they would be able to get the drug held

Alcohol and the Entertainment Industry

Nels Ericson, a writer for the U.S. Office of Juvenile Justice and Delinquency Prevention, pointed out that alcohol is a standard prop in more than 90 percent of America's most popular movie rentals. Television is another media source that bombards youth with pro-drinking messages. The National Council on Alcoholism and Drug Dependence (NCADD) reported that "the typical American young person will see 100,000 beer commercials before he or she turns 18."

The *New York Times* reported in 2002 that a link may exist between movie-viewing habits and alcohol usage among teens. A Dartmouth College survey based on information from more than 4,500 fifth through eighth graders in the eastern United States revealed that "teenagers whose parents place no restrictions on their viewing R-rated movies appear much more likely to use tobacco or alcohol." Most of the students interviewed were fourteen years old or younger. By law, moviegoers are supposed to be seventeen or older to view an R-rated film at a theater. Nearly half of the students who saw R-rated films on a regular basis admitted they had tried alcohol, versus only 4 percent of the students who were not allowed to view R-rated films.

steady, with more than 94 percent of the twelfth graders surveyed saying it would be "fairly easy" or "very easy" to obtain alcohol. Only 26 percent of twelfth graders disapproved of kids their age "trying one or two drinks of an alcoholic beverage." Beer and fruit-flavored alcoholic beverages, such as wine coolers, seemed to be a favorite among middle school and high school drinkers.

The 2004 Monitoring the Future survey also showed that:

- 44 percent of eighth-grade students, 64 percent of tenth-grade students, and 77 percent of twelfth-grade students admit to having tried alcohol.
- 20 percent of eighth-grade students, 42 percent of tenth-grade students, and 60 percent of twelfth-grade students report having been drunk from alcohol use at least once.

Binge Drinking

In the late 1990s, "BINGE DRINKING" became an accepted term for a night of heavy drinking or simply for heavy alcohol consumption at one sitting. The NCADD claimed that in 1999 "44 percent of college students reported binge drinking (five or more drinks in a row for males or four or more drinks in a row for females)" at some point in their college years. This does not make them *frequent* binge drinkers; it means that they have engaged in binge drinking at least once. As of 2002, about one in four students could be classified as a *frequent* binge drinker. To make matters worse, "59 percent of frequent binge drinkers report driving after drinking," noted Dr. Henry Wechsler, director of the Harvard School of Public Health's College Alcohol Study, in his book *Dying to Drink: Confronting Binge Drinking on College Campuses,* written with Bernice Wuethrich.

Research conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) indicates that some 1,400 college students die each school year in alcohol-related incidents. Another 100,000 became victims of sexual assault after drinking too much.

binge drinking: consuming a lot of alcohol at one time

Paying the Price

In addition to the high one gets when drinking alcohol, the substance produces a variety of other potentially embarrassing, not to mention uncomfortable, effects. Read on to learn more.

- The human body has all sorts of natural protective mechanisms. Vomiting is one of them. Nausea and stomach cramps are two ways that the brain alerts the body to the presence of poisons—like alcohol—in the system. The stomach rids itself of the poison by vomiting. People who have too much alcohol in their systems often end up clutching a toilet bowl and heaving up every bit of food and drink in their stomachs. And those are the lucky ones. Vomiting in a toilet is preferable to vomiting somewhere else, and sometimes people under the influence of alcohol just cannot reach a toilet in time. Accidental urination can occur under the influence of alcohol as well, compounding the embarrassment.
- Alcohol makes the blood vessels inside the brain expand. Drinking to the point of intoxication (drunkenness) often results in an uncomfortable set of physical effects known as a "hangover." Contrary to popular belief, drinking coffee, eating high-sugar foods, or taking a cold shower will not relieve hangover symptoms. The pounding headache, upset stomach, and trembling feelings that often follow a night of heavy drinking will not subside until the brain's blood vessels return to their normal size. In short, nothing but time will get rid of a hangover.

Effects on the Body

Even though alcohol is considered "one of the most widely accepted recreational drugs," noted Gahlinger, its overall impact on public health "is far worse than all illegal drugs combined." Prolonged use of alcohol can have serious negative effects on the body. Long-term alcohol use can result in memory loss. Alcohol can suppress the immune system, making people more susceptible to infections. Heavy drinking can increase the user's risk of nutritional deficiencies, ULCERS, high blood pressure, heart disease, STROKE, certain cancers, and liver disease.

The NIAAA reported that "alcohol-induced liver disease is a major cause of illness and death in the United States." The liver is the organ that breaks down alcohol in the body. It removes alcohol from the blood, leaving water, carbon dioxide gas, and energy as by-products. The carbon dioxide gas leaves the body through the lungs, and the water is eliminated in urine. Depending on the size, gender, and general health of the drinker, it can take the liver between one and two hours to process a glass of wine, a single beer, a shot of hard liquor, or one mixed drink.

ulcers: the breakdown of mucus membranes, usually in the stomach

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

A young alcoholic man is shown lying against a building on a busy street in California. He cries as he begs for money to feed his addiction. His drinking habit has caused cirrhosis of the liver. *AP/Wide World Photos.*

If large quantities of alcohol are present in the body, the liver has to work overtime to break it down and eliminate it from the body. Until the liver has a chance to filter all of the toxins, or highly poisonous substances, out of a drinker's blood, the remaining alcohol will simply stay in the bloodstream and recirculate. "There are limits on the number and amounts of toxic substances a liver can handle without harm to it," explained Laurence Pringle in *Drinking: A Risky Business.* Heavy drinking can lead to CIRRHOSIS of the liver, a deadly disease common among alcoholics. "In cirrhosis," continued Pringle, "cells of the liver are actually being killed by alcohol. . . . Continued heavy drinking may cause the liver to fail entirely."

cirrhosis: pronounced sir-OH-sis; destruction of the liver, possibly leading to death

Down the Hatch, and Then What?

After alcohol is swallowed, it passes first into the stomach and then into the small intestine. Most of the alcohol is absorbed into the

If police suspect someone is driving drunk, they give the driver a sobriety test. Here, a youth is instructed to walk a straight line. If he cannot do so without stumbling, chances are that he is intoxicated. © *Richard Hutchings/Corbis.*

bloodstream through the small intestine and carried to the brain through the blood. Alcohol has profound effects on the brain's ability to function effectively. Even though alcohol is a depressant, low doses of it can cause the release of certain brain chemicals that produce a sense of euphoria. This "HIGH" is misleading because it makes alcohol seem like a stimulant.

First and foremost, alcohol causes a loss of inhibition in those who drink it. "Judgment is the first function of the brain to be affected," wrote Gail Gleason Milgram of the Rutgers University Center of Alcohol Studies in an online article. "The ability to think and make decisions becomes impaired." People with lowered inhibitions tend to take more chances and engage in riskier behavior than they would if they had not been drinking. A self-conscious individual who has had a drink or two may become more confident. A shy person may become more talkative. People who have had too much to drink often engage in unsafe sex and are at a much greater risk for contracting sexually transmitted diseases, including HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome).

The most obvious physical effects of alcohol consumption are slowed reflexes, a lack of coordination, difficulty walking "a straight line," and slurred speech. As more alcohol is consumed, drinkers

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

Blood alcohol concentration (BAC) levels and effects

Blood alcohol concentration	Changes in feelings and personality	Impaired activities (continuum)
0.01–0.05	Relaxation Sense of well being Loss of inhibition	Alertness Judgment
0.06–0.10	Pleasure Numbness of feelings Nausea, sleepiness Emotional arousal	Coordination (especially fine motor skills) Visual tracking
0.11–0.20	Mood swings Anger Sadness Mania	Reasoning and depth perception Inappropriate social behavior (e.g., obnoxiousness)
0.21–0.30	Aggression Reduced sensations Depression Stupor	Slurred speech Lack of balance Loss of temperature regulation
0.31–0.40	Unconsciousness Death possible Coma	Loss of bladder control Difficulty breathing
0.41 and greater	Death	Slowed heart rate

SOURCE: Adapted from "Table 4," in *Understanding Alcohol*, Biological Sciences Curriculum Study, for the National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, MD [Online] http://science.education.nih.gov/supplements/nih3/alcohol/guide/info-alcohol.htm [accessed May 24, 2005].

experience dizziness, nausea, dehydration, and an inability to reason. Having a large number of drinks in rapid succession puts many drinkers to sleep. Those who remain awake and continue drinking increase their likelihood of passing out, which can be very dangerous. Intoxicated people who throw up while unconscious risk choking on their vomit. This can be—and often is—fatal, because vomit easily blocks the drinker's airway, making breathing impossible.

"Chronic, repeated drinking damages and sometimes kills the cells in specific brain areas," noted Kuhn. "And it turns out that it might not take a very long history of heavy drinking to kill cells in certain areas of the brain" involved in memory formation and problem solving.

Effects May Vary

The physical effects of alcohol on the body depend on several different factors. Both the amount of food present in the stomach when drinking and the amount of time that elapses between drinks influence a person's physical response to alcohol. "Peak blood alcohol concentration [BAC] could be as much as three times greater in someone with an empty stomach than in someone who has just

eaten," wrote Kuhn. Five drinks consumed in one hour will have drastically different effects on the drinker than five drinks consumed with food over five hours.

The gender, size, and mental outlook of the drinker also affect the body's response to alcohol. "Alcohol does not dissolve in fat tissues," explained Weathermon and Crabb. Because women have a larger proportion of body fat than men, they tend to feel the effects of alcohol after drinking smaller doses than men do. A smaller person will become intoxicated sooner than a larger person because the larger person has more blood and body fluids mixing with the alcohol he or she consumes. A person's reaction to alcohol also varies according to the circumstances under which it is consumed. "The same amount of wine that makes someone pleasantly high at a party may make a depressed person in a lonely room even more depressed," commented Weil.

Drinking and Driving

"Alcohol abuse kills some 75,000 Americans each year and shortens the lives of these people by an average of thirty years," noted *MSNBC.com* in the fall of 2004. The statistics, which were provided by the Centers for Disease Control and Prevention (CDC), indicate that about 35,000 of these people died from diseases connected with heavy drinking. The other 40,000 were killed in alcohol-related car crashes and other accidents, including falls, fires, and drownings. Young people under twenty-one years of age accounted for about 4,500 of alcohol-related deaths.

The rate of fatal motor-vehicle crashes in alcohol-involved drivers age sixteen to twenty is more than twice the rate for alcohol-involved drivers over the age of twenty-one. The probable reason for this statistic, according to an NIAAA "Alcohol Alert" from 2003, is that younger drivers have less experience behind the wheel. Adding alcohol to the mix is a recipe for disaster. In addition, *Newsweek* reported in 2005 that, according to the NIH, "the area of the brain that inhibits risky behavior isn't fully developed" in humans until they reach the age of twenty-five.

Alcohol and Pregnancy

Alcohol and pregnancy do not mix. Alcohol use can interfere with a woman's ability to become pregnant. It can also lower a man's sperm count and reduce his sexual drive.

There is no safe level of alcohol consumption for a woman at any time during a pregnancy. Every bottle of alcohol bears a warning label that reads: "According to the Surgeon General, women should

A Vermont state trooper examines a wrecked car that held four teens who died in a crash after a night of drinking in Canada. Some American teens go to Canada to drink because the legal drinking age is lower there.
AP/Wide World Photos.

not drink alcoholic beverages during pregnancy because of the risk of birth defects." If a pregnant woman drinks alcohol, so does her baby. If she becomes drunk, so does her baby.

Drinking alcohol during pregnancy can cause miscarriages, stillbirths, and serious birth defects. Alcohol "disrupts [the] formation of nerve cells in a baby's brain," wrote Margaret O. Hyde and John F. Setaro in *Drugs 101: An Overview for Teens.* FETAL ALCOHOL SYNDROME (FAS) can occur when a woman drinks while she is pregnant. It is one of the leading causes of birth defects in children and the most preventable cause of mental retardation. FAS babies have low birth weights, small heads, slowed mental and physical growth rates, and certain facial and skeletal abnormalities. It is a hard condition to diagnose because its symptoms can mimic those of other disorders. Babies born with FETAL ALCOHOL EFFECTS (FAE) are less severely impaired than FAS babies. FAE babies do not have

fetal alcohol syndrome (FAS): a pattern of birth defects, learning deficits, and behavioral problems affecting the children of mothers who drank heavily while pregnant

fetal alcohol effects (FAE): the presence of some—but not all—of the symptoms of fetal alcohol syndrome (FAS)

distinctive facial and skeletal abnormalities, nor do they suffer the same level of brain damage as FAS babies, but they can have physical and behavioral problems such as poor coordination, learning disabilities, and attention deficit disorders.

Alcohol-Related Vehicle Crashes

According to the U.S. Department of Transportation's National Highway Traffic Safety Administration (www.nhtsa.dot.gov):

- 17,013 people in the United States died in alcohol-related motor-vehicle crashes in 2003
- Alcohol-related crashes on America's roads injure someone every two minutes
- Alcohol-related crashes in the United States cost roughly 51 billion dollars each year.

Reactions with Other Drugs or Substances

Alcohol should not be consumed with any over-the-counter or prescription medications because harmful interactions can occur. Sometimes, the effect of a medicine is increased by alcohol. In other cases, a medication may not be able to break down properly in the presence of alcohol. Drinking alcohol with antihistamines, for instance, will increase the drowsiness that can occur with cold-type medicines. Alcohol can cause liver damage when taken in combination with acetaminophen (best known by the brand name Tylenol).

Alcohol has additional negative effects when taken with other drugs. For example, when taken with aspirin, alcohol can irritate the stomach lining and cause gastrointestinal bleeding. Alcohol combined with antidepressants affects the user's coordination and reaction time, making the operation of motor vehicles and other machinery extremely risky. Alcohol taken with BARBITURATES ("downers" such as Nembutal, Seconal, Amytal, and Tuinal) can increase depression.

Mixing alcohol with TRANQUILIZERS, muscle relaxants, sleeping aids, and other medicines can cause serious side effects, especially in elderly people. Alcohol consumed with illegal drugs such as marijuana, cocaine, heroin, or amphetamines can be deadly.

Treatment for Habitual Users

There is no cure for alcoholism, but the advancement of the disease can be stopped if the user quits drinking. The Hazelden Foundation's "Alcohol Screening" Web page states that "for one in thirteen American adults, alcohol abuse or alcohol dependence (alcoholism) causes substantial harm to their health and disruption in their lives." In "Substance Abuse: The Nation's Number One Health Problem," Nels Ericson noted that "only a quarter of individuals who

barbiturates: pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers"

tranquilizers: drugs such as Valium and Librium that treat anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens)

abuse alcohol and illicit drugs get treatment. . . . Treatment for alcoholism is successful for 40 to 70 percent of patients."

There are several types of treatment options available for alcoholics. Most incorporate at least some of the principles that make up the twelve-step program used by Alcoholics Anonymous (AA). AA offers a popular and effective approach to rehabilitation. It helps the user gain an understanding of alcoholism as a disease. The first AA group was formed in Akron, Ohio, in 1935, by Bill Wilson and Dr. Bob Smith. According to the *AA* Web site, there were more than 100,000 groups and over 2 million members in 150 countries as of 2005.

Inpatient programs, which are often found in hospital settings, usually begin with a period of DETOXIFICATION, followed by extensive counseling and, if necessary, a drug program to discourage the drinker from relapsing. (Certain medications are designed to make an alcoholic feel very sick when combined with alcohol.) Detoxification, or detox, addresses the physical aspect of "drying out" the drinker. Withdrawal symptoms can be intense and frightening to the recovering alcoholic. At their worst, symptoms can include HALLUCINATIONS, tremors (uncontrollable shaking), and seizures.

Detox is usually followed up with individual and/or family counseling and involvement in a twelve-step program such as the one offered by AA. Psychiatric hospitals address both the problem of alcohol abuse and the emotional issues that accompany it. Treatment includes individual, group, and/or family counseling, drugs to treat psychiatric illnesses, and the additional support of a twelve-step program.

Another type of inpatient program is the 28-day rehabilitation facility. This type of treatment program offers detoxification from alcohol as well as: 1) support from substance abuse counselors; 2) education on the disease concept of alcoholism; and 3) individual, group, and family therapy. In addition, it uses support group meetings both on and offsite. Residential programs are yet another alternative. In residential programs, patients stay at a home for recovering alcoholics. At these "sober houses," as they are called, several alcoholics work together to stay alcohol-free. They receive counseling, job assistance, and group support.

detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

hallucinations: visions or other perceptions of things that are not really present

sober: not drunk

Consequences

People have been known to do things under the influence of alcohol that they would never consider doing when SOBER. Drinking too much can leave users with little or no recollection of what they did or said while drunk. NCADD statistics show that alcohol is

Groups like the Students Against Destructive Decisions (SADD) formed to warn teens and others about the dangers of driving drunk. Members of the group are seen here at the U.S. Capitol in Washington, D.C., promoting their cause. *AP/Wide World Photos.*

involved in one out of every four emergency room admissions, one out of every three suicides, and one out of every two homicides and incidents of domestic violence. "A report from the British Medical Association," stated Emma Haughton in *Drug Abuse?* (1997), estimated that up to 70 percent of all murders in the United Kingdom were somehow "associated with alcohol abuse."

People who drink heavily develop a tolerance to alcohol. As the disease of alcoholism progresses, an alcoholic will need to drink

more and more to get the desired result that lower doses of alcohol had once produced. Tolerance actually changes the alcoholic's brain impulses and the chemical makeup of cell membranes.

Alcoholics typically go through several stages, changing their patterns of use to patterns of abuse. They may begin using alcohol as an occasional stress reliever. They promise themselves and others that their drinking is just a "temporary thing." But over several years it becomes a habit. Their families struggle to hide the drinkers' growing problems with alcohol. As the disease progresses, drinkers usually experience mood changes, problems with friends and family, and trouble on the job. In the final stage, alcoholics begin to suffer physical decline as a result of drinking and may develop illnesses like liver disease or heart failure.

The personal consequences of alcoholism reach far beyond the alcoholic. An alcoholic's drinking affects many people, especially the members of his or her family. Children of alcoholics sometimes continue the cycle of alcoholic behavior when they reach adulthood. Alateen is an international organization for teens who are relatives or friends of a problem drinker. Support groups like Alateen help young people break the cycle of addiction and lead healthy lives.

The Law

It is against the law to consume alcohol in the United States until the age of twenty-one, but, according to the *TeensHealth* Web site, nearly 80 percent of teens have done it. Underage drinking can lead to arrest. In the United Kingdom, it is illegal for anyone under the age of eighteen to buy alcohol, whether in a supermarket or a pub. It is also illegal to supply someone under the age of eighteen with alcohol.

For years, the legal blood alcohol concentration for adult drivers ranged from 0.08 percent to 0.1 percent throughout the United States. A stricter national standard of 0.08 was adopted by most states in the first few years of the twenty-first century. The BAC limit for drivers under twenty-one was set at 0.02 in every state. Penalties for driving while intoxicated vary from state to state and can include fines, jail sentences, probation, driver's license suspension, mandatory community service, or participation in an alcohol education program.

The National Center for Injury Prevention and Control (NCIPC), a division of the Centers for Disease Control and Prevention, released a summary of impaired-driving statistics in December of 2004. The latest information available for that report

came from the records of the National Highway Traffic Safety Administration (NHTSA) for 2002 and 2003. According to the data, about 1.5 million people were arrested for driving under the influence (DUI) in 2002. More than 100 million other drunk drivers were on the roads but were not caught. Alcohol consumption was a factor in two out of every five traffic-related deaths in 2003. In addition, about 25 percent of all drivers under the age of twenty who were killed in motor vehicle crashes that year had a blood-alcohol level of 0.08 or higher.

Drunk on Mouthwash

Listerine mouthwash is 26.9 percent alcohol. In January of 2005, a Michigan woman was arrested for drunk driving after drinking three glasses of Listerine. Her blood alcohol concentration (BAC) was more than three times Michigan's legal limit of 0.08 percent.

Alcoholic beverage control laws (ABC laws) were developed in the United States to prevent the illegal sale of alcohol. ABC laws are enforced by federal, state, and local law enforcement agencies. Each state regulates where alcohol can be sold and where it can be consumed. Restaurants, convenience stores, grocery stores, and bars selling alcohol must have special licensing. A person must be twenty-one years old to purchase and consume alcohol. Buying alcohol for an underage drinker is illegal, even if the buyer is over twenty-one. Warning labels are required on all alcoholic beverages sold in the United States. These labels alert consumers to the possible dangers of alcohol use when pregnant, driving an automobile, or operating machinery.

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Amphetamines

Official Drug Name: Amphetamine (am-FETT-uh-meen); Benzedrine (BENZ-uh-dreen)
Also Known As: Amp, bennies, pep pills, speed, and uppers
Drug Classifications: Schedule II, stimulant

What Kind of Drug Is It?

Amphetamines are stimulant drugs that improve concentration, reduce appetite, and help keep users awake. Stimulants heighten the activity of a living being. In the 2003 edition of their book *Drugs 101: An Overview for Teens,* Margaret O. Hyde and John F. Setaro defined stimulants as "drugs used to increase alertness, relieve fatigue, [and make users] feel stronger and more decisive." Caffeine, nicotine, cocaine, ecstasy (MDMA), and steroids are all stimulants. (An entry for each of these substances is available in this encyclopedia.) However, amphetamines have a great potential for abuse. The "HIGH" created by stimulants makes people feel good, but only temporarily. "They may elevate mood," wrote John B. Murray in the *Journal of Psychology,* but "their effects are short-lived."

Overview

Although they were discovered late in the nineteenth century, amphetamines did not receive much attention in the medical community until 1927, when a University of California researcher named Gordon Alles began studying their effects. Alles found that the drugs gave people a lot of energy, allowing them to do more and stay awake longer without getting tired. This effect of "speeding up" people's actions explains how amphetamines eventually came to be known by the street names "speed" and "uppers."

There are several different types of amphetamines. (For more information, see individual entries on Adderall, dextroamphetamine, and methamphetamine in this encyclopedia.) Generally, all amphetamines act the same way: as stimulants.

Early Amphetamines Treat Breathing Problems

The first amphetamine was made in a laboratory by a German chemist in the late 1880s. The drug was not used for medical purposes, however, until more than forty years later. By that time, scientists were looking to create a drug that would mimic the effects of ephedra, a natural Chinese remedy for ASTHMA. When boiled in

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

asthma: pronounced AZ-muh; a lung disorder that interferes with normal breathing

water, stems from the ephedra bush produce a tea that helps dilate, or open up, the small sacs of the lungs. The active ingredient in this tea apparently eases breathing in asthmatics who drink it. (An entry on ephedra is also available in this encyclopedia.)

Research on asthma medications led to the manufacture of Benzedrine, the earliest and most basic form of amphetamine. In 1931, the pharmaceutical company Smith, Kline, and French introduced the Benzedrine inhaler to relieve the discomfort of nasal congestion due to colds, allergies, and asthma. As Murray pointed out, these first Benzedrine users reported trouble sleeping when they were on the drug. This sparked yet another branch of research on the effects of amphetamines. By 1935, drug companies were marketing amphetamines for the treatment of a daytime sleeping disorder known as NARCOLEPSY. Researchers did not yet realize that amphetamine use could be dangerous.

The ADHD Connection

As far back as 1937, doctors were looking for ways to help children who had problems concentrating. At the time, the condition that is now referred to as ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) was called "minimal brain dysfunction." Little was known about the disorder, and it was believed to affect only children. Since then, the misleading name "minimal brain dysfunction" has been dropped, and medical researchers have learned more about ADHD and its effects.

ADHD is a disorder that begins during childhood, although in many cases it goes undiagnosed until adulthood. It is very difficult for people with ADHD to focus their attention and control their behavior. Children with ADHD are easily distracted and have difficulty concentrating, especially on schoolwork. They may also talk excessively, interrupt conversations, and have trouble waiting their turn. In many cases, people diagnosed with ADHD display IMPULSIVE BEHAVIOR, which frequently persists into adulthood.

According to the Schaffer Library of Drug Policy's 1972 entry on amphetamines, early use of amphetamines in young patients with ADHD produced surprising results. "Instead of making them even more jittery, as might be expected, the amphetamines calm many of these children and noticeably improve their concentration and performance," commented the authors of the article. The use of amphetamines for ADHD in children and adults continues into the twenty-first century.

narcolepsy: a rare sleep disorder characterized by daytime tiredness and sudden attacks of sleep

attention-deficit/hyperactivity disorder (ADHD): a disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning

impulsive behavior: (sometimes called impulsivity) acting quickly, often without thinking about the consequences of one's actions

Usage Spikes after World War II

During World War II (1939–1945), soldiers used amphetamines to maintain alertness during combat. In the years following the war, many service personnel had trouble functioning without the drug. One major instance of widespread amphetamine abuse occurred in Japan after the war. Much of the country was devastated by bombs dropped during World War II, and the Japanese had to work long hours to rebuild their country. Japanese men who had been soldiers recalled how amphetamines had helped them face one battle after another when the war was in full swing. Demand for the drug increased, and amphetamines were released for sale in Japan without a prescription. This led to a decade of abuse throughout the nation. In the mid-1950s, though, the Japanese government restricted access to amphetamines and passed stricter laws against illegal amphetamine use.

Around the same time, Americans were becoming hooked on amphetamines, too. Users found they could lose weight quickly and effortlessly. Amphetamines quickly earned a reputation as a "wonder drug" that allowed users to work harder without feeling tired. "Pharmaceutical companies encouraged doctors to prescribe amphetamines to depressed housewives in the 1960s," wrote Andrew Weil and Winifred Rosen in *From Chocolate to Morphine.* The drugs were even given to racehorses, since it was thought the drug would make them run faster. Throughout the decade, public health authorities noted a new and disturbing trend in amphetamine use among drug users in San Francisco, California. Individuals, soon to be known as "speed freaks," were injecting liquefied amphetamines into their veins.

Amphetamine use also went up dramatically in the United Kingdom in the 1960s. According to Hilary Klee in the *Journal of Drug Issues,* "the 'Swinging Sixties' was a period of revolutionary social change and experimentation with psychoactive drugs. . . . 'Pop idols' became major . . . influences on British youth. The role models in the United Kingdom were . . . young and working class, like many of their fans. Amphetamine was popular among them because it provided the energy to perform all night and survive periods on tour."

The massive increase in drug use in the 1960s prompted countries throughout the world to pass new anti-drug laws and regulations. In the United States, Congress passed the Controlled Substances Act (CSA) of 1970, which cut down considerably on the production, importation, and prescription of amphetamines. Many forms of amphetamine, particularly diet pills, were removed from the over-the-counter market. But this crackdown on amphetamines led to the development of illegal labs in many countries. By the 1990s, ILLICIT amphetamine production had emerged worldwide, with large numbers of illegal labs being reported especially in the western United States, the United Kingdom,

illicit: unlawful

"Speed Kills"

The people who made the phrase "Speed Kills" popular were not talking about driving responsibly. The saying was used in the psychedelic era of the 1960s and early 1970s. It was coined by people who saw many of their peers fall victim to intravenous (IV) drug abuse.

Shooting amphetamines directly into the bloodstream is the most dangerous of all methods of use. This is because of the "speed" with which the drug flows throughout the body. The high is almost immediate, the shock to the system is intense, and the results can be deadly. Long-term speed use increases the risk of a drug-related fatality. Users build up a tolerance for the drug, meaning that they need more and more speed to get the same high. Taking higher and higher doses of the drug can lead to overdose and even death.

An anti-drug button from the 1960s warns of the dangers of taking speed. *Photo by Herbert Orth/Time Life Pictures/Getty Images.*

The phrase "Speed Kills" was not just used by anti-drug activists. It was also popular among drug users who knew firsthand the dangers of amphetamine abuse. The slogan appeared on various mementos of the psychedelic era. The anti-amphetamine message adorned buttons, posters, and even stickers that schoolchildren put on their notebooks.

and eastern Europe. The problem persisted into the early twenty-first century, especially among unemployed youth.

What Is It Made Of?

Amphetamines do not occur naturally; they cannot be grown in a garden or dug up from the ground. Rather, amphetamines are synthetic, or manufactured, substances that consist of the elements carbon, hydrogen, and nitrogen.

The chemical structure of amphetamines is related to two natural substances known to boost energy within the human body. Those substances are EPHEDRINE and ADRENALINE. Ephedrine is a

ephedrine: pronounced ih-FEH-drinn; a chemical substance that eases breathing problems

adrenaline: pronounced uh-DREN-uh-linn; a natural stimulant produced by the human body; also known as epinephrine (epp-ih-NEFF-run)

Some speed abusers use a razor blade to chop amphetamine tablets into a fine powder to snort the drug. *Science Photo Library.*

natural stimulant found in the ephedra bush. It is the active ingredient in a Chinese herbal drug that relieves the symptoms of asthma. Adrenaline is a natural stimulant that the human body produces all by itself. It sets off the body's "fight or flight" reaction in times of emergency. When adrenaline is released, heart rate and blood pressure increase, the muscles that control breathing relax, and the pupils of the eyes dilate.

How Is It Taken?

Amphetamines come in both tablets and capsules and are usually swallowed. However, drug abusers sometimes crack open the capsule to get to the flecks of the drug inside it, or they grind the tablets into a fine powder. Amphetamine powder obtained from either method is then inhaled or "snorted." Users also mix it with tobacco or marijuana and then smoke it.

intravenous, or IV, drug abuse: injection of a liquid form of a drug directly into the bloodstream

Beginning in the 1960s, some hardcore drug abusers started mixing the amphetamine powder into a liquid and then injecting it. This is called INTRAVENOUS, OR IV, DRUG ABUSE. When injected, the amphetamine high occurs almost immediately, increasing the

danger of addiction. Weil and Rosen described the physical and mental effects of a few weeks of continued intravenous use. Addicts "became EMACIATED and generally unhealthy," the authors reported. "They stayed up for days on end, then 'crashed' into stupors. They became jumpy, paranoid, and even psychotic."

Many high-dose amphetamine abusers become psychotic, or mentally deranged, after a week or so of continuous use. A disruption occurs in the way their minds function, making it difficult for people suffering from a psychotic episode to distinguish between what is real and what is imagined. Users who increase "their dose rapidly to enormous levels . . . swallowing whole handfuls of amphetamine tablets" can develop an "amphetamine PSYCHOSIS." According to the Schaffer Library of Drug Policy, this condition makes them feel as if "ants, insects, or snakes [are] crawling over or under the skin."

Are There Any Medical Reasons for Taking This Substance?

Historically, amphetamines have been prescribed by doctors as an appetite suppressant and as a treatment for both ADHD and an unusual sleep disorder called narcolepsy.

Amphetamines tend to decrease feelings of hunger in people who take them, making them an often-abused drug among dieters. Although the use of amphetamines for weight control was popular in the 1950s and again in the 1980s and part of the 1990s, this practice is no longer common. Amphetamine use for weight loss can be very dangerous. Most doctors agree that the best way to regulate weight is through moderate exercise and a healthy diet.

As of 2005, amphetamines were most commonly prescribed to treat ADHD and narcolepsy. Amphetamines are successful in the treatment of ADHD because they help improve the user's ability to concentrate. In prescription form, amphetamines also have been found to be helpful in treating narcolepsy, a fairly rare condition that causes people to fall asleep quickly and unexpectedly. Amphetamines speed up bodily functions, producing a much-desired feeling of alertness in people with narcolepsy.

emaciated: pronounced ee-MASE-ee-ate-ed; very thin and sickly looking

psychosis: pronounced sy-KOH-sis; a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined

Usage Trends

Amphetamine abuse is very widespread and often unintended. Cynthia Kuhn and her coauthors summarized the dangers of amphetamines in their book *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy.* In a word, the buzz from

In the 1930s, Benzedrine inhalers were introduced to treat asthma. But some users reported that the amphetamine-based drug made sleeping difficult. Today's inhalers (shown above) no longer contain Benzedrine.
Photograph by Leitha Etheridge-Sims.

amphetamines is "pleasurable." Overuse typically stems from the drug's effects. Amphetamines make most users feel good, at least in the short term. Experimentation with amphetamines can get out of hand quite easily, though. Even legal users—those individuals taking the drug with a doctor's prescription—can get hooked.

Not Just a Nasal Spray

Generations ago, over-the-counter nasal inhalers contained amphetamines. The reasoning behind amphetamine treatment for nasal congestions was quite simple: stimulants are known to constrict blood vessels. Constricting the blood vessels in the nose and sinuses cuts down on congestion because it shrinks the nasal tissues, allowing air to flow more freely through the nose. This effect is only temporary, though, and when it wears off, a "rebound effect" occurs. The nasal passages actually end up more severely blocked than they were before the amphetamine was inhaled.

The first users of any new drug are a bit like human guinea pigs. "Because of the incredible complexity of the brain," explained Kuhn, "most drugs that affect it have actions in addition to those for which

they were developed." Aside from the problems with the rebound effect, some users of early nasal inhalers "experienced general stimulation from them" as well, wrote Weil and Rosen. "Some got high, and some became dependent." Because of their side effects and the potential for abuse, amphetamines are no longer dispensed in over-the-counter decongestants.

Who's Using Amphetamines?

The results of the 2004 Monitoring the Future (MTF) study were released to the public on December 21, 2004. Conducted by the University of Michigan (U of M), it was sponsored by research grants from the National Institute on Drug Abuse (NIDA). Since 1991, U of M has tracked patterns of drug use and attitudes toward drugs among students in the eighth, tenth, and twelfth grades. (Prior to that, from 1975 to 1990, the MTF survey was limited to twelfth graders.)

The 2004 MTF survey results indicate that nonprescription amphetamine use among students in the eighth and tenth grades had fallen. Researchers noted "a steady decline among eighth graders since 1996; in fact, their annual . . . use has fallen by almost half since then," from 9.1 to 4.9 percent. Amphetamine use was also down among tenth graders, "but not among twelfth graders, who . . . remain near their recent peak levels of use." According to MTF charts for 2003 to 2004, about one in every ten high school seniors reported using amphetamines "in the last twelve months." The ease with which seniors said they would be able to get the drug held steady. More than half of the twelfth graders surveyed said it would be "fairly easy" or "very easy" to obtain amphetamines.

The MTF survey does not track drug use among people after their high school years. However, amphetamine use in the general population can be determined by other data. Experts in the field of drug research periodically gather together all of the information available on certain drugs to create a profile, or description, of a typical user. Based on these studies, the typical amphetamine user of the 1960s, 1970s, 1980s, and part of the 1990s was young, white, male, single, and often unemployed. More recent findings cited in the *Journal of Psychology* in 1998 indicate that the population of amphetamine users is becoming broader and now includes:

- more women
- more married, divorced, and widowed people
- fewer whites
- people of all age groups, from middle school students to retirees.

In mid-2003, *Alcoholism & Drug Abuse Weekly* reported the results of the Quest Diagnostics 2002 Drug Testing Index, a measure of drug use among American workers. Based on 7 million urine tests performed by the lab throughout 2002, the overall use of drugs in the workplace apparently decreased. The incidence of amphetamine usage, however, went up significantly. According to Quest, positive test results among U.S. workers "increased 70 percent over the past five years" from 1998 through 2002.

The use and abuse of amphetamine-like stimulants is a growing global problem that poses "a serious threat to the health, social and economic fabric of families, communities and nations," according to the *World Health Organization* Web site. The United Nations estimated that in the year 2000, 29 million people around the world had abused various types of amphetamine stimulants in the previous decade.

Effects on the Body

Amphetamines are PSYCHOSTIMULANTS. As a prescription drug for the treatment of ADHD, amphetamines have been shown to increase performance accuracy, improve short-term memory, improve reaction time, aid in solving mathematical problems, increase problem-solving abilities in games, and help individuals concentrate.

"If stimulants simply increased energy and alertness," commented Kuhn, "they indeed would be [a] miracle medicine. . . . However, these drugs also cause an unmistakable euphoria and sense of well-being that is the basis of addiction." The effect of amphetamines is similar to the effect of cocaine, another widely abused psychostimulant. However, amphetamine highs are generally longer lasting.

Amphetamine users often feel that the drug puts them in a better mood and increases their level of confidence. "It gives me a lot of energy," remarked one user in an interview with Klee. "I can get out and do things, meet people, things like that. And you don't let anything get to you. You're on top of the world."

Amphetamines are often abused by people who want to boost their energy and enhance their physical performance. Athletes on amphetamines may find that they can play longer, harder, and better. Students on speed can endure longer studying sessions and remain focused on their homework for hours, sometimes without even taking a break to eat. Truck drivers who take amphetamines are able to cover more miles without falling asleep at the wheel. But the high generated by amphetamines eventually wears off.

psychostimulants: pronounced SY-koh-STIM-yew-lents; stimulants that act on the brain

In 2001, track star Justin Gatlin received a two-year suspension from competing after testing positive for amphetamines. He successfully fought the suspension, however, showing that the drug was prescribed to him to treat ADHD. Gatlin stopped taking the medication and later won a gold medal at the 2004 Olympic Games. *AP/Wide World Photos.*

After the Buzz

"A single oral dose of amphetamine usually stimulates the body for at least four hours," wrote Weil and Rosen. After that, more of the drug is needed to maintain the high. Once the buzz of uppers has worn off, users who felt awake, energized, and full find themselves very tired, grumpy, and extremely hungry. A person coming down from an amphetamine high may sleep an entire day away before the drug leaves his or her system entirely.

"Irritability and/or aggression is common when 'coming down' off the drug, when using [it] heavily, and when [it is] combined with alcohol," reported Klee. "You get to the point where you're shouting at people and causing trouble and the amphetamine gives you the energy to do it . . . which is a problem," noted one of the users Klee quoted. Such behavior can ruin long-standing relationships and, in some cases, result in social rejection for users.

Addiction and Other Dangers

Long-term amphetamine use can result in a PSYCHOLOGICAL ADDICTION OR PSYCHOLOGICAL DEPENDENCE. Psychological dependence can develop quickly, especially in people who already show signs of depression. As Kuhn put it, "We know that the drive to use cocaine or amphetamine is considerably stronger than that for any of the other addictive drugs."

The use of amphetamines can cause an upset stomach, diarrhea, headache, dizziness, nervousness, weight loss, and insomnia. The drug can also lead users to perform bizarre, repetitive actions. "Assembling and disassembling radios, cars, and gadgets is common among . . . users. [They] are aware that their activity is meaningless but report not being able to stop," noted Murray. Higher doses result in fever, an unusually fast heartbeat, chest pain, blurred vision, tics, tremors, and antisocial behavior.

Amphetamines can kill. Prolonged abuse of amphetamines can lead to TOLERANCE. Taking greater quantities of amphetamines increases the chance of an overdose. Signs of an overdose include convulsions, followed by coma, and then possibly death. The cause of death may be from the bursting of blood vessels in the brain, a heart attack, or an extremely high fever.

Lab Studies

The National Academy of Sciences revealed in 2003 that exposure to amphetamines can reduce "the ability of certain brain cells to change in response to life experiences." With funding provided by the National Institute on Drug Abuse (NIDA), drug researchers from the University of Lethbridge in Canada and U of M-Ann Arbor worked together, conducting experiments with amphetamines on lab rats.

Amphetamine-treated rats seemed confused by changes that were introduced to their surroundings during the course of the testing. Rats that were not given amphetamines, however, had no problems maneuvering around ramps, bridges, tunnels, and toys that had been relocated in their cages. Even after three and a half months, the amphetamine-treated rats were unable to adjust to changes in their environment. Analysis of the brains of both treated and untreated rats showed definite differences in their physical appearance.

These findings correspond with drug experiments conducted by three researchers on human volunteers in 1969. Those experiments, according to Murray, indicated that high doses of amphetamines affect the brain. The volunteers, who were hospitalized for the six-week-long study, experienced wide mood swings that began with euphoria, or a feeling of great happiness, and ended with deep

psychological addiction or psychological dependence: the belief that a person needs to take a certain substance in order to function

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

depression. They also went for days without eating or sleeping well, talked nonstop for hours at a time, and showed signs of PARANOIA before the experiment was concluded.

Reactions with Other Drugs or Substances

Amphetamines are dangerous drugs. The dangers increase when they are taken with other addictive substances. Amphetamines are frequently combined with other drugs to prolong or add to the high they produce alone. Caffeine is one substance that is known to add to the effects of amphetamines. When combined with alcohol, "amphetamines have the potential to produce unprovoked, random, and often senseless violence," noted Murray. Amphetamines raise blood pressure, so they should not be taken by people who are on medication to reduce their blood pressure. In addition, the drug should not be taken with over-the-counter cold medications or with certain antidepressant medications.

Treatment for Habitual Users

Tolerance to amphetamines occurs quickly. In an attempt to sustain the high that results from amphetamine use, users often begin taking more of the drug than they should. They then find themselves unable to stop on their own. The WITHDRAWAL process can last days or weeks. Besides feeling intense cravings for the drug, long-time users who attempt to kick their habit experience other unpleasant effects. These include extreme anxiety, abdominal pain, shortness of breath, vivid or unpleasant dreams, fever, decreased energy, and depression. Even "long after the withdrawal period, past users may experience urgings and cravings," added Murray. Addiction experts consider behavioral therapy and emotional support essential for the successful treatment and rehabilitation of amphetamine abusers.

Consequences

Amphetamines can be extremely toxic. When uppers are "used without medical supervision, they are potentially dangerous, even for first-time users," warned Murray. People who are high on amphetamines are more likely to take chances and engage in riskier behavior than they would if they were not high. This increases the danger of becoming infected with HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome), either through unsafe sex or by sharing needles.

Drug abuse among young people is associated with early sexual activity, increased involvement in criminal activities, and higher

paranoia: abnormal feelings of suspicion and fear

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

Many countries destroy illegal drugs seized in police raids. Here, Thailand officials load packs of amphetamines onto a cart to be burned in an incinerator in December 2004. The amphetamines were among 3.5 tons of drugs taken to the incinerator. *Pornchai Kittiwongsakul/AFP/Getty Images.*

school dropout rates. Amphetamine users often take other drugs along with uppers. This can increase the likelihood of becoming involved in accidents. It can also contribute to the development of physical, mental, and emotional problems, including high rates of infection, PHOBIAS, depression, and suicidal tendencies.

Infants born to mothers dependent on amphetamines have an increased risk of premature delivery and low birth weight. The infants may actually experience symptoms of drug withdrawal. Mothers taking the drug should not breast-feed their babies, since amphetamine is excreted in human milk. A number of studies using rodents as test animals indicate that women should not take amphetamines at all when pregnant.

phobias: extreme and often unexplainable fears of certain objects or situations

The Law

Amphetamines are controlled substances: their use is regulated by certain federal laws. The Controlled Substances Act (CSA) of 1970 called for the assignment of all controlled drug substances into one of five categories called schedules. These schedules are based on a substance's medicinal value, harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use. Amphetamines fall under Schedule II: dangerous drugs with genuine medical uses that also have a high potential for abuse and addiction.

Possessing amphetamines without a medical doctor's prescription is against the law and can result in imprisonment and stiff fines. The length of the jail sentence and the amount of the fine are increased when a person is convicted of a second or third offense of amphetamine possession. People convicted of distributing amphetamines—selling or giving away prescribed drugs—face lengthy prison terms and fines of up to $2 million.

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See also: Adderall; Cocaine; Dextroamphetamine; Diet pills; Ephedra; Methamphetamine

Amyl Nitrite

Official Drug Name: Amyl nitrite (AM-ull NITE-rite), Aspirols, Vaporole; sometimes referred to as amyl nitrate; this substance is closely related to butyl nitrite, isobutyl nitrite, and other nitrites, including nitroglycerin.
Also Known As: Amys (pronounced like the girl's name Amy), pearls, poppers, and snappers. Note that butyl nitrite and isobutyl nitrite have their own street names, including liquid gold, locker room, rush, and thrust. The most frequently used nickname for nitrites in general is *poppers*.
Drug Classifications: Not scheduled, inhalant

What Kind of Drug Is It?

Amyl nitrite is a clear, yellowish, flammable (burns easily) liquid with a strong fruity odor. Some sources describe it as having a sweet smell similar to a ripe banana; others compare it to the slightly sickening sweetness of a rotten apple. Old amyl nitrite takes on a vinegary smell similar to dirty, sweaty socks.

Amyl nitrite is a stimulant, meaning that it increases the rate at which chemical reactions occur in the body. Stimulants are substances that increase the activity of a living organism or one of its parts. Amyl nitrite EVAPORATES into the air at room temperature and is not intended to be swallowed. Instead, the fumes from liquid amyl nitrite are inhaled by the user, usually through the nose. For this reason, amyl nitrite is called an INHALANT. It is available legally in the United States only with a prescription.

Overview

Amyl nitrite was discovered in the United Kingdom in the mid-1800s and used to treat severe chest pain. People with heart disease (also called coronary artery disease) often experience shortness of breath and feelings of intense pain and pressure in their chests. This pain, called ANGINA PECTORIS, is felt when the blood supply to the heart is restricted. Blood carries oxygen to all parts of the body. Without oxygen, the body's cells die. Chest pain is the brain's way of telling a person with coronary artery disease that the heart needs more oxygen. In order to get that oxygen, the flow of blood to the heart must increase.

Amyl nitrite helps relax the muscles around the blood vessels of the heart, making it easier for blood to flow through them. The blood vessels that carry oxygen to the heart are called arteries. Amyl nitrite acts on those arteries by dilating or opening them up. As a result, the pumping action of the heart improves, and blood circulates more freely throughout the body. When oxygen-rich blood reaches the heart, the chest pain goes away. Amyl nitrite acts very quickly, relieving the pain of angina in heart patients within a few minutes.

evaporate: to change from a liquid into a vapor

inhalant: a chemical that gives off fumes or vapors that are sniffed

angina pectoris: pronounced an-JINE-uh peck-TOR-ess; a feeling of suffocation and pain around the heart that occurs when the blood supply to the heart is not adequate

Amyl nitrite was originally manufactured and prescribed to treat angina pectoris, a heart condition marked by severe chest pain and shortness of breath. More effective treatments exist today.

People who use amyl nitrite as a RECREATIONAL DRUG find its side effects appealing. Sniffing amyl nitrite brings on a short but dizzying burst of euphoria, making it a prime target for abuse. Its use as a recreational drug began growing in popularity in the 1950s. Because of the way in which amyl nitrite is taken, however, "it is very difficult to control the dose," explained Ruth Stalnikowicz in a *Journal of Toxicology* article. This can pose serious health threats to users. Throughout the 1960s, though, amyl nitrite was actually available to the public as an over-the-counter drug. According to Andrew Weil and Winifred Rosen in *From Chocolate to Morphine,* abuse of the substance skyrocketed during that time, and by 1969, the U.S. Food and Drug Administration (FDA) declared that amyl nitrite could only be obtained with a doctor's prescription.

Over time, amyl nitrite was used less and less to treat angina, but it became fashionable on the club scene following rumors that it intensified sexual pleasure. It found particular acceptance among gay men in cities across the United States and the United Kingdom. Usage later spread to straight dance clubs, where both men and women sniffed it to achieve a quick HIGH that supposedly added to the wild dance club experience.

What Is It Made Of?

A NITRITE is a chemical compound that contains one nitrogen atom joined to two oxygen atoms. The chemical symbol for a nitrite is NO_2. In medical applications, nitrites are used to enlarge blood vessels. In the food industry, nitrites are often used as preservatives.

recreational drug: a drug used solely to achieve a high, not to treat a medical condition

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

nitrite: a negatively charged molecule of nitrogen and oxygen

How Is It Taken?

Amyl nitrite vapor is usually inhaled through the nose and more rarely inhaled through the mouth. Small doses—0.3 millilitres

each—of the prescription drug come in very fragile, airtight glass vials or containers called ampules. These ampules are covered with a layer of cotton material and topped off with an outer mesh wrapping. The containers are easily crushed between the thumb and fingers. That's how vials of amyl nitrite became known as *poppers*—because of the "popping" sound they make when crushed. In fact, the term *poppers* is so closely associated with amyl nitrite that it has been listed as a slang name for the drug in the last three editions of *Merriam-Webster's Collegiate Dictionary.* (The definition, according to *Webster's 11th Edition,* is "a vial of amyl nitrite or butyl nitrite used [illegally] as an inhalational APHRODISIAC.")

After the ampules are broken, the layer of cotton surrounding the popper becomes soaked with the drug. When the vapors from the liquid are inhaled, the amyl nitrite triggers an almost immediate jump in heart rate and a drop in blood pressure. Heart patients experiencing severe chest pain are instructed to wave the broken ampule under their noses and inhale the amyl nitrite vapors up to six times (while seated because dizziness may occur). Amyl nitrite begins working very quickly—within fifteen to thirty seconds—and its pain-relieving effects are dramatic.

Because a prescription is required to obtain amyl nitrite in the United States, two variants of the drug, butyl nitrite and isobutyl nitrite, became popular in the 1970s. These and other nitrites are now generally sold in small, dark-colored glass bottles and sniffed in concentrated form. Nitrite-based inhalants produce an almost instant high that is felt for two to five minutes.

Are There Any Medical Reasons for Taking This Substance?

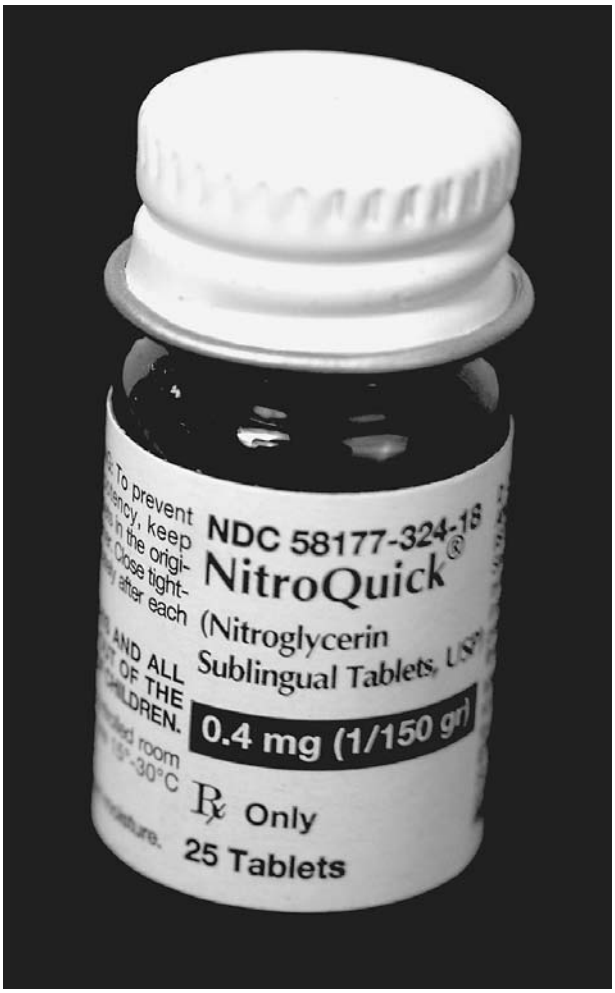
Amyl nitrite was originally manufactured and prescribed to treat angina pectoris, a heart condition marked by severe chest pain and shortness of breath. More effective treatments for angina now exist, and it is rarely prescribed for this purpose in the twenty-first century.

The most important medical use for amyl nitrite since the late 1980s has been as an ANTIDOTE for CYANIDE poisoning. By the turn of the twenty-first century, the possibility of chemical weapons use in times of war had become increasingly real. The most extreme use of cyanide is as a chemical weapon, since high doses can kill large groups of people at one time. The terrorist attacks of September 11, 2001, against the United States sparked considerable concern about the need for antidotes to poisons such as cyanide. According

aphrodisiac: pronounced aff-roh-DEE-zee-ack; a drug or other substance that excites or increases sexual desire

antidote: a remedy to reverse the effects of a poison

cyanide: a poisonous chemical compound that shuts down the respiratory system, quickly killing people who have been exposed to it



Nitroglycerin, when used in very small doctor-prescribed amounts, relieves the pain of angina pectoris in heart patients. *Scott Camazine/Photo Researchers, Inc.*

to the *Seattle Post-Intelligencer,* the U.S. Centers for Disease Control and Prevention hoped to have stocks of antidotes called "chem-packs" distributed to every state by 2006. Amyl nitrite is one of the drugs included in these chem-packs.

Usage Trends

The use of amyl nitrite as a prescription drug for angina pectoris has dropped considerably since the 1960s. Doctors now use other drugs more commonly to control chest pain in heart patients. One of those drugs is nitroglycerin—a heavy, oily, highly explosive liquid. When used in very small doctor-prescribed amounts, it relieves the pain of angina pectoris. It is easier to administer than amyl nitrite, causes fewer side effects, and is considered a more reliable form of treatment for angina pectoris.

Since the growth in popularity of butyl nitrite and isobutyl nitrite in the 1970s, other nitrites have been produced and continue to be sold through Web sites and catalogs as an industrial chemical, specifically as a room deodorizer or liquid incense. These substances are widely known, however, for the high they give users who sniff them in concentrated form.

Clifford Sherry cited statistics from the National Institute on Drug Abuse (NIDA) in his 1994 book *Inhalants.* According to Sherry, more than 5 million Americans were abusing nitrites at least once a week in the early 1990s. At that time, the primary abusers of amyl nitrite were adults around twenty-five years of age—not students in middle school or high school. There are several reasons for this, and the main one is accessibility. Amyl nitrite is a prescription drug, which makes it harder for teens to obtain. Different inhalants, such as glue, paint, nail polish, hair spray, and other aerosol propellants, were—and still are—far easier to get and can produce a quick high of their own. (An entry on inhalants is available in this encyclopedia.)

Raves are often associated with illegal drug use, including nitrites, 2C-B, ecstasy (MDMA), GHB, and ketamine. Such drug use is not common at all raves, however. Some groups sponsor drug-free raves where people can go just to enjoy the dancing and music. *AP/Wide World Photos.*

Another reason for the historic popularity of amyl nitrite among people twenty-five and older had to do with the muscle-relaxing effects of the drug. Sherry points out that "nitrite abusers tend to be looking for different effects from the other inhalant abusers." The heart isn't the only muscle that amyl nitrite relaxes; other muscles throughout the body are affected by it as well. As a result, amyl nitrite has gained a reputation as a sexual aid, especially among gay men. In fact, the drug has a long history of use by members of the gay community. Medical experts have linked amyl nitrite abuse with unsafe sexual activity, prompting fears that users have a higher risk of developing AIDS (acquired immunodeficiency syndrome) and other sexually transmitted diseases.

Frequent Abusers

As of 2005, nitrite abuse could be found across all ethnic groups, age levels, and genders. However, the most frequent users fell into one of two groups: 1) older, white, usually male adolescents from families with low to average incomes, and 2) teenagers and young adults who attend all-night dance parties, known as RAVES, on a regular basis.

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

Nitrites are often used in combination with other so-called rave or club drugs, such as 2C-B, ecstasy (MDMA), GHB, and ketamine.

Few studies focus specifically on amyl nitrite abuse; the drug is usually lumped into the general category of inhalants. However, researchers and other members of the scientific community generally believe the amyl nitrite problem is not as severe as that posed by other, more readily available, inhalants.

Monitoring the Future Study

Data from national and state surveys show that, generally speaking, inhalant abuse is most common among middle school and high school students. The results of the 2004 Monitoring the Future (MTF) study, conducted by the University of Michigan (U of M) and sponsored by research grants from NIDA, were released to the public on December 21, 2004. Since 1991, U of M has tracked patterns of drug use and attitudes toward drugs among students in the eighth, tenth, and twelfth grades. (Prior to that, from 1975 to 1990, the MTF survey was limited to twelfth graders.)

Results of the 2004 MTF survey indicate that, overall, the abuse of inhalants among eighth graders increased between 2003 and 2004. (Note that this information refers to inhalants in general, not specifically to nitrites.) MTF study authors called the increase in inhalant use "among younger students . . . one of the more troublesome findings this year." Researchers were unsure what caused the increase.

Information on nitrite usage, particularly among eighth-grade and tenth-grade students, was not available, but nitrite abuse appears to have trickled down to adolescents. About 4 out of every 300 twelfth graders surveyed admitted using a nitrite of some kind at some point in their lives. The perceived availability of amyl and butyl nitrites (the ease with which seniors said they would be able to get the drugs) was high: 20 percent of those surveyed said it would be "fairly easy" or "very easy" to obtain.

Trends in the United Kingdom

A similar trend has occurred in the United Kingdom. Neville Hodgkinson, writing in the London *Sunday Times* in 1994, revealed the results of a study of amyl nitrite use among fourteen and fifteen year olds in Manchester, United Kingdom. Fourteen percent of the students in the study admitted that they had sniffed poppers in the past. "It has become increasingly popular as a 'rave' drug [but now it's] even for playground use," concluded Hodgkinson.

In a 2003 *Guardian* article, Alan Travis reported: "Illegal drug use in England and Wales remains among the highest in Europe with around 4 million people—12% of the population between 16 and 59—having used some kind of illicit substance in the last year. . . . But the new figures from the British Crime Survey," added Travis, "show . . . that the legal prescription drug amyl nitrite or poppers is now more widely used by 16 to 24-year-olds."

Do You Know What Nitrites Do?

The effects of amyl nitrite go far beyond bad breath, a headache, and a case of the giggles. Remember what it does to some muscles? It relaxes them. Two of the muscles it works on are those associated with bowel and bladder control. Put plainly, nitrites can cause users to have accidents before they can reach a toilet.

Effects on the Body

British writer Georgie Dales admits to having manufactured illegal drugs with her classmates many years ago when they were young chemistry students. She described poppers in the London *Independent Sunday* as "a heady brew which when sniffed makes the heart race and the head spin as it kills a couple of million brain cells." She and her cohorts had plans to manufacture more illicit drugs, but, as she put it, "Luckily, we got busted first."

Amyl nitrite is absorbed into the bloodstream rapidly and reaches the brain quickly, with effects usually beginning ten to fifteen seconds after inhaling. The initial effects include an almost immediate sense of happiness and pleasure called a "head rush," or simply a "rush." The RUSH is caused by a temporary cut in the amount of oxygen to the brain and the faster pumping of the heart. These feelings last just two to five minutes and are usually followed by a headache.

Amyl nitrite and other poppers tend to impair the judgment of the user, increasing the likelihood that he or she will make bad decisions—especially when it comes to sexual behavior. Virtually every available reference source on nitrites states that these drugs cause a decrease in the user's INHIBITIONS, providing a sense of well-being, intensified emotions, and enhanced sexual desire. People with lowered inhibitions tend to take more chances and engage in riskier behavior than they would if they were not high.

Poppers cause confusion, dizziness, giddiness, drowsiness, facial flushing, skin irritations around the mouth and nose, and a slowed perception of time, not to mention bad breath. They also cause certain muscles in the body to relax involuntarily. Despite these side effects, users claim that nitrites heighten their sense of sexual arousal.

rush: a feeling of euphoria or extreme happiness and well-being

inhibitions: inner thoughts that keep people from engaging in certain activities

Amyl nitrite (center) and Liquid Gold are nicknamed "poppers." They are stimulant drugs that are often abused at all-night dance parties called raves. *Science Photo Library.*

Dangers

Sniffing amyl nitrite can be dangerous to anyone because nitrites reduce blood pressure. The inhalation of nitrites by pregnant women or by people with the blood condition ANEMIA, the eye disease glaucoma, high blood pressure, heart disease, respiratory (or breathing) problems, or a recent injury to the head sets the stage for extremely severe health risks, and possibly death, according to the NIDA. Poppers can also trigger a short-term deficiency of oxygen reaching the tissues of the body, a condition called HYPOXIA.

anemia: a blood condition that results in the decreased ability of the blood to transport enough oxygen throughout the body

hypoxia: a dangerous condition brought on by an inadequate amount of oxygen circulating throughout the body

Overdose symptoms include nausea, vomiting, dangerously low blood pressure, difficulty breathing, cold skin, blue lips or fingernails, a rapid heartbeat, an unbearable headache and/or a strong feeling of pressure in the head, and eventual unconsciousness. The

inhalation of nitrites can damage red blood cells and affect the blood's ability to carry oxygen from the lungs to the rest of the body. Swallowing nitrites can be fatal.

Other long-term effects of popper use are unclear. Mood swings and personality changes have been reported but have not been studied. Tolerance to nitrites develops with repeated use.

Recent data from the NIDA indicate that the inhalation of nitrites can damage the cells of the immune system and make it more difficult for users to fight off certain infections. Among HIV-positive individuals (people who test positive for the human immunodeficiency virus, which can lead to AIDS), amyl nitrite usage can increase the rate at which the virus multiplies. The higher the number of viral cells in a person's body, the greater the risk for developing AIDS. In a 2004 article for *AIDS Treatment News,* John S. James reported on a United States-based study of infections among men who have sex with men. Nearly half the men in the study used poppers, "suggesting a potentially large impact on the spread of HIV." James also noted that animals exposed to poppers have shown an increased risk of "cancer growth and bacterial growth, probably by suppressing the animals' natural immunity."

"A Feeling . . . of Bursting of the Head"

According to the *Medsafe* Web site of New Zealand, "inhaled doses of 5 to 10 drops of amyl nitrite may cause violent flushing of the face, accompanied by a feeling of imminent bursting of the head and very excessive heart action. The inhalation of larger amounts may produce a feeling of suffocation and muscular weakness."

Reactions with Other Drugs or Substances

Sniffing amyl nitrite is dangerous. Combining amyl nitrite use with other drugs or alcohol can be deadly. The effects of nitrites are intensified by substances such as aspirin, high blood pressure medication, and alcohol. Drug users frequently use nitrites to enhance the high brought on by the other illicit drugs they take—marijuana, cocaine, methamphetamines, and hallucinogens, among others. Doing so increases the risk of harmful reactions. According to various British sources, a majority of young people at dance clubs and raves in the early 2000s regularly used more than one drug at a time, with amyl nitrite often part of the mix.

Amyl nitrite is particularly dangerous when combined with the prescription drug Viagra, used to help men who have problems with their sexual performance. Tobias Jones reported in the London *Independent Sunday* that "Viagra can have a lethal effect if mixed with amyl nitrite 'poppers.'" Since both act to dilate

Jail Time or Anti-Drug Treatment?

In 2000, California voters approved Proposition 36, also known as the Substance Abuse and Crime Prevention Act. Proposition 36, which took effect on July 1, 2001, allows state courts to sentence first- and second-time drug-use offenders to probation and drug abuse treatment programs rather than jail time. Treatment can include outpatient care, inpatient treatment at a halfway house, psychotherapy, and drug education and prevention classes. This law applies to persons convicted of possession of amyl nitrite without a prescription. Its goal is to reduce repeat drug use.

A follow-up study on the success of Proposition 36 was conducted by the University of California at Los Angeles. According to a press release dated September 23, 2004, "California's groundbreaking 'drug treatment instead of incarceration'" program produced "excellent results in its first two years of implementation." More than 66,000 people entered the program, saving the state hundreds of millions of dollars in incarceration costs. Proposition 36 could become a model for other states to follow in the ongoing fight against drug abuse.

blood vessels, a mixture of the two can cause blood pressure to drop to dangerously low levels. This can lead to a heart attack, STROKE, coma, or death.

Treatment for Habitual Users

"We really don't know exactly why the nitrites have the mental effects that make them attractive for people to use," explained Cynthia Kuhn and her coauthors in the 2003 edition of *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy.* Nitrites, in fact, are not considered addictive substances. The biggest problem for amyl nitrite abusers stems from their tendency to combine it with other drugs. Habitual nitrite sniffers are likely to benefit from drug dependency treatment programs, including counseling.

Education and knowledge regarding the dangers of inhaling nitrites is a key to preventing their use. Studies show that most youths who try drugs do so because of peer pressure. Therefore, it is important that young people not only resist the pressure, but try to persuade friends who are using amyl nitrite—or abusing any drug—to get help.

Consequences

Studies and surveys in the United States and the United Kingdom show that people who use poppers generally tend to underperform academically and are less likely to graduate from high school. Historical trends show that dropouts are more likely to end up with low-paying jobs or to become part of the welfare system. In addition, a number of studies show that people who abuse drugs are much more prone to illness, particularly viruses and other infections. Unlike other inhalants, amyl nitrite is abused primarily because it is believed to enhance sexual pleasure and performance through loss of inhibition. Users often engage in unsafe sex and are at a much greater risk for contracting sexually transmitted diseases, including HIV.

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

The Law

Laws governing the possession, use, or sale of nitrites can seem very confusing. Not all nitrites are considered drugs. In fact, of all the nitrites used as inhalants, only amyl nitrite is classified as a drug. In the United States, the only legal way to get amyl nitrite is by prescription. The other nitrites fall into a different category. These substances are not considered foods or drugs, and this is where the legal complexities begin.

The FDA made the possession, use, or sale of amyl nitrite without a prescription illegal in the United States in 1969. In 1988, the U.S. Consumer Products Safety Commission banned the sale of butyl nitrite, and the law was amended, or changed, in 1990 to include a broader range of nitrites. The laws regarding the possession, use, or sale of poppers in the United States vary from state to state but usually involve prison terms and stiff fines.

Still, some dishonest manufacturers have found ways to dodge the laws covering amyl and butyl nitrites. They simply make slight alterations to the chemical compounds that bind to the nitrites. One example of an altered popper is a substance called cyclohexyl nitrite, commonly sold in drug paraphernalia or "head" shops and adult bookstores as a head cleaner for VCRs. Researchers point out that regardless of the legal status, the dangers of using any type of nitrite remain the same.

In the United Kingdom, the laws concerning nitrites are somewhat different. The Medicines Act (1968) states that it is illegal to sell amyl nitrite without a prescription. However, possession or use of amyl nitrite without a prescription is not a crime. Most other nitrites sold as poppers are not covered by the Medicines Act, since distributors market them as room deodorizers and liquid incense, not medicines. Therefore, the sale, possession, and use of butyl and isobutyl nitrites are not restricted in any way under British law.

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See also: Inhalants

Antidepressants

Official Drug Name: Amitriptyline (amm-uh-TRIP-tuh-leen; Elavil), bupropion (byoo-PROH-pee-on; Wellbutrin), citalopram (sye-TAL-oh-pram; Celexa), clomipramine (kloh-MIPP-ruh-meen; Anafranil), escitalopram (EE-sye-TAL-oh-pram; Lexapro), fluoxetine (flu-AKS-uh-teen; Prozac), imipramine (ih-MIPP-ruh-meen; Tofranil), mirtazapine (murr-TAZ-uh-peen; Remeron), paroxetine (purr-OKS-uh-teen; Paxil), phenelzine (FENN-uhl-zeen; Nardil), sertraline (SURR-truh-leen; Zoloft), venlafaxine (venn-luh-FAKS-een; Effexor). The twelve drugs listed here are a sampling of the various types of antidepressants in use as of 2005.
Also Known As: Happy pills
Drug Classifications: Not scheduled, psychotherapeutic drugs with "black box" warnings

What Kind of Drug Is It?

Antidepressant drugs are used to relieve the symptoms of depression and anxiety. Depression is a mood disorder that causes people to have feelings of overwhelming and lasting hopelessness, sadness, despair, and self-blame. The condition can also bring on changes in sleeping and eating habits, a loss of pleasure, feelings of apathy, and even suicidal thoughts. Anxiety is a disorder that causes feelings of being extremely overwhelmed, restless, fearful, and worried. Symptoms of anxiety include loss of sleep, dizziness, sweating, and shaking, among others.

Antidepressants play an important role in the treatment of depression and anxiety. They help to rebalance brain chemistry so the symptoms of depression and anxiety are alleviated. A large number of people take antidepressants. Richard Jerome, writing in *People*, reported that "133 million prescriptions for antidepressants were written in 2002" in the United States alone.

Overview

Depression is a condition that affects the way people feel, think, and act. "Ten to 20 percent of adults in the United States experience depression at some point in their lifetime," noted Adrienne Z. Ables and Otis L. Baughman III in an article for the journal *American Family Physician.*

Sometimes depressive episodes are sparked by an especially upsetting event in life such as the death of a loved one, the breakup of a relationship, a change in jobs, separation from friends or family, or a severe illness. Because depression seems to run in families, scientists are investigating possible biological causes for the condition. The authors of "Depression: Help Is at Hand," a publication of the Royal College of Psychiatrists (RCP), stated that people who have a parent who has become severely depressed "are about eight times more likely to become depressed" themselves. This may be due to an abnormality in the brain involving chemical messengers called NEUROTRANSMITTERS.

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

Depressed people often have a hard time tracing their sadness to a particular cause. Certain medicines and even some physical illnesses such as the flu can bring on depression, so it is extremely important for people to educate themselves about its signs, symptoms, and treatments.

Symptoms of depression include:

- A long-lasting sad mood
- A change in sleep patterns—either sleeping all the time or having difficulty getting enough sleep
- A change in eating habits—some people eat more when they get depressed, others stop eating altogether and begin losing significant amounts of weight
- A loss of interest in activities or hobbies that used to bring pleasure
- Self-destructive thoughts or actions
- Difficulty making decisions
- A loss of confidence
- Increased irritability
- Problems with school or work
- Problems with friends or family members
- A feeling of hopelessness, as if things will never be any better.

Depression is common among people who have experienced a life-threatening event, such as these teenagers who grieved following the shootings at Columbine High School in 1999. Counselors are often brought in to help students deal with the loss of friends when a tragedy occurs. *AP/Wide World Photos.*

Depression occurs in people of all ages, from small children to the elderly. "In contrast to the normal emotional experiences of sadness, loss, or passing mood states, depression is extreme and persistent and can interfere significantly with an individual's ability to function," stated the authors of the "Depression Research" page of the *National Institute of Mental Health* (NIMH) Web site.

A study sponsored by the World Health Organization and the World Bank is cited in "Depression Research." The study noted that major depression was found "to be the leading cause of disability in the United States and worldwide." Regardless of what triggers their depression, those who suffer from it require medical assistance. This assistance might include PSYCHOTHERAPY, medication, or a combination of both. Many depressed people from all age groups have responded well to treatment.

psychotherapy: the treatment of emotional problems by a trained therapist using a variety of techniques to improve a patient's outlook on life

Depression Statistics

Doctors and research scientists continuously seek to learn more about depression. They have learned that:

- Nearly 10 percent of the adult population in the United States suffers from a depressive illness. That is about 19 million Americans over the age of eighteen.
- One in five children and adolescents in the United States suffers from some kind of emotional problem that affects his or her daily life.
- As of 2004, doctors were writing about 11 million prescriptions for antidepressants to teenagers and children each year.
- More women than men have been diagnosed with depression, but that does not necessarily mean that more women are depressed than men. Researchers suggest that women are just more likely to seek help than men.

Anxiety, which is often associated with depression, can also be helped by medication. Severe anxiety can result in PANIC ATTACKS. These attacks can make a person feel like he or she is dying. They cause rapid heartbeat, tightness in the chest, shaking, shortness of breath, and dizziness. Antidepressants can help a person focus on dealing with his or her fears before an attack occurs, and the drugs can alleviate the physical symptoms of an attack.

An Accidental Find

Chemists seem to have stumbled upon drugs with antidepressive effects while working on treatments for other medical problems. The very first antidepressants, iproniazid (sold under the brand name Marsilid) and imipramine (sold under the brand name Tofranil), were developed in the 1950s. Since then, great strides have been made in understanding how the human brain works. These strides contributed to the creation of the four main types of antidepressant drugs known as of 2005: 1) tricyclics, 2) monoamine oxidase inhibitors (MAOIs), 3) selective serotonin reuptake inhibitors (SSRIs), and 4) "others," including serotonin and norepinephrine reuptake inhibitors (SNRIs). All of these drugs get their names from the way they act on chemicals called neurotransmitters located in the human brain.

Tricyclics and MAOIs were available years before the SSRIs came on the scene. Richard DeGrandpre, writing in *Nation,* stated that "SSRIs have not been clinically proven to be more effective" than the older tricyclics. The SSRIs gained a reputation for safety because they are generally less toxic, or harmful to the body, when taken in overdoses. In normal doses, however, both the new and the old classes of antidepressants have been shown to relieve the symptoms of depression in some patients. Because each patient will respond differently to the various antidepressants, physicians may try several different kinds—or even combine one with another—in the search for the most effective treatment for a particular patient.

panic attacks: unexpected episodes of severe anxiety that can cause physical symptoms such as shortness of breath, dizziness, sweating, and shaking

Main types of antidepressants

Tricyclics (try-SICK-licks)	MAOIs (monoamine oxidase inhibitors)	SSRIs (selective serotonin reuptake inhibitors)	Others, including SNRIs (serotonin and norepinephrine reuptake inhibitors)
amitriptyline (amm-uh-TRIP-tuh-leen; Elavil)	mirtazapine (murr-TAZ-uh-peen; Remeron)	citalopram (sye-TAL-oh-pram; Celexa)	bupropion (byoo-PROH-pee-on; Wellbutrin)
clomipramine (kloh-MIPP-ruh-meen; Anafranil)	phenelzine (FENN-uhl-zeen; Nardil)	escitalopram (EE-sye-TAL-oh-pram; Lexapro)	venlafaxine (venn-luh-FAKS-een; Effexor)
imipramine (ih-MIPP-ruh-meen; Tofranil)		fluoxetine (flu-AKS-uh-teen; Prozac)	
		paroxetine (purr-OKS-uh-teen; Paxil)	
		sertraline (SURR-truh-leen; Zoloft)	

SOURCE: Prepared by Barbara C. Bigelow for Thomson Gale, 2005.

The Ultimate Problem Solver?

The most popular antidepressants are the SSRIs. Prozac was the first SSRI approved for use in the treatment of depression. It became available in 1987, received extensive coverage in the media, and within a few years became a household name. Some people were under the impression that Prozac was the ultimate problem solver—a sort of "happy pill" that gave everyone who took it a more positive outlook on life. It had no reported side effects and was even thought to help in weight loss. What most people failed to realize, however, is that antidepressants have no psychological effects on people who don't suffer from depression. They only help depressed patients reach a normal level of functioning.

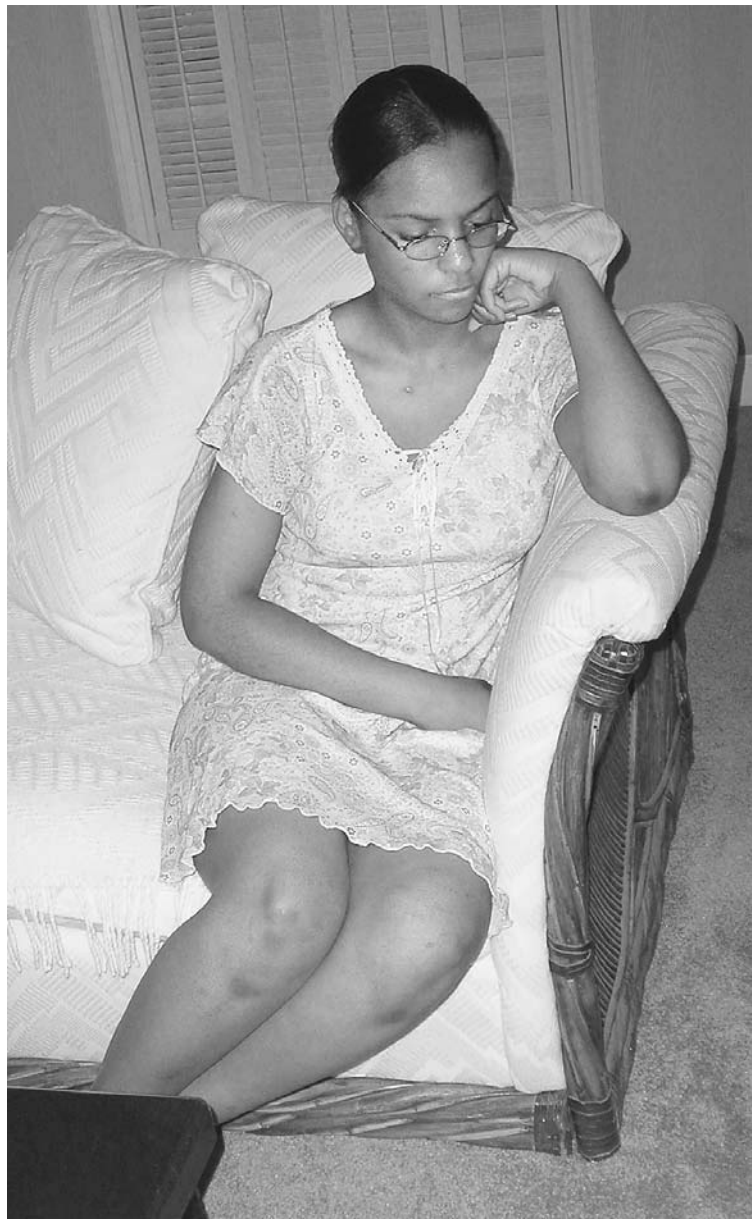
Still, the market for antidepressants grew wildly in the 1990s and early 2000s. According to *The Pill Book,* seven of the top fifty prescriptions written by U.S. doctors in 2003 were for antidepressants. Associated Press reporter Bruce Smith, as recorded on the *ABC News* Web site, noted that 32.7 million prescriptions for Zoloft, another SSRI, were written that year. This made Zoloft the most widely prescribed antidepressant in the United States.

What Is It Made Of?

A variety of substances have antidepressant actions. The antidepressants available in the United States are classified in two main ways: 1) by their chemical structure, as in the case of tricyclics (three-ring structure), or 2) by their actions on neurotransmitters, as in the case of MAOIs, SSRIs, and SNRIs. Tricyclics work to increase the levels of the neurotransmitters NOREPINEPHRINE and SEROTONIN in the

norepinephrine: pronounced nor-epp-ih-NEFF-run; a natural stimulant produced by the human body

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator



Many people experience depression at some time in their lives. Depression is a mood disorder that causes people to have feelings of overwhelming and lasting hopelessness, sadness, despair, and self-blame. *Photograph by Leitha Etheridge-Sims.*

brain. These neurotransmitters are usually at low levels in people who suffer from depression. The problem with tricyclics is that they can affect other neurotransmitters as well, causing a number of side effects. MAOIs stop the protein in the brain known as monoamine oxidase from breaking down serotonin, norepinephrine, and another neurotransmitter called dopamine after they deliver their messages to the brain. This leaves high levels of these chemicals in the brain and subsequently keeps depression at bay.

However, MAOIs also keep monoamine oxidase from destroying tyramine (found in various foods), which can cause fatal increases in blood pressure. SSRIs were specifically designed by scientists to stop the "reuptake," or reabsorption, of only serotonin in the brain, allowing levels of serotonin to build and remain high while not affecting the levels of other chemicals. They are the most prescribed forms of antidepressants because they usually have fewer side effects and interactions with other drugs. SNRIs focus on stopping the reuptake of serotonin and norepinephrine so that they both build and remain at a high level.

How Is It Taken?

Prescription antidepressants are taken orally, usually once a day, and usually in capsules or tablets. Some are available in liquid form for swallowing. It is very important that patients on antidepressants take their medications exactly as prescribed, even if the drugs do not seem to be working at first. In some cases, three to four weeks of antidepressant use may be needed before the effects of the drug can be observed.

The usual daily dose prescribed of an antidepressant can differ. For the SSRI Prozac, a patient is typically prescribed 20 to 40 milligrams per day. In higher doses, it has been used to treat OBSESSIVE-COMPULSIVE DISORDER (OCD) and the eating disorder BULIMIA. In 2002, Prozac became available in a once-a-week capsule-form that contains 90 milligrams of fluoxetine granules that are released over time. The effect of one of these capsules is equivalent to seven daily doses of 20 milligrams of Prozac.

obsessive-compulsive disorder (OCD): an anxiety disorder that causes people to dwell on unwanted thoughts, act on unusual urges, and perform repetitive rituals such as frequent hand washing

bulimia: pronounced bull-EEM-eeh-yuh; an eating disorder that involves long periods of bingeing on food, followed by self-induced vomiting and abuse of laxatives

Dosages of Zoloft, another SSRI, typically begin at 50 milligrams per day for adults and may be raised to 100 or 200 milligrams per day. When the SSRI Paxil is prescribed for depression, the initial dose is usually 20 milligrams per day. This dose may be increased to about 40 milligrams per day. Citalopram (Celexa) and escitalopram (Lexapro) are SSRIs that are gaining popularity for two reasons. First, their side effects are said to be minimal. Second, the risk of harmful interactions with other drugs is low. As of 2005, drug

Prozac was the first SSRI approved for use in the treatment of depression.

Photo by Stephen Chernin/Getty Images.

researchers noted a definite increase in the number of prescriptions being written for these two particular antidepressants.

Are There Any Medical Reasons for Taking This Substance?

Antidepressants are used mainly to relieve the symptoms of depression, which include feelings of sadness, helplessness, and

hopelessness. They may also be used to treat severe anxiety, panic attacks, POST-TRAUMATIC STRESS DISORDER (PTSD), obsessive-compulsive disorders, eating disorders, chronic pain, severe PREMENSTRUAL SYNDROME, and postpartum depression. Affecting more than one in ten new mothers, postpartum depression causes sadness, anxiety, irritability, tiredness, interrupted sleep, a loss of enjoyment or desire to do anything, and guilt over not being able to care properly for the baby.

Sometimes severely ill individuals become depressed. The symptoms of depression can have very negative effects on their recovery. STROKE patients are especially vulnerable to depression. After-stroke, or post-stroke, effects can include a loss of voluntary movement (usually on one side of the body), a loss of sensation (especially in affected limbs), weakness, and difficulty speaking. The long process of rehabilitation for stroke patients is often hampered by depression. Antidepressants have proven very effective in post-stroke patients. A positive attitude is crucial to recovery and helps patients stick to their intensive and often exhausting physical therapy schedules. Treating post-stroke depression improves the chances of the stroke patient regaining both physical strength and mental sharpness.

September 11, 2001

Doctors reported that requests for antidepressants increased dramatically after the terrorist attacks of September 11, 2001, on American soil. Fear, depression, and anxiety were common among Americans after terrorists hijacked planes and flew them into the World Trade Center in New York City and the Pentagon in Washington, D.C.

Usage Trends

"I think the categorical belief is that depression is something you get over rather than something you take medication for," stated Dr. Zachary N. Stowe in an interview with Laurie Tarkan for the *New York Times.* Indeed, some "four out of five people with depression will get completely better without any help," noted the authors of "Depression: Help Is at Hand." Episodes of depression frequently last for eight months to a year before going away. For some depressed people, however, the symptoms hang on even longer.

Of the one in five people with depression that does *not* go away on its own, treatment is recommended. Without help, those people are twice as likely to fall into a pattern of repeated depressive episodes. A 2003 *Time* magazine article pointed to the potential seriousness of the condition. "Untreated depression has a lifetime suicide rate of 15 percent—with still more deaths caused by related behaviors like self-medicating with alcohol and drugs."

post-traumatic stress disorder (PTSD): an illness that can occur after experiencing or witnessing life-threatening events, such as serious accidents, violent assaults, or terrorist attacks; symptoms include reliving the experience through nightmares and flashbacks, having problems sleeping, and feeling detached from reality

premenstrual syndrome: symptoms that occur in some women about a week before the start of their monthly period and may include irritability, fatigue, depression, and abdominal bloating

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

Defining Depression

Depression is hard to define, and not all doctors agree on whether it is a mood disorder or the more serious definition: a disease. In his 2005 book, *Against Depression,* Peter Kramer notes that his work presents "an insistent argument that depression is a disease." In fact, he calls depression one of the worst diseases to afflict humankind.

Dr. Peter R. Breggin sees the situation differently. In his 2001 work, *The Antidepressant Fact Book,* he states that "it is a mistake to view depressed feelings or even severely depressed feelings as a 'disease.'" He continues: "Depression . . . is an emotional response to life. It is a feeling of unhappiness—a particular kind of unhappiness that involves helpless self-blame and guilt, a sense of not deserving happiness, and a loss of interest in life. . . . A human emotion or psychological state—basically, a feeling—should not be considered a 'disease' simply because it becomes extreme."

The Debate over SSRI Safety and Suicide Risks in Children and Teens

As more and more children and teens are diagnosed with depression, the effects of the drugs used to treat it must be evaluated in young people. Some experts worry that antidepressants may act differently in people under the age of eighteen because their brains are not yet fully mature. "Our knowledge of antidepressant treatments in youth, though growing substantially, remains limited when compared with what we know about treatment of depression in adults," stated the authors of the NIMH article "Antidepressant Medications for Children and Adolescents: Information for Parents and Caregivers."

According to *Christian Science Monitor* correspondent Patrik Jonsson, two separate congressional hearings revealed that the U.S. Food and Drug Administration (FDA) had "known about problems with [antidepressant] drugs since 1996, but failed to take decisive action." These "problems" included higher rates of aggression and an increase in suicidal thinking among young patients being treated with antidepressants. By 2000, even more studies had emerged "showing a possible link between hallucinations and aggression in children and teens taking Zoloft, Paxil, and Prozac," reported "FindLaw" columnist Elaine Cassel on *CNN.com.* Despite these findings, in January of 2003 the FDA approved the use of Prozac in depressed children as young as seven years old. As of 2005, only Prozac has been approved to treat depression and OCD in children. Zoloft, Luvox, and Anafranil are only approved for children for OCD. As of 2005, no other antidepressant is approved for use in children.

Treatment for Adolescents with Depression Study (TADS): To gain more information on the effects of antidepressants in young people, the NIMH spent $17 million on the Treatment for Adolescents with Depression Study (TADS), which was conducted between 2000 and 2003. More than 400 depressed adolescents were divided into groups that received varying forms of treatment. One group was treated with Prozac alone. Another group received a combination of Prozac and COGNITIVE BEHAVIORAL THERAPY (CBT), a type of psychotherapy that stresses positive thinking. A third group received CBT without the Prozac. A fourth group received only a PLACEBO.

cognitive behavioral therapy (CBT): a type of therapy that helps people recognize and change negative patterns of thinking and behavior

placebo: pronounced pluh-SEE-boh; a "sugar pill" or "dummy pill" that contains no medicine

Some antidepressants have been linked to increased suicides in users. Here, the mother (left) of a deceased teen waits to testify at a public hearing before the FDA. Her son, Jacob, committed suicide at age 14 while taking antidepressant drugs. *AP/Wide World Photos.*

The results of the study were released to the press by the NIMH in August of 2004. The participants were monitored for improvement in their depression and for trends in their suicidal thinking. The combination of medication and therapy proved the most effective in relieving the symptoms of depression. The data concerning suicidal thinking were more difficult to interpret.

The results of TADS revealed that 7 percent of adolescents receiving Prozac either attempted suicide or threatened to do so. Only 4 percent of participants in the placebo group had a suicide-related event. Still, the NIMH concluded that "it is extremely difficult to determine whether SSRI medications do or do not increase the risk of . . . suicide, especially since depression itself increases the risk for suicide." Experts believe that a larger study is needed to resolve unanswered questions.

Results Lead to "Black Box" Warnings

In 2004, the FDA examined information from more than twenty studies, including TADS, on antidepressants and adolescents. Together, the studies involved about 4,300 patients under the age of eighteen. Overall, the results mirrored the TADS findings. The rate of suicidal thinking or behavior was twice as high among

Testing New Drugs

The word *placebo* is Latin for "I shall please." Placebos, often called "sugar pills" or "dummy pills," are used in experiments that test the effectiveness of new drugs. Doctors give one group of patients regular doses of a placebo and one group of patients regular doses of the real drug that is being tested for a particular condition. Patients are not told what they have been taking until the testing period is over. After a few months, both groups are compared. A higher rate of improvement among patients in the test-drug group is good news for drug researchers. It indicates that the new drug is truly effective in treating the condition it was designed to treat.

Patients' conditions may improve for a time if they *believe* they are taking a medication that will relieve their symptoms. In the treatment of depression, an average of 35 percent of placebo-treated individuals will improve, compared with about 60 percent of SSRI-treated individuals.

adolescents taking SSRIs as it was in adolescents who were not. This prompted the FDA to announce in late 2004 that "black box" labeling of antidepressants would become mandatory. In "Antidepressant Medications for Children and Adolescents," the authors noted: "A black-box warning is the most serious type of warning in prescription drug labeling." Black box warnings for antidepressants state that the drugs may be linked with an increased risk of suicidal thinking or behavior. On its Web site, the FDA specifies the language to be used on the black box warnings. Part of the standard warning follows:

> Antidepressants increased the risk of suicidal thinking and behavior (suicidality) in short-term studies in children and adolescents with Major Depressive Disorder (MDD) and other psychiatric disorders. Anyone considering the use of [drug name] or any other antidepressant in a child or adolescent must balance this risk with the clinical need. Patients who are started on therapy should be observed closely for clinical worsening, suicidality, or unusual changes in behavior. Families and caregivers should be advised of the need for close observation and communication with the prescriber.

According to *MSNBC.com*, antidepressant use among children and teens has declined by about 10 percent since the information on suicide risks was released.

Effects on the Body

Neurotransmitters, such as serotonin and norepinephrine, are chemical substances that transmit information from one nerve to another. By the middle of the twentieth century, researchers had found that depressed people seemed to have lower concentrations of neurotransmitters coating the nerve endings in their brains. Antidepressants help stop the reuptake of these chemical substances in the brain, creating a kind of bath of neurotransmitters like serotonin for the nerve endings to soak in. Raising the concentration of neurotransmitters in the brains

of depressed individuals works to reduce the symptoms of their depression.

The actions of antidepressants on the brain are not fully understood, but scientists are learning more about them every day. Studies show little difference in the effectiveness of the various antidepressants, but some individual patients appear to do better on one drug than another. In the search for the most effective drug for a particular patient, a physician may prescribe various antidepressant drugs or even try some in combination.

General side effects of antidepressants can include stomach upset, agitation, anxiety, dizziness, INSOMNIA, and a dry mouth (which usually increases a user's thirst). Since SSRIs were discovered, the older MAOIs are prescribed less often for the treatment of depression. Side effects of MAOIs can be severe and include a sudden elevation of blood pressure. Tricyclics may cause dryness of the mouth and eyes. A dry mouth can lead to the formation of dental cavities, and dry eyes can result in blurred vision. Use of tricyclics may also result in reduced urine output, constipation, and weight gain. Older patients are cautioned against tricyclic use because the drugs can disrupt the normal rhythm of the heartbeat. SNRIs should not be used by people with heart problems.

News from Around the Globe

Depression and anxiety are common problems throughout the world. Were you aware that:

- The National Institute on Mental Health in England (NIMHE) reported that about 1 in every 100 deaths in the United Kingdom is a suicide.
- Canada's labeling of SSRIs carries an additional warning of a potential increase in hostility, aggression, and "harm to others." A reference to harming others does not appear on the black box warnings of SSRIs in the United States, however.

The Question of Addiction

Until the early 2000s, antidepressants were not believed to cause addiction in users. A traditional feature of addictive substances is the "HIGH" or "buzz" they cause in users. "Antidepressants will not make you high," stated Andrew Weil and Winifred Rosen in *From Chocolate to Morphine.*

Ables and Baughman mentioned in 2003 that some degree of WITHDRAWAL occurs with all antidepressants. This contradicts the belief that antidepressants are not addictive. The withdrawal symptoms, which are usually mild, begin about a week after the antidepressant medication is stopped. They include dizziness, nausea, headache, and flu-like symptoms, but agitation and even panic attacks may occur. Withdrawal symptoms usually end within three weeks for SSRIs. However, "withdrawal from paroxetine [SSRI Paxil]," explained Ables and Baughman, "was shown to cause more severe symptoms that may occur more quickly, even after the second missed dose."

insomnia: difficulty falling asleep or an inability to sleep

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

Zoloft on Trial

Christopher Pittman threatened suicide and was hospitalized after his parents' final breakup in 2001. Pittman's mother had first left home when Pittman was just two years old. His parents' repeated attempts to get back together failed. After hearing that their relationship was really over, Pittman, then twelve years old, became desperate and ran away from his Florida home. After he was found, he spent a couple of weeks in a psychiatric hospital and was diagnosed with depression and defiant behavior. Doctors put him on Paxil, an SSRI, briefly. Days later he was prescribed Zoloft, a different SSRI. Zoloft was the most widely used antidepressant for both adults and teens in the United States at that time.

Pittman went to live with his father's parents in South Carolina later in 2001. He was there for only a matter of weeks, and life seemed to be going well for him. Then, one day that November, Pittman and his grandfather had a serious argument. They fought about some trouble that Pittman had caused on his school bus. Pittman was told that he might have to return to his father's home in Florida because of the incident. That night, the twelve-year-old boy shot his grandparents to death in their bed, set their home on fire, and drove away in their car with his dog. Pittman's lawyers argued that "the killings occurred for a reason beyond the boy's control—a reaction to the antidepressant Zoloft," noted Barry Meier in the *New York Times*. "Such defenses," Meier continued, have been used in the past but "have rarely succeeded."

Pittman's case did not go to trial until three years after the tragic incident. While in jail awaiting his trial, Pittman repeatedly claimed that he loved his grandparents. His own father even came to his defense, stating that the boy had always been especially

Researchers in the United Kingdom noted similar findings. According to the Royal College of Psychiatrists, "up to a third of people who stop SSRIs and SNRIs have withdrawal symptoms. These include: stomach upsets, flu-like symptoms, anxiety, dizziness, vivid dreams at night, and sensations in the body that feel like electric shocks." These symptoms are more often associated with paroxetine (sold under the brand name Paxil in the United States and Seroxat in the United Kingdom) and venlafaxine (sold under the brand name Effexor in the United States and Efexor in the United Kingdom) than any other SSRIs and SNRIs. Research continues on the still-baffling question of addiction and withdrawal issues among antidepressant users.

Reactions with Other Drugs or Substances

Anyone prescribed an antidepressant should consult with a physician before taking any other drug, including over-the-counter

Defense attorney Paul Waldner (left) tries to comfort his client, Christopher Pittman, who was on trial for murdering his grandparents. *AP/Wide World Photos.*

close to the couple. Pittman told police that on the night of the murders, he had heard voices urging him to kill his grandparents. Those voices in his head, claimed defense lawyers, were caused by the Zoloft, and possibly even the Paxil, he had been taking for depression.

The so-called "Zoloft defense" did not work for Christopher Pittman. On February 15, 2005, he was sentenced to thirty years in prison for the murders of his grandparents.

The Pittman case fueled the growing debate about the safety of antidepressants in children and teens. Between 2001 and 2004, the FDA stepped up its investigations into the effects of antidepressants on patients under the age of eighteen. In June of 2003, the FDA recommended against prescribing Paxil (the first medication prescribed by Pittman's doctors) for depression in children and adolescents.

medications. Patients taking MAOIs must avoid certain foods such as aged meats, cheeses, and pickles because they contain tyramine, which can cause harmful reactions when combined with MAOIs. These foods should not be consumed until well after a person stops taking the drug.

It is important to know that the effects of alcohol are greatly increased when combined with antidepressants. In addition, combining large amounts of caffeine with antidepressants may intensify the jitters and agitation that sometimes accompany depression.

The reactions of RECREATIONAL DRUGS with antidepressants are unpredictable and possibly very dangerous. The symptoms of depression are often intensified by ILLICIT drug use. To help avoid problems, it is important that patients taking antidepressants stick to their prescribed dosage and stay away from other drugs, unless prescribed by a physician. In addition, the effectiveness of a drug can only be measured when the prescription is followed accurately.

recreational drugs: drugs used solely to achieve a high, not to treat a medical condition

illicit: unlawful

Alternatives to Medicine

Antidepressants are believed to help relieve the symptoms of depression, but there are other things depressed people can do to feel better. Among these are:

- Talking with trusted friends, family members, and counselors
- Identifying and solving the problem that may have caused the depression in the first place
- Getting regular exercise
- Eating well
- Staying away from alcohol and other depressants
- Practicing relaxation techniques
- Setting time aside for enjoyable activities or hobbies

Treatment for Habitual Users

Antidepressants are not abused in the traditional sense. This means that they are not taken by users to get high. If antidepressant drug therapy is discontinued, it should be done under a doctor's care using the "step-down method" in order to reduce the risk of side effects. This method involves gradually lowering the dose of the drug until the patient is weaned off it entirely.

Consequences

Depression and anxiety can interfere with a person's happiness, success, and relationships. The symptoms of depression and anxiety should not be ignored. About 80 percent of people with depression respond very positively to treatment, but that leaves a significant number—the other 20 percent—without help. Thus, an important goal of NIMH research is to advance the development of more effective treatments for depression, especially those "hard-to-treat" forms that don't respond well to currently available medications and/or counseling.

Major depression can occur just once in a person's lifetime, but it is usually recurring. Depressive episodes will interfere with the ability to work, eat, sleep, concentrate, and take pleasure in formerly enjoyed activities. Treatment for depression is often a long-term process, but it can help those with the condition lead fuller and happier lives.

Taking antidepressants for depression and/or anxiety does have consequences. They all have side effects, some dangerous, that need to be monitored. A number of people believe that taking drugs for depression and/or anxiety is not necessary. In fact, they claim, it can even be harmful. In 2005, actor Tom Cruise spoke out against the use of antidepressants, citing vitamins and exercise as better alternatives. However, others state that their lives have greatly improved since they started taking antidepressants.

The Law

Antidepressants are only available by prescription. It is illegal for people to take drugs that have not been prescribed for them. It is also illegal for patients to share prescribed drugs with other people.

Since users of antidepressants do not achieve a high with these drugs (as may occur with the STIMULANT drugs AMPHETAMINES and other drugs of abuse), they are rarely abused. No market for the illegal sale of antidepressants has been reported.

stimulant: a substance that increases the activity of a living organism or one of its parts

amphetamines: stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

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See also: Herbal drugs

Barbiturates

Official Drug Name: Amobarbital (AMM-oh-BAR-bit-al; Amytal), aprobarbital (AH-pro-BAR-bit-al; Alurate), barbital (BAR-bit-al; Veronal), butabarbital (BYOOT-uh-BAR-bit-al; Butisol), butalbital (byoo-TAHL-bit-al; Fioricet and Fiorinal), mephobarbital (MEFF-oh-BAR-bit-al; Mebaral), pentobarbital (PENT-oh-BAR-bit-al; Nembutal), phenobarbital (FEEN-oh-BAR-bit-al; Luminal), secobarbital (SEK-oh-BAR-bit-al; Seconal), secobarbital with amobarbital (Tuinal), thiopental (THY-oh-PENN-tal; Pentothal).
Also Known As: Barbs, downers, and sleeping pills (general names). Certain barbiturates have their own street names, often based on the color of the pill: blues or blue dolls for Amytal; purple hearts for Luminal; rainbows for Tuinal; reds, red birds, or red devils for Seconal; yellows or yellow jackets for Nembutal.
Drug Classifications: Schedule II, III, IV; depressant

What Kind of Drug Is It?

Barbiturates (pronounced bar-BIH-chuh-rits) are drugs that act as DEPRESSANTS and are used as SEDATIVES or sleeping pills. Because they are depressants, they are often called "downers." According to Lawrence Clayton in *Barbiturates and Other Depressants,* "Any depressant will kill if taken in a large enough quantity." Accidental overdose can occur quite easily among barbiturate users.

The effects of barbiturates are very similar to those of alcohol and include increased feelings of relaxation, sleepiness, and a decrease in INHIBITIONS. Barbiturates are habit-forming drugs and should not be used on an everyday basis. They can cause depression in high doses and addiction when taken over a long period of time.

Overview

Barbiturates have an extremely high potential for abuse. Ever since their introduction in the early 1900s, barbiturates have been considered addictive drugs. Barbiturates slow down both the mind and the body. In his book *A Brief History of Drugs: From the Stone Age to the Stoned Age,* Antonio Escohotado pointed to their "high capacity to produce numbness" by putting the user in a state somewhere between drunkenness and sleep. Aside from those effects, he continued, is their "almost inevitable ability to kill in high doses: a detail that converted these drugs into the most common means of committing suicide" from the 1940s through the 1960s.

Discovered in the 1860s

The story of barbiturates began "when a chemist combined animal urine and acid from apples," explained Clayton. That chemist was German professor and future Nobel prizewinner Adolf von Baeyer (1835–1917). The substance he created became known as barbituric (bar-bih-CHUR-ik) acid. It received its name because Baeyer first produced it on St. Barbara's Day (a day of religious recognition observed each year on December 4) of 1863.

Following Baeyer's discovery, two German researchers, Dr. Joseph von Mering (1849–1908) and Nobel prizewinner Emil Hermann

depressants: substances that slow down the activity of an organism or one of its parts

sedatives: drugs used to treat anxiety and calm people down

inhibitions: inner thoughts that keep people from engaging in certain activities

Fischer (1852–1919), produced barbital, the first barbiturate. Barbiturates are compounds derived from barbituric acid. Doctors recognized barbital's sleep-enhancing effects as far back as 1882. More than twenty years later, in 1903, barbital was marketed as a sleeping pill under the brand name Veronal. The second barbiturate, phenobarbital, arrived on the scene in 1912 under the name Luminal. Since then, several thousand barbituric acid-type drugs have been SYNTHESIZED. At the beginning of the twenty-first century, only about twelve were still being used.

Barbiturates were found to reduce the activity of nerves that control emotions and bodily functions such as breathing. Because of the drugs' soothing effects, they were commonly prescribed as sedatives for nearly fifty years. Other uses include EPILEPSY treatment and anesthesia before surgery.

Nobel prizewinner Emil Hermann Fischer produced barbital, the first barbiturate. *Photo courtesy of the Library of Congress.*

Intoxicating Effects Lead to Abuse

During the 1930s, many Americans received barbiturate prescriptions to help them sleep or relax. Barbiturates quickly gained a reputation as an intoxicant, a substance that makes users seem drunk. People began taking barbiturates as recreational drugs. They also began the dangerous practice of combining the pills with alcohol to increase the intoxication.

The 1938 Food, Drug, and Cosmetic Act gave authority over drug production to the U.S. Food and Drug Administration (FDA). The federal agency used those powers to restrict access to drugs that had a potential for abuse or misuse. The use of barbiturates without a medical doctor's prescription became illegal in the United States. But that didn't keep the drugs from becoming more and more popular throughout the 1940s.

At that time, researchers in the United States and the United Kingdom began noticing a disturbing trend. Over the years, the production of barbiturates had grown from thousands to millions of doses per year. Higher rates of barbiturate production and consumption seemed to coincide with a growing number of deaths from barbiturate poisoning. As late as 1964, Joel Fort, author of "The Problem of Barbiturates in the United States of America," argued

synthesized: made in a laboratory

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

Prescription Abuse

In 1948, the Supreme Court of the United States gave the Food and Drug Administration (FDA) permission to investigate pharmacies' records of barbiturate prescriptions. The results showed a shocking pattern of abuse. In one case a single prescription for barbiturates was refilled sixty-one times. The last three of those refills were approved *after* the patient had already died from a barbiturate overdose. In another incident, more than 180,000 barbiturates simply disappeared from a Tennessee drug store. Records indicated that drug manufacturers had sent the pills to the store, but the staff at the store was unable to explain where they went.

Soon after these discoveries were made public, pharmacies began complying with laws regarding the sale and refill of prescription barbiturates. Illegal transactions made by pharmacists, drug store owners, and drug store employees dropped dramatically. This led to the growth of a black market—a market in which barbiturates are supplied and sold illegally—beginning in the 1960s.

against the wide availability of barbiturates. "Despite conclusive evidence to the contrary," he wrote, "many physicians in the United States appear to think and act as though barbiturates are completely harmless drugs that can be prescribed in unlimited quantities." His report was prepared for the United Nations Office on Drugs and Crime.

Downers and Uppers

The pairing of barbiturates with AMPHETAMINES became a significant problem throughout the United States in the 1940s and 1950s. It all began when record numbers of people started taking barbiturates to help them sleep at night. To counteract the grogginess and lack of energy they suffered the next morning, users would take amphetamines to help them wake up. Amphetamines are STIMULANTS or "uppers." At night, users still "up" from an amphetamine HIGH would take "downers," or barbiturates, to rid themselves of their extra energy and get to sleep. The next day the drug-taking cycle would start again. The regular use of barbiturates with amphetamines was so widespread by the 1950s that the U.S. government classified them as the most abused drugs in the country.

New Generation, New Drugs

During the 1960s, a new generation of young people began experimenting with a wide variety of mind-altering substances. Barbiturates were among the drugs abused by these new users, mainly because the pills were widely available and frequently used by the generation that came before them—their parents. According to the 1972 *Consumers Union Report on Licit and Illicit Drugs,* 10 billion barbiturate doses were scheduled for production in 1969 alone. That figure represented an 800-percent increase in the amount produced twenty-seven years earlier in 1942.

Passage of the Controlled Substances Act (CSA) in 1970 restricted access to barbiturates in the United States. Another category of anti-anxiety drugs, the benzodiazepines (pronounced ben-zoh-die-AZ-uh-peenz), were promoted as a safer alternative to

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

stimulants: substances that increase the activity of a living organism or one of its parts

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

Drugs and Fame

"Until recently," wrote Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use, and Abuse,* "about 3,000 people a year died from barbiturates, about half of them suicides." Film star and sex symbol Marilyn Monroe died of an overdose on August 5, 1962, after taking nearly fifty Nembutal tablets. The popular blonde had appeared in such films as *Some Like It Hot, How to Marry a Millionaire, Bus Stop,* and *Gentlemen Prefer Blondes.* Her death was controversial as it was deemed a suicide. But many of her fans insisted that she would never take her own life.

Other celebrity deaths can be attributed to barbiturate use as well. Electric guitarist Jimi Hendrix died of suffocation brought on by a barbiturate overdose on September 18, 1970. Hendrix thrilled audiences with his performance at Woodstock in 1969. Among his popular songs were "Purple Haze," "All Along the Watchtower," and an electrifying guitar rendition of "The Star Spangled Banner."

Barbiturates may have played a role in the death of Elvis Presley, the King of Rock 'n' Roll, as well. He died on August 16, 1977, of a drug overdose. A mixture of methaqualone, morphine, codeine, and several barbiturates were found in his system at the time of his death. (Entries on each of these drugs are available in this encyclopedia.) Remembered for his many movies, he recorded such hits as "Hound Dog," "Jailhouse Rock," "Love Me Tender," "Don't Be Cruel," and "Return to Sender." Each year, thousands of people visit his former home, Graceland, in Memphis, Tennessee.

Film star Marilyn Monroe's death, resulting from an overdose of barbiturates, shocked her fans around the world.

barbiturates. Prescriptions for benzodiazepines rose because health providers considered them less addictive than barbiturates, with a lower risk of accidental overdose among users. As barbiturates became harder to obtain, drug abusers turned to other illegal substances during the 1970s and 1980s. U.S. Drug Enforcement Administration (DEA) reports indicate that the use of marijuana, heroin, and cocaine began to rise after 1970.

What Is It Made Of?

Barbiturates are compounds derived from barbituric acid, a substance made from carbon, hydrogen, nitrogen, and oxygen. The *uric acid* portion of the name is taken from the main ingredient in urine, which provides the basis for barbituric acid.

Barbiturate users often refer to the pills they take in terms of the color of the capsule. These street names include blues or blue dolls for Amytal; reds, red birds, or red devils for Seconal; yellows or yellow jackets for Nembutal; purple hearts for Luminal; and rainbows for Tuinal.

How Is It Taken?

In the United States, barbiturates are manufactured in various forms. Most barbiturates come in pills and capsules that patients swallow. Some are available as liquids that are swallowed. Others are produced in injectable forms. Some abusers have been known to mix up their own injectable liquid barbiturates by crushing pills and combining the powdered drug with water.

Drugs made from barbituric acid are classified in one of four categories: ultrashort-, short-, intermediate-, or long-acting. These categories are defined by the amount of time that it takes for the barbiturate to produce effects in the user and how long those effects last.

DEA reports indicate that drug abusers favor short- and intermediate-acting barbiturates. These types of barbiturates take effect within fifteen to forty minutes of being swallowed, and their depressant effects last from five to six hours. Drugs in this category include amobarbital, aprobarbital, butabarbital, pentobarbital, and secobarbital.

Are There Any Medical Reasons for Taking This Substance?

For many years, barbiturates were used as daytime sedatives. Since the discovery of another type of anti-anxiety drug called benzodiazepine, which is considered safer, barbiturates are not prescribed for this purpose as frequently as they once were.

When combined with an aspirin or nonaspirin pain reliever and caffeine, the barbiturate butalbital is effective in treating severe pain. It is sometimes prescribed to relieve the pain associated with migraine headaches.

The "Death with Dignity" Debate

The use of barbiturates in assisted suicides in Oregon has fueled a storm of controversy throughout the United States. In 1997 Oregon became the only state in the nation to permit assisted suicide. Oregon voters approved the Death with Dignity Act, allowing doctors to prescribe lethal doses of barbiturates, most often secobarbital, to terminally ill people.

The terms of the act defined terminally ill people as those individuals estimated to have fewer than six months to live. That diagnosis had to be verified by two physicians, who would also determine whether the terminally ill person was competent to make such a decision. "During the six years since the Oregon law took effect," wrote Jim Barnett in a 2004 article for the *Oregonian*, "171 Oregonians have died by doctor-assisted suicide."

The administration of President George W. Bush has fought against the Death with Dignity Act since 2001. Opponents of the assisted suicide law argue that the state of Oregon is breaking federal laws that govern the use of controlled substances. However, supporters of the Death with Dignity law believe that it represents the will of the people—the voters of Oregon. They contend that the act treats the terminally ill with compassion and dignity by allowing them the right to end their lives humanely. As of mid-2005, the U.S. Supreme Court had not ruled on the issue of assisted suicide in Oregon.

As of 2005, barbiturates were used primarily for presurgical and surgical anesthesia. They were being administered to patients in operating rooms under an anesthetist's care. They also continued to be used in the treatment of certain types of epilepsy.

Usage Trends

Reactions to barbiturates range from mild sedation to coma and even death. Doctors may prescribe barbiturates as sedatives to calm patients' nerves, reduce tension, or help them sleep. The drugs are also used as an anticonvulsant to control epileptic seizures. The sleep-producing action of barbiturates is used to relax and partially anesthetize patients before some surgical procedures.

At the close of the twentieth century, the DEA reported that barbiturates represented about 20 percent of all depressant prescriptions in the United States.

Barbiturate Use Down Since the Mid-1980s, Says SAMHSA

Recent surveys of ILLICIT drug abuse showed a sharp decline in barbiturate abuse since the mid-1980s. The National Survey on Drug

illicit: unlawful

In 1997 Oregon became the only state in the nation to allow assisted suicide. Under the Death with Dignity Act, terminally ill people with less than six months to live can choose to end their lives. During his stint as attorney general of the United States, John Ashcroft challenged the Oregon law in court, but lost. *AP/Wide World Photos.*

Use and Health (NSDUH), formerly known as the National Household Survey on Drug Abuse, is a carefully calculated assessment of American drug use. It is conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) and obtains information on nine different categories of illicit drug use. As of 2005, the latest results available were from the 2003 survey. All of the respondents to the survey were over the age of twelve. They were asked to report "only uses of drugs that were not prescribed for them or drugs they took only for the experience or feeling they caused." Over-the-counter drugs and legitimate uses of prescription drugs were not included.

tranquilizers: drugs such as Valium and Librium that treat anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens)

According to the 2003 NSDUH summary, prescription-type sedatives were placed in a category called "psychotherapeutic drugs." This category also included TRANQUILIZERS, pain relievers, and stimulants. About 300,000 Americans over the age of twelve reported

using sedatives without a prescription. The authors of the survey noted that "the number of *first-time* sedative users rose steadily during the late 1960s and early 1970s, and then declined during the early 1980s, remaining below 250,000 per year since 1984." The 2003 estimates were all similar to the corresponding estimates for 2002.

Monitoring the Future Results

The results of the 2004 Monitoring the Future (MTF) study were released to the public on December 21, 2004. Conducted by the University of Michigan (U of M), it was sponsored by research grants from the National Institute on Drug Abuse (NIDA). Like the NSDUH results regarding sedative use from 2002 and 2003, the MTF survey results indicate that barbiturate use among twelfth-grade students held steady between 2003 and 2004.

Effects on the Body

Barbiturates are classified as ultrashort-, short-, intermediate-, and long-acting, depending on how quickly they act and how long their effects last. Ultrashort barbiturates such as thiopental (Pentothal) produce unconsciousness within about a minute of INTRAVENOUS (IV) INJECTION. These drugs are used to prepare patients for surgery; other general ANESTHETICS like nitrous oxide are then used to keep the patient from waking up before the surgery is complete. Because Pentothal and other ultrashort-acting barbiturates are typically used in hospital settings, they are not very likely to be abused, noted the DEA.

Abusers tend to prefer short-acting and intermediate-acting barbiturates. The most commonly abused are amobarbital (Amytal), pentobarbital (Nembutal), and secobarbital (Seconal). A combination of amobarbital and secobarbital (called Tuinal) is also highly abused. Short-acting and intermediate-acting barbiturates are usually prescribed as sedatives and sleeping pills. These pills begin acting fifteen to forty minutes after they are swallowed, and their effects last from five to six hours. Veterinarians use pentobarbital to anesthetize animals before surgery; in large doses, it can be used to euthanize animals.

Long-acting barbiturates such as phenobarbital (Luminal) and mephobarbital (Mebaral) are prescribed for two main reasons. When taken at bedtime, they help treat INSOMNIA. When taken during the day, they have sedative effects that can aid in the treatment of tension and anxiety. These same effects have been found helpful in the treatment of convulsive conditions like epilepsy. Long-acting

intravenous (IV) injection: injection of a liquid form of a drug directly into the bloodstream

anesthetics: substances used to deaden pain

insomnia: difficulty falling asleep or an inability to sleep

Truth Serum

Thiopental is a barbiturate that is marketed under the name Sodium Pentothal, but it is probably best known as "truth serum." When dissolved in water, it can be swallowed or administered by intravenous injection. In large doses, it is one of three drugs used in the United States to execute prisoners on death row. In lower doses, it is sometimes used as a truth serum.

Drug experts claim that truth serum does not force people to tell the truth. It merely decreases their inhibitions, making them more likely to be "caught off guard" when questioned by authorities. People being questioned may slip up and expose a lie or give more information on a subject or event than they intended.

barbiturates take effect within one to two hours and last twelve hours or longer.

Similar to Alcohol

RECREATIONAL USERS report that a barbiturate high makes them feel "relaxed, sociable, and good-humored," according to an *Independent* article. Users typically describe feelings of decreased anxiety, a loss of inhibitions, and an increased sense of confidence. Physical effects include slowed breathing and a lowering of both blood pressure and heart rate.

Like alcohol, barbiturates are intoxicating. During the stage after mild INTOXICATION, the user's speech may be slurred and a loss of coordination may become noticeable. Stumbling and staggering are common. Other symptoms include shallow breathing, fatigue, frequent yawning, and irritability.

When taken in high doses, barbiturates can cause serious side effects, including "unpredictable emotional reactions and mental confusion," noted the *Independent.* Judgment becomes severely impaired and the user may experience mood swings.

The mental effects of barbiturates generally depend on the amount of the drug taken and the strength of the dosage. Generally, a person falls asleep when taking a prescribed dosage at bedtime. But barbiturates remain in the system for a long time. "At normal doses," explained Cynthia Kuhn and her coauthors in *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy,* "the major concern is that they can have sedative effects that outlast their sleep-inducing properties. . . . Driving, flying an airplane, or other activities requiring muscle coordination can be impaired for up to a day after a single dose." Some barbiturates can be detected in a user's urine sample days or even weeks after the drug was consumed.

Dependence, Tolerance, and Overdose

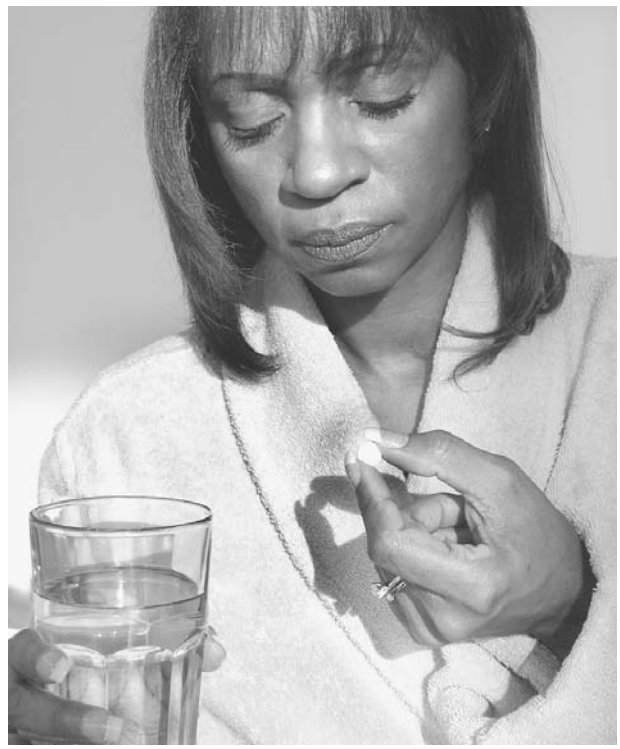
Barbiturate use can lead to both psychological and physical dependence. Psychological addiction can occur quickly. Signs of drug dependence include relying on a drug regularly for a desired effect. The addicted abuser believes he or she must take a barbiturate to sleep, relax, or just get through the day. Continued use of barbiturates leads to physical dependence.

recreational users: people who use drugs solely to achieve a high, not to treat a medical condition

intoxication: drunkenness

As people develop a TOLERANCE for barbiturates, they may need more of the drug or a higher dosage to get the desired effect. This can lead to an overdose, which results when a person takes a larger-than-prescribed dose of a drug. "People who get in the habit of taking sleeping pills every night to fall sleep," noted Andrew Weil and Winifred Rosen in *From Chocolate to Morphine,* "might start out with one a night, progress to two, then graduate to four to get the same effect. One night the dose they need to fall asleep might also be the dose that stops their breathing." Generally, barbiturate overdoses "occur because the effective dose of the drug is not too far away from the LETHAL dose," explained Dr. Eric H. Chudler on the *Neuroscience for Kids* Web site.

Symptoms of an overdose typically include severe weakness, confusion, shortness of breath, extreme drowsiness, an unusually slow heartbeat, and darting eye movements. The amount of a fatal dosage of barbiturate varies from one individual to another. However, the lethal dose is usually ten to fifteen times as large as a usual dose. An overdose affects the heart and the respiratory system. The user then falls into a coma and dies.



Short-acting and intermediate-acting barbiturates are usually prescribed as sedatives and sleeping pills. *Photo by Dan Newell.*

Clayton pointed out that barbiturates "can have a 'multiplying' effect when taken with other depressants. For example, if someone drinks alcohol and takes a barbiturate, the effect may be ten times stronger than either one taken separately." According to Weil, "many people have died because they were ignorant of this fact."

Older adults and pregnant women should consider the risks associated with barbiturate use. When a person ages, the body becomes less able to rid itself of barbiturates. As a result, people over the age of sixty-five are at higher risk of experiencing the harmful effects of barbiturates, including drug dependence and accidental overdose. When barbiturates are taken during pregnancy, the drug passes through the mother's bloodstream to her fetus. After the baby is born, it may experience WITHDRAWAL symptoms and have trouble breathing. In addition, nursing mothers who take barbiturates may transmit the drug to their babies through breast milk.

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

lethal: deadly

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

Dream Time

Barbiturates bring on sleep in people who take them. This slumber, however, differs from normal sleep. Barbiturate use decreases the amount of dream time during sleep known as the rapid eye movement (REM) stage. This phase of sleep is necessary for maintaining good health.

Reactions with Other Drugs or Substances

People who abuse inhalants run a very high risk of overdose if they consume barbiturates while on an inhalant high. OPIATES are also especially dangerous when combined with barbiturates. Barbiturates should not be mixed with alcohol or other drugs, including tranquilizers, muscle relaxants, antihistamines, cold medicines, allergy medicines, and certain pain relievers. The use of barbiturates by people suffering from depression may pose an increased risk of suicide. Children or adults diagnosed with ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) may experience increased excitability rather than a calming effect when given barbiturates. In addition, these drugs may lower the effectiveness of birth control pills that contain estrogen. Unless they use a barrier-type form of birth control, women taking oral contraceptives may become pregnant while taking barbiturates.

Treatment for Habitual Users

When addicted users stop taking barbiturates, their bodies must adapt to the lack of drugs in their systems. This process is known as withdrawal. If the users have taken barbiturates in large doses or for an extended period of time, a physician should be consulted about the withdrawal process. An attempt to withdraw abruptly from barbiturates can be fatal.

Withdrawal symptoms usually begin eight to sixteen hours after the last pill was taken. Symptoms in users with a long history of barbiturate use may last up to fifteen days, but the severity of the symptoms decreases as the body rids itself of the drug. During withdrawal, users feel anxious, weak, dizzy, and nauseated. They may also experience shakes, tremors, and even seizures. In addition, users could possibly have HALLUCINATIONS and become violent or hostile.

In some cases, withdrawal symptoms can be deadly. A physician must establish a plan of gradual withdrawal from this type of drug, usually decreasing the dosage by about 10 percent each day over a ten-day to two-week period. The withdrawal process may occur in a hospital, or treatment may be given on an outpatient basis. Either way, counseling is vital. Users who are treated successfully for their physical addiction must follow through with psychological rehabilitation. Behavioral treatment helps former users avoid barbiturates so

opiates: drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

attention-deficit/hyperactivity disorder (ADHD): a disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning

hallucinations: visions or other perceptions of things that are not really present

In a scene from the movie *Valley of the Dolls* (1967), a young woman in a mental institution reaches for a bottle of sleeping pills. The movie follows the lives of three women trying to make it big in New York City and deals with drug addiction. The "dolls" in the movie title refer to drugs.

they can remain drug free even when faced with cravings. Long-term support can be found in twelve-step programs and other support groups that meet regularly.

Consequences

Barbiturates are used to treat anxiety, sleeplessness, muscular tension, and pain. Their calming effect has a serious downside, though. Barbiturates lessen the brain's control over breathing.

Respiratory failure is the primary cause of death in cases of barbiturate overdose. Gahlinger pointed out that "since barbiturates reduce the amount of oxygen reaching the brain, the overdosing person who survives may be left with permanent brain damage."

Barbiturate users can develop a tolerance for the drug. As the body becomes used to the presence of barbiturates in the system, the prescribed dose of the drug may lose its effectiveness. Habitual users may find themselves taking more and more pills in stronger and stronger dosages to achieve the effect they once attained on a low dosage of the drug. This cycle often leads to accidental overdose.

Prolonged barbiturate use can shorten a person's attention span and result in memory loss. Both conditions would make it difficult for a person to do well in school or perform on a job. In addition, barbiturates affect the judgment of those who use them, increasing the likelihood of risky behavior. Users of barbiturates are sometimes tempted to drive while drunk because they know that police will not smell alcohol on their breath.

Taking barbiturates to ease depression "is probably the riskiest way of using them," cautioned Weil. Although these drugs may improve the user's mood temporarily, "over time they often increase anxiety and depression, encouraging further drug-taking in a downward spiral that can end in suicide."

The Law

When barbiturates first became available in the United States, they could be purchased without a prescription. It did not take long, however, for lawmakers to realize that barbiturates were addictive. On their own, some state governments adopted laws in the mid-1930s that banned the sale of nonprescription barbiturates. In 1938, the U.S. government stepped in, passing the U.S. Food, Drug, and Cosmetics Act. This act gave the FDA regulatory power over new drugs, including barbiturates. This means that drug companies would have to apply to the FDA for approval to manufacture such drugs. Once approved, the FDA would determine whether a new drug would require a medical doctor's prescription.

For more than thirty years, until the passage of the Controlled Substances Act (CSA) of 1970, barbiturates were still widely abused. Under the stiffer terms of the CSA, barbiturates became controlled substances. In other words, their use is regulated by certain federal laws. The CSA called for the assignment of all controlled drug

substances into one of five categories called schedules. These schedules are based on a substance's medicinal value, possible harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use.

Various barbiturates fall into three different schedules: Schedule II, Schedule III, and Schedule IV. Drugs in all of these categories cannot be obtained legally without a medical doctor's prescription. Schedule II drugs are dangerous substances with genuine medical uses that also have a high potential for abuse and addiction. They are accepted for medical use with restrictions. These drugs may lead to severe psychological or physical dependence. Barbiturates in this category include amobarbital (Amytal), pentobarbital (Nembutal), and secobarbital (Seconal and Tuinal).

Schedule III drugs have less of a potential for abuse than drugs placed in Schedules I and II. The drugs have real medical uses, but their abuse can still lead to PSYCHOLOGICAL ADDICTION OR PSYCHOLOGICAL DEPENDENCE in those who take them. Barbiturates in this category include aprobarbital (Alurate), butabarbital (Butisol), and butalbital (Fiorinal and Fioricet).

Schedule IV drugs have a low abuse potential when compared to Schedule III drugs. These substances have an accepted medical use, but some patients risk developing a psychological dependence on them. Schedule IV barbiturates include barbital (Veronal), mephobarbital (Mebaral), and phenobarbital (Luminal).

Fines and Jail Time

Possessing barbiturates without a prescription is against the law and can result in up to a year's imprisonment and/or thousands of dollars in fines. The length of the jail sentence and the amount of the fine are increased when a person is convicted of a second or third offense of barbiturate possession. People convicted of distributing or selling barbiturates face lengthy prison terms and fines in the millions of dollars. Selling drugs is a dangerous business for both the buyer and the seller. Illegally distributed Schedule II drugs can kill or seriously injure a user. In cases such as these, the distributor or seller of the substance is considered partially responsible for the user's death and could end up with a lifetime jail sentence.

In the United Kingdom, drugs are regulated by the 1971 Misuse of Drugs Act and the 1986 Medicines Act. The 1971 act placed drugs in three classes: A, B, or C. The most dangerous drugs are called Class A drugs; the least dangerous drugs are in the C category.

psychological addiction or psychological dependence: the belief that a person needs to take a certain substance in order to function

Most barbiturates are considered Class B drugs throughout the United Kingdom. If they are used in an injectable form, however, they

jump to a Class A rating. The maximum penalty for possession of a Class B drug under UK law is five years of prison, an unlimited fine, or a combination of jail time and a fine. Penalties for supplying or distributing Class B drugs are higher. For Class A drugs, the penalty for possession is seven years in prison, an unlimited fine, or both. The supply penalty for this class could land a seller in jail for life.

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See also: Alcohol; Benzodiazepine; Tranquilizers

Benzodiazepine

Official Drug Name: Alprazolam (al-PRAZZ-oh-lam; Xanax), chlordiazepoxide (klor-dye-az-uh-POKS-ide; Librium), clonazepam (kloh-NAZZ-uh-pam; Klonopin), clorazepate (klor-AZZ-uh-pate; Tranxene), diazepam (dye-AZZ-uh-pam; Valium), flurazepam (flor-AZZ-uh-pam; Dalmane), flunitrazepam (Rohypnol), halazepam (huh-LAZZ-uh-pam; Paxipam), lorazepam (lorr-AZZ-uh-pam; Ativan), midazolam (Versed), oxazepam (oks-AZZ-uh-pam; Serax), prazepam (PRAZZ-uh-pam; Centrax), quazepam (KWAY-zuh-pam; Doral), temazepam (tuh-MAZZ-uh-pam; Restoril), triazolam (try-AY-zoe-lam; Halcion)
Also Known As: Benzos, tranks, downers
Drug Classifications: Schedule IV, except for flunitrazepam (Rohypnol), which is a Schedule III drug; depressant

What Kind of Drug Is It?

Benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens) are depressants that relieve anxiety. Their names are easy to recognize because many of them end in the suffix "-am." Some common benzodiazepines are alprazolam, diazepam, and lorazepam. Benzodiazepines are only available legally with a doctor's prescription.

A number of medical terms apply to benzodiazepines. Just like alcohol and BARBITURATES, benzodiazepines are classified as depressants because they slow down both the mind and the body. They are also considered SEDATIVE-HYPNOTIC AGENTS and tranquilizers because they reduce anxiety and promote sleep. Benzodiazepines can be addicting.

Overview

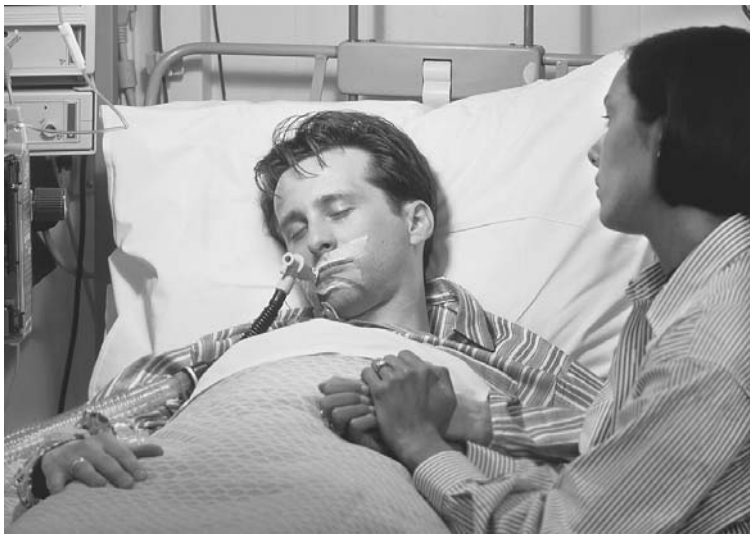
Benzodiazepines are widely prescribed in the treatment of ANXIETY DISORDERS, sleep disorders, and seizure conditions. They calm down users by acting on the brain to lower anxiety levels, relax muscles, and bring on sleep. Benzodiazepines were first used in the late 1950s. By the 1960s, physicians were regularly prescribing them to patients in place of barbiturates. Barbiturates, another class of depressants, can slow the breathing center of the brain to dangerously low levels. Benzodiazepines have less of an effect on breathing than barbiturates and are therefore considered safer. In addition, benzodiazepines are less likely to lead to death in cases of overdose.

The likelihood of addiction among benzodiazepine users did not become an issue until several years after their introduction. When taken for a limited amount of time in doctor-prescribed doses, benzodiazepines are generally quite safe. Problems develop when they are taken for more than several months or in larger-than-recommended doses. Psychological and physical dependence on benzodiazepines can actually occur within a matter of weeks. It has also been reported that benzodiazepine abusers usually combine their "benzos" with other drugs or alcohol. These combinations can lead to very serious physical consequences, including slowed breathing, coma, and even death.

barbiturates: pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers"

sedative-hypnotic agents: drugs that depress or slow down the body

anxiety disorders: a group of mental disorders or conditions characterized in part by extreme restlessness, uncontrollable feelings of fear, excessive worrying, and panic attacks



A variety of health conditions can lead to a coma, including head trauma, drinking too much alcohol, and a drug overdose, among other things. A coma is a state of unconsciousness from which a person cannot be awakened by noise or other stimuli. *© Mike Laye/Corbis.*

About fifty different kinds of benzodiazepines were being used throughout the world in 2005. However, only fifteen of these have been approved for use in the United States by the Food and Drug Administration (FDA). According to *The Pill Book,* four of the top seventy-five prescriptions written by U.S. doctors in 2003 were for benzodiazepines:

- alprazolam (Xanax) ranked 12th
- lorazepam (Ativan) ranked 32nd
- clonazepam (Klonopin) ranked 52nd
- diazepam (Valium) ranked 68th

Of these benzodiazepines, alprazolam was the most frequently abused in the United States in the early 2000s. This likely occurs because it acts so quickly—within twenty to thirty minutes. As Lance P. Longo and Brian Johnson, writing in *American Family Physician,* put it, "drugs that work immediately tend to be addictive."

Drug companies classify benzodiazepines according to the length of time it takes for them to begin working. The ultra-short acting benzodiazepines kick in almost immediately and are mainly used in a hospital setting as a form of anesthesia. Two common

"Mother's Little Helper"

Historically, tranquilizers were not the drug of choice among the biggest drug users of the 1960s. College students, hippies, and concert-going youths of that decade were more likely to experiment with hallucinogenic drugs. Benzodiazepines and minor tranquilizers were associated more with stay-at-home moms. Their practice of taking Valium—the "little yellow pill"—was widespread in the United States and the United Kingdom during this time. The Rolling Stones recorded a song in 1966 called "Mother's Little Helper" about this trend. As noted on *CNN.com,* the Stones sang: "Mother needs something today to calm her down / And though she's not really ill, There's a little yellow pill / She goes running for the shelter of a mother's little helper. . . ."

It is estimated that in the 1970s, as many as 30 million women were taking minor tranquilizers. "In promoting these drugs, the manufacturers portrayed stresses of everyday life as disease states treatable by prescribing their products," explained Andrew Weil and Winifred Rosen in *From Chocolate to Morphine.* Some advertisements "suggested giving tranquilizers to harried mothers and bored housewives." One particular ad aimed at physicians suggested they carry syringes of injectable diazepam "ready to use, when something must be done to calm the patient in emotional crisis." As Weil pointed out, ads like these always seemed to feature pictures of women as emotionally distressed patients in need of help. Psychiatrists were freely prescribing these minor tranquilizers to women with little regard of their potential for addiction.

ultra-short acting benzodiazepines are midazolam (Versed) and triazolam (Halcion). The short-acting benzodiazepines typically begin working in less than half an hour. These are among the most commonly abused drugs and include alprazolam (Xanax) and lorazepam (Ativan). The long-acting benzodiazepines, such as chlordiazepoxide (Librium) and diazepam (Valium), take a longer time to produce effects.

The strongest benzodiazepines, known as high-potency benzodiazepines, include alprazolam, lorazepam, triazolam, and clonazepam. Among the less powerful, or low-potency, benzodiazepines are chlordiazepoxide, clorazepate, diazepam, and flurazepam.

What Is It Made Of?

Benzodiazepines consist of chemical substances known as AMINES. All benzodiazepines are produced in laboratories. Like the other amines, they are derived from ammonia, a gas that consists of one molecule of nitrogen and three molecules of hydrogen.

amines: organic (or carbon-containing) chemical substances made from ammonia

How Is It Taken?

Benzodiazepines are usually taken in capsule or tablet form, but some are available as an injectable solution. The tablets are typically pastel shades of yellow, green, or blue. Some users dissolve the pills in water, mix them with other drugs, and then inject them directly into a vein.

People using prescription drugs must be careful about taking additional medications, even those sold over the counter. Mixing prescribed drugs with alcohol can also lead to serious health problems. For example, combining benzodiazepine with other drugs or alcohol can lead to slowed breathing, coma, and even death. *AP/Wide World Photos.*

Are There Any Medical Reasons for Taking This Substance?

Physicians use benzodiazepines in the treatment of many anxiety disorders. For example, they are used to treat panic attacks, which are unexpected episodes of severe anxiety that can cause physical symptoms such as shortness of breath, dizziness, sweating, and shaking. The drugs also help people suffering from post-traumatic stress disorder (PTSD), an illness that can occur after someone experiences or witnesses a life-threatening event such as a serious accident, violent assault, or terrorist attack. PTSD symptoms include reliving the experience through nightmares and flashbacks, having problems sleeping, and feeling detached from reality.

Benzodiazepines also help with obsessive-compulsive disorder (OCD), an anxiety disorder that causes people to dwell on unwanted thoughts, act on unusual urges, and perform repetitive rituals such as frequent hand washing. Benzodiazepines may also be used to relieve tension, agitation, insomnia, muscles spasms, and EPILEPTIC seizures.

Patients undergoing surgery, dental procedures, diagnostic studies, and cancer treatments are sometimes given benzodiazepines to help reduce their fear and anxiety. In addition, benzodiazepines may be prescribed for alcoholics and addicts undergoing the DETOXIFICATION process. When used under strict medical supervision, these drugs can lessen the symptoms of withdrawal that occur as the user cuts back on the amount of a drug being taken until use can be discontinued entirely.

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

detoxification: a difficult process by which substance abusers stop taking those substances and rid their bodies of accumulated toxins

Usage Trends

Benzodiazepines are very commonly prescribed, but they are supposed to be used *only* for brief periods of time. Benzodiazepine drugs have a number of genuine medical uses, but they are most frequently prescribed to relieve anxiety and fear. According to the American Psychiatric Association (APA), approximately "8 percent of all adults have suffered from a PHOBIA, panic disorder or other anxiety disorder" during any given six-month period. "For millions of Americans, anxiety disorders are disruptive, debilitating and often the reason for loss of job and serious problems in family relationships."

Treating Anxiety

Anxiety disorders are sometimes controllable without drugs. Patients are often able to reduce their anxiety to manageable levels through weekly "talk therapy" sessions with trained psychotherapists. One type of PSYCHOTHERAPY, called COGNITIVE-BEHAVIORAL THERAPY (CBT), has a very high success rate. Cognitive-behavioral therapy helps patients change their outlook on life and recast their negative feelings into positive ones.

In certain cases, however, therapy is not enough. Patients may require medication to control their symptoms. Psychiatrists often prescribe benzodiazepines to such patients. According to the APA, these drugs "relieve the fear, help end the physical symptoms such as pounding heart and shortness of breath, and give people a greater sense of control." Along with that greater sense of control comes the ability to recognize and "reduce the stress that can trigger anxiety."

Benzodiazepines are most commonly prescribed for women and elderly patients. Four out of five people who experience panic attacks are female. Elderly patients are commonly diagnosed with conditions such as insomnia and DEPRESSION. These conditions respond well to treatment with certain benzodiazepines. But long-term use of these drugs among the elderly increases the likelihood of these patients developing a physical dependence on benzodiazepines.

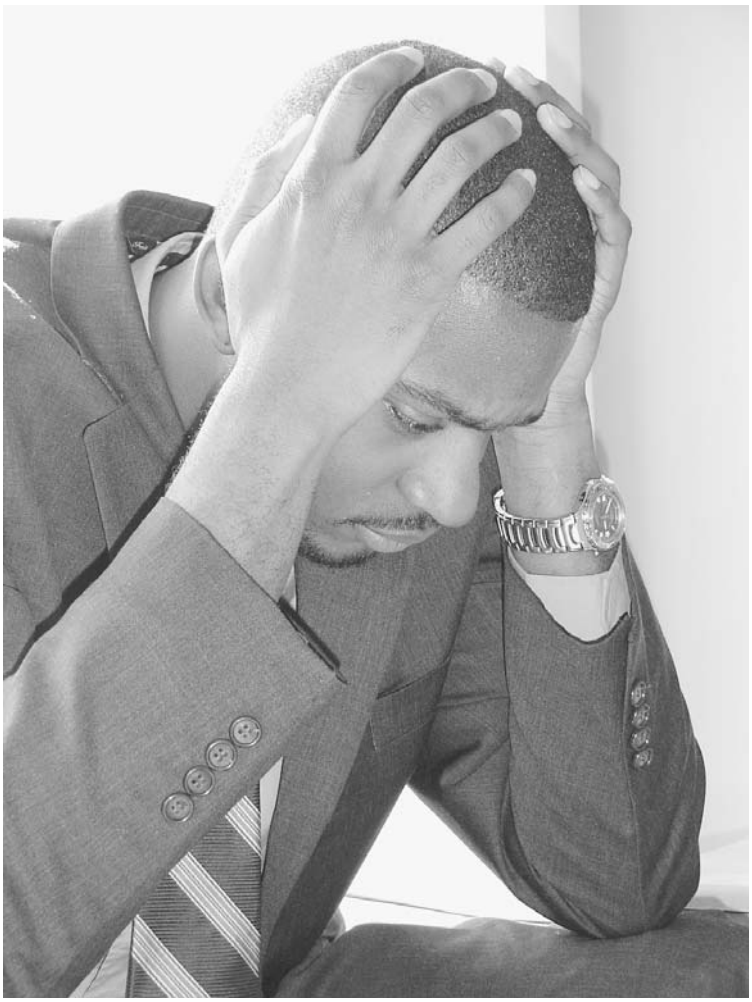
In one study cited by *Mental Health Weekly,* 60 percent of older women taking benzodiazepines by prescription were on the drugs for more than four months. That time period is longer than recommended. In addition, the National Institute on Drug Abuse (NIDA) reported in its "Prescription Drugs: Abuse and Addiction" that "elderly persons who take benzodiazepines are at increased risk for falls that cause hip and thigh fractures, as well as for vehicle accidents."

phobia: an extreme and often unexplainable fear of a certain object or situation

psychotherapy: the treatment of emotional problems by a trained therapist using a variety of techniques to improve a patient's outlook on life

cognitive behavioral therapy (CBT): a type of therapy that helps people recognize and change negative patterns of thinking and behavior

depression: a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts



Benzodiazepines are prescribed to treat anxiety as well as to relieve tension, agitation, insomnia, muscle spasms, and epileptic seizures.

Photo by Erlie E. Pruitt Jr. Courtesy of Lance Logan Sims.

Part of the Multi-Drug Mix

Among drug abusers, benzodiazepines are hardly ever used alone. The White House's drug policy publication "*Pulse Check*" revealed that multi-drug use "increased steadily" between 1993 and 2003. About 80 percent of benzodiazepine abuse occurs in people who regularly abuse other drugs. This has led to "increased complications for drug treatment," noted the "*Pulse Check*" report, because "it is hard to determine what clients are using."

Reading up on Rohypnol

Flunitrazepam (Rohypnol) is an extremely powerful and fast-acting benzodiazepine. The drug began receiving a lot of attention in the mid-1990s, especially on college campuses because of its use as a "date rape" drug. Flunitrazepam is one of the drugs, along with ecstasy (MDMA), used by teens and young adults as part of the nightclub, bar, or "rave" scene. Raves are wild overnight dance parties that usually involve huge crowds of people, loud techno music, and illegal drug use.

Flunitrazepam is also known by the brand name Rohypnol and the street names roofies, R2, Roche, roofinol, rope, rophies, forget-me pill, and Mexican valium. It comes in the form of a small, white tablet with "Roche" on one side and a "1" or "2" in a circle on the other side. The numbers indicate a 1-milligram or 2-milligram dosage. It is usually taken by mouth, often combined with alcohol. Or, it is sometimes snorted after the user crushes the tablets.

The effects of Rohypnol include sedation, muscle relaxation, and anxiety reduction. Its sedative effects are said to be seven to ten times stronger than diazepam (Valium). Because it is tasteless and odorless, flunitrazepam is hard to detect in beverages. After taking this drug, users begin to feel intoxicated rather quickly. The "drunken" feelings soon turn to extreme sleepiness. Speech becomes slurred, and judgment is most definitely impaired. Partial amnesia is a common effect, as well. For this reason, flunitrazepam has been used in date rape.

Victims of date rape are usually unable to remember the assault or identify their attacker because Rohypnol affects one's memory. Rohypnol begins working within minutes of being consumed. Its effects can last up to eight hours. Deep sedation, respiratory distress, and daylong blackouts are some of the more serious possible effects of Rohypnol. In high doses, flunitrazepam can kill.

Rohypnol has never been approved for use in the United States. It is smuggled in from other countries in Europe, Central America, and South America. The U.S. Congress passed the Drug-Induced Rape Prevention and Punishment Act of 1996. This legislation increased the federal penalties for individuals using any controlled substance to aid them in sexual assault. The law makes it a crime to give others a controlled substance without their knowledge or with the intent to commit a violent crime against them. (A separate entry on Rohypnol is available in this encyclopedia.)

ILLICIT drug users report that benzodiazepines increase and lengthen the HIGH they get with other drugs. Heavy drinkers have reported that benzodiazepines enhance the effects of alcohol. These drugs can also ease the process of "coming down" from a stimulant high. So, many multi-drug abusers use it as part of their regular drug mix.

illicit: unlawful

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

Abuse of benzodiazepines is especially high among heroin, cocaine, and methadone abusers. (A separate entry on each of these drugs is available in this encyclopedia.) According to S. Pirzada Sattar

and Subhash Bhatia in an article for *Current Psychiatry Online,* nearly half of all INTRAVENOUS (IV) DRUG ABUSERS also take benzodiazepines. However, "even patients who begin taking benzodiazepines for legitimate reasons may end up abusing them."

Typical Users

Benzodiazepine users can be young or old, male or female. Illicit users—individuals who were not prescribed the drug for a medical reason—typically range in age from their late teens to early thirties. About two-thirds of these users are male.

Who's Using Benzodiazepines?

Patterns of benzodiazepine use in America have been documented in two long-term surveys. One is the Monitoring the Future (MTF) study conducted by the University of Michigan (U of M) and sponsored by research grants from NIDA. The second is the National Survey on Drug Use and Health (NSDUH), previously called the National Household Survey on Drug Abuse or NHSDA. It is conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), a division of the U.S. Department of Health and Human Services.

The results of the 2004 MTF study were released to the public on December 21, 2004. Since 1991, U of M has tracked patterns of drug use and attitudes toward drugs among students in the eighth, tenth, and twelfth grades. (Prior to that, from 1975 to 1990, the MTF survey was limited to twelfth graders.) The 2004 MTF survey revealed that the use of tranquilizers and sedatives remained relatively "stable among all grades." About 2.5 percent of eighth graders, 5.1 percent of tenth graders, and 7.3 percent of high school seniors reported using drugs like Xanax between 2003 and 2004.

SAMHSA's 2003 NSDUH was broader than the MTF survey. The NSDUH traces drug use in the United States among people of all ages, not just among eighth, tenth, and twelfth graders. The NSDUH obtains information about nine different categories of illicit drug use. One of those categories includes the nonmedical use of prescription-type pain relievers, tranquilizers, STIMULANTS, and sedatives.

NSDUH reports combine the four prescription-type drug groups into a category referred to as "any psychotherapeutics" (SY-koh-ther-uh-PYOO-tiks). Numerous drugs are covered by this category. All of them are available through prescriptions and sometimes illegally "on the street." Over-the-counter drugs and legitimate uses of prescription drugs are not included in the NSDUH report. Respondents are asked to report only uses of drugs that were not prescribed for them or drugs they took only for the experience or feeling they caused.

intravenous (IV) drug abusers: abusers who inject the liquid form of a drug directly into their bloodstream

stimulants: substances that increase the activity of a living organism or one of its parts

The short-acting benzodiazepines, such as Ativan, typically begin working in less than a half hour and are among the most commonly abused drugs. *Scott Camazine/ Photo Researchers, Inc.*

The results show that a number of Americans became "new users" of psychotherapeutic drugs in 2002. Roughly 1.2 million people began using tranquilizers, and 225,000 began using sedatives. Among fifteen benzodiazepines, the nonmedical use of two specific drugs—alprazolam (Xanax) and lorazepam (Ativan)—rose the most between 2002 and 2003, from 3.5 percent to 4 percent of those surveyed. Use among twelve to seventeen year olds was unchanged, reflecting the same trend as the MTF survey. The biggest jump was seen in users who were slightly older, age eighteen to twenty-five. From 2002 to 2003, usage in that particular age group increased from 6.7 to 7.5 percent.

In Canada, benzodiazepine use is tracked by the Centre for Addiction and Mental Health (CAMH). The CAMH publishes a series of leaflets on drugs under the title "Do You Know . . . . " The "Do You Know . . . Benzodiazepines" leaflet states that "approximately 10 percent of Canadians report using a benzodiazepine at least once a year, with one in ten of these people continuing use regularly for more than a year."

Effects on the Body

Benzodiazepines act on the area of the brain that controls emotions. They do this by boosting the effects of a NEUROTRANSMITTER called gamma-aminobutyric acid (GABA). GABA receptor sites are especially numerous on cells in the part of the brain responsible for fear and worrying. Benzodiazepines work by increasing GABA activity. Higher levels of GABA activity help block feelings of tension and anxiety. The result is a calming effect. Some benzodiazepines bind more tightly to GABA receptors than others, causing more intense sedation.

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

Benzodiazepines are designed to produce feelings of relaxation and an increased sense of well-being in the user. But, along with reducing anxiety, these drugs decrease emotional reactions, mental

alertness, and attention span. Common side effects of benzodiazepine use include confusion, drowsiness, loss of coordination, dizziness, and light-headedness. More serious side effects caused by these drugs are rare but can occur. They include outbursts of anger, severe depression, hallucinations, muscle weakness, extreme tiredness, loss of memory, skin rashes, itching, fever and chills, and sores in the throat or mouth.

High doses of benzodiazepines lead to symptoms similar to those caused by excessive use of barbiturates or alcohol. These include slurred speech, impaired memory, slowed breathing, and lowered blood pressure. Although overdosing on benzodiazepines alone is not likely, it has occurred. In these cases, the patients' rate of breathing and blood pressure dropped so low that they went into a coma and eventually died.

Use Interferes with Learning and Memory

Benzodiazepines seem to interfere with memory formation and learning. They "can prevent the brain from recording and adapting to new information," explained Cynthia Kuhn and her coauthors in *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy*. "Someone who needs to learn new information should never use these drugs and expect to do so to their full potential."

For example, college students might take benzodiazepines while studying. They might use the drugs in an attempt to relax or to get a good night's sleep. However, such drugs can make it difficult for students to recall the information they need on exam day. Impaired memory is limited to events that occur during the time the drugs are being used. When the dosage wears off, new learning and memory formation become possible again.

Because they decrease mental alertness, benzodiazepines should never be used when driving or operating heavy machinery. "Benzodiazepines slow reaction time and impair driving skills, increasing the risk of motor vehicles crashes in patients who are taking [them]," explained Longo and Johnson. In addition, benzodiazepines should not be taken by pregnant women or by people suffering from lung, kidney, or liver disease.

Addiction and Withdrawal

Benzodiazepines are addictive substances. Regular use of any benzodiazepine can lead to physical and psychological dependence in as little as four to six weeks. According to a 2002 *Mental Health Weekly* article, taking Xanax "for more than eight weeks carries a high

To perform well on school assignments and tests, many students study for long hours. There have been reports of students using benzodiazepines in order to relax or to get a good night's sleep. However, such drugs can make it difficult for students to recall information on exam day. Instead of using drugs, many students opt to study in a group or with a friend to help them stay motivated. *© Jose Luis Pelaez, Inc./Corbis.*

risk of dependency." Both psychologically and physically addicted users may experience cravings for the drug, but those with physical addictions will actually experience withdrawal symptoms if they suddenly stop taking benzodiazepines. In other words, they will become ill if they don't get the drug into their systems. Withdrawal symptoms can be quite serious and range from insomnia, nervousness, irritability, and nausea, to tremors, seizures, and even hallucinations.

Reactions with Other Drugs or Substances

When taken with other depressants such as alcohol or barbiturates, benzodiazepines can be extremely dangerous. The combined effects of two or more depressants can greatly lower blood pressure

and reduce a user's ability to breathe. This, in turn, can lead to coma and death. Use of benzodiazepines with meperidine, oxycodone, codeine, or morphine can be deadly as well. (Entries on each of these drugs are available in this encyclopedia).

Treatment for Habitual Users

The potential for addiction to benzodiazepines is very real. That potential is even greater among certain segments of the population, especially those undergoing treatment for substance abuse. "Among psychiatric patients," wrote Sattar and Bhatia, "substance abusers are most likely to abuse benzodiazepines and become addicted to them." Multiple addictions are complicated. Users should seek professional help when trying to stop using the drug.

The withdrawal process can take weeks or even months and requires a combination of physical and psychological care. Benzodiazepine abusers must undergo the process of detoxification under strict medical supervision. During this time, the dosage of the drug is lowered gradually, and eventually use is phased out completely. Cognitive-behavioral therapy helps provide habitual users with the support they need to kick their habit. This type of psychotherapy focuses on increasing a patient's skills for coping with the everyday stresses in life.

Consequences

"It is dangerous to combine any sedative, including benzodiazepines, with anything else that makes a person sleepy," stated Kuhn. *Mental Health Weekly* reported that in 2001, bad reactions to Xanax and other benzodiazepines were responsible for a high percentage of prescription drug-related emergency room visits. The use and abuse of benzodiazepines can impair decision-making, decrease learning skills, and bring on aggression. Each of these factors can have a significant effect on an individual's educational, social, and workplace environments.

Unwanted Side Effects

Interesting evidence has surfaced about the effects of benzodiazepines on some patients. Although such drugs are routinely prescribed to treat the anxiety that comes with depression, benzodiazepines—especially when taken in high doses—may actually *increase* the risk of depression. This theory was reinforced in 2004, when a study was conducted on soldiers returning home from war. War, terrorist attacks, and other life-threatening events can trigger post-traumatic stress disorder (PTSD) in people who have experienced these events firsthand. A Harvard Medical School doctor noted in *Newsweek* that "anxiety-muting benzodiazepines such as lorazepam and clonazepam may actually raise the risk of chronic PTSD if taken continuously." The reasons for this unwanted side effect were still being studied in 2005.

ER Visits

The Drug Abuse Warning Network (DAWN) collects data on drug-related hospital emergency room (ER) visits throughout the United States. ER trips resulting from benzodiazepine abuse numbered more than 100,000 in 2002, an increase of 41 percent since 1995. Complete results of the DAWN report can be found at http://www.oas.samhsa.gov.

The Law

"The nonmedical use or abuse of prescription drugs remains a serious public health concern," wrote the NIDA director in his introduction to "Prescription Drugs: Abuse and Addiction." Medical prescriptions are the primary source of benzodiazepines for abusers, but some of these prescriptions are obtained illegally. Benzodiazepine addicts often use a practice known as "DOCTOR SHOPPING" to keep up with their addiction. They switch doctors and visit emergency rooms regularly in the hopes of getting multiple prescriptions for benzodiazepines. The doctors used in this scheme are usually unaware that another physician has already prescribed the same drugs for the patient.

Writing fake prescriptions on stolen prescription pads is a common practice used to obtain prescription drugs. Another means of getting prescription drugs such as benzodiazepines is by buying the drug from a patient who was legitimately prescribed the medication. These "legitimate" patients can be friends, parents, relatives, or even people on the street offering their pills in exchange for money.

Regardless of how the drugs are obtained, it is against the law to possess or use controlled substances such as benzodiazepines without a doctor's prescription. Selling or distributing benzodiazepines to others is a more serious offense. Physicians who write fraudulent prescriptions are also subject to various legal consequences. These include felony convictions and the possible loss of their medical licenses.

doctor shopping: a practice in which an individual continually switches physicians so that he or she can get enough of a prescription drug to feed an addiction; this makes it difficult for physicians to track whether the patient has already been prescribed the same drug by another physician

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See also: Alcohol; Antidepressants; Barbiturates; Ecstasy (MDMA); Rohypnol

Benzylpiperazine/Trifluoromethyl-phenylpiperazine

Official Drug Name: Benzylpiperazine (BENZ-ull-pih-PAIR-uh-zeen; BZP), trifluoromethyl-phenylpiperazine (try-FLU-roh METH-ull FENN-ull-pih-PAIR-uh-zeen; TFMPP)
Also Known As: A2, BZP, legal E, legal X, herbal ecstasy, herbal speed, the party pill, piperazine, and TFMPP
Drug Classifications: Schedule I, stimulant, hallucinogen

What Kind of Drug Is It?

Benzylpiperazine (BZP) and trifluoromethyl-phenylpiperazine (TFMPP) are both stimulants—substances that increase the activity of a living organism or one of its parts. Neither one of these compounds has any known medical use for humans, at least not in their existing chemical forms. BZP and TFMPP are substances known as INTERMEDIARIES, meaning they are at a middle stage in chemical production. Because PIPERAZINES can dissolve fats, they are often used as cleaning solutions. Usually, piperazines are made into detergents or medicines.

Overview

Chemicals known as piperazines are used for industrial purposes worldwide. A basic piperazine can be changed into a variety of different substances simply by adding different chemical groups to the original compound. For instance, a drug called piperazine citrate destroys intestinal worms, making it useful in the treatment of parasitic infections in both humans and animals. Parasites are organisms that must live with, in, or on other organisms to survive.

Other medicinal and mind-altering qualities of piperazines are being studied as possible treatments for:

- Depression, a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts.
- Psychosis (pronounced sy-KOH-sis), a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined.
- Alzheimer's disease, a brain disease that usually strikes older individuals and results in memory loss, impaired thinking, and personality changes; symptoms worsen over time.
- Tumors.

BZP and TFMPP are piperazine stimulants. They stimulate the brain, creating HALLUCINOGENIC experiences in some users. Both drugs have been compared to AMPHETAMINES. According to the U.S. Department of Justice, "the amphetamine-like stimulant

intermediaries: chemical compounds that are intended for use in the manufacture of more complex substances

piperazines: pronounced pih-PAIR-uh-zeens; chemical compounds made of carbon, hydrogen, and nitrogen that are used medically to destroy worms and other parasites in humans and animals

hallucinogen: a substance that brings on hallucinations, which alter the user's perception of reality

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

Piperazines are being studied as a possible treatment for Alzheimer's disease—a disease that affects the brain and leads to memory loss, impaired thinking, and personality changes. As these symptoms worsen over time, Alzheimer patients need help taking care of themselves.

effects of BZP" seem to "attract the attention of drug abusers." The effects of piperazine abuse can be unpredictable. Some users report feelings of relaxation, happiness, and increased closeness with others after taking BZP and TFMPP. However, others describe their experiences with these drugs as frightening and extremely unpleasant. BZP seems to be more commonly abused than TFMPP, probably because there is a greater supply of it available for purchase. Most users of TFMPP prefer to combine it with the club drug ecstasy (MDMA).

Until March of 2004, piperazines were considered legal in the United States. Piperazines sold in bulk over the Internet made their way to the club and RAVE scene. They grew in popularity among adolescents and young adults, sometimes being sold as the

rave: a wild overnight dance party that typically involves huge crowds of people, loud techno music, and illegal drug use

Mystery Ingredients

Most industrial sources supply a BZP preparation that is 97 percent pure, but manufacturers often do not list the ingredients used to prepare the other 3 percent of the compound. Many additives found in industrial chemicals may be toxic or even fatal if consumed. BZP poses a big enough threat to human health on its own. The "mystery ingredients" that are mixed in with it may add to that risk.

dangerous and often-abused drug ecstasy but usually as "BZP," "legal E," "legal X," or "A2." The dangers of BZP and TFMPP stem from their stimulant effects. Rapid heart rhythms, tremors, and convulsions have been reported in some cases.

What Is It Made Of?

BZP and TFMPP are chemical compounds of carbon, hydrogen, and nitrogen. Piperazines are synthetic drugs. They cannot be grown in a garden or dug up from the ground. BZP, the more common of the two abused piperazines, is an odorless, colorless, or faintly yellow oily liquid at room temperature. Like water, it freezes at 32°F (0°C). If consumed by humans or animals in this form, it can cause burns to the skin, lungs, or intestinal tract.

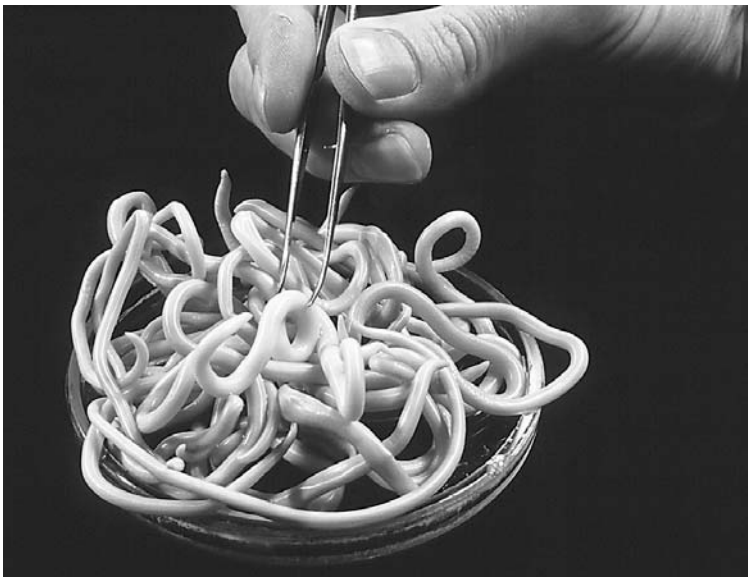
How Is It Taken?

Legal piperazine preparations available in the United States and Canada are listed in the Micromedex Healthtouch prescription database "to treat common roundworms and pinworms." A drug called piperazine citrate comes in various forms, including granules (to be mixed with water), an oral suspension (a liquid medication), or tablets. It can only be obtained with a doctor's prescription. As of 2005, use among humans was limited to the treatment of parasitic worm infections.

Most ILLICIT piperazines are sold in tablet form and contain both BZP and TFMPP. Sometimes, BZP tablets are sold as ecstasy. There is no sure way of knowing the exact dose of BZP and/or TFMPP in tablet form because all of the pills are made in illegal labs. Frequent users usually take anywhere from 35 milligrams to 150 milligrams at a time.

Illegal piperazine tablets are sometimes packaged in vitamin containers. The pills may be white, off-white, tan, or bright shades of green, orange, pink, purple, or yellow. Like ecstasy tablets, piperazine tablets resemble sweet-and-sour candies. They often feature tiny logos—a heart, a fly, a butterfly, a crown, a smiley face, a bull's head, or a squirrel, for example—etched in them. Some users have reported snorting or smoking BZP preparations. This particular method of ingestion irritates the lining of the nose, mouth, and breathing tubes.

illicit: unlawful



Piperazine citrate is used by doctors to destroy intestinal worms, like these roundworms, in humans and animals. It is often used in the treatment of parasitic infections. *© Sinclair Stammers/Science Photo Library/Photo Researchers, Inc.*

Are There Any Medical Reasons for Taking This Substance?

Since the early 1950s, piperazines have been used widely by veterinarians as an ANTHELMINTIC drug. Anthelmintics are used to treat parasitic infections. In other words, they destroy worms. In humans, piperazine citrate serves a similar function and is used to treat pinworm and roundworm infestations in adults and children. The drug acts by paralyzing the muscles of mature worms and dislodging them from the walls of the intestines. The worms are then eliminated as part of a bowel movement.

In 1999, drug researchers in Japan found that a particular form of benzylpiperazine stimulates a brain chemical called ACETYLCHOLINE. A NEUROTRANSMITTER, acetycholine is involved in learning and memory. This led to the discovery of donepezil (Aricept), which helps ward off memory loss in patients with Alzheimer's and other brain diseases.

As of early 2005, other chemical substances related to BZP were being investigated for possible uses in the treatment of depression, psychosis, EPILEPSY, and severe pain. In addition, phenylpiperazine derivatives (substances similar to TFMPP) were being tested for their ability to kill certain types of cancerous tumors.

anthelmintic: pronounced ant-hel-MINN-tick; a substance that helps destroy and expel parasitic worms, especially worms located in the intestines

acetylcholine: pronounced ah-settle-KOH-leen; a neurotransmitter that forms from a substance called choline, which is released by the liver

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

Typical Users

The U.S. Drug Enforcement Administration reported that the typical abusers of BZP and TFMPP are "adolescents and young adults involved with the current rave culture." Of particular concern is the fact that many of its users do not even know they are taking it. Some dealers do not realize they are selling it. Not only have BZP and TFMPP tablets been found among bags of ecstasy (MDMA) tablets, the powders of all three drugs have been found mixed together in drugs being passed off as pure ecstasy.

BZP is not considered a controlled substance worldwide. In late 2004 and early 2005, it was being sold over-the-counter in New Zealand as an herbal party pill. (Oddly enough, the pills contain no herbs.) The staff of New Zealand's Christchurch Hospital, according to a *New Zealand Press* article, said that piperazine users admitted for emergency treatment "were usually young women in their late teens or early twenties."

Usage Trends

Use of BZP was first reported in the United States and Switzerland in 2000. According to the U.S. Drug Enforcement Administration (DEA), seizure of BZP and TFMPP tablets, capsules, and powders increased steadily through 2004.

Teenagers and young adults who attend raves on a regular basis are the most frequent users of both BZP and TFMPP. Like ecstasy, piperazine has spread from the club scene to high schools and college campuses.

In the United States, BZP is usually imported in powder form and then manufactured into pills. Several hundred pounds of powdered BZP have been seized from India. Busts have been made for possession and use of piperazines throughout the United States, especially in California, Connecticut, and Texas.

In Europe, BZP—which is known there as A2—is marketed "as a cheap and safe alternative compared to illicit amphetamines," stated a DEA "Drug Intelligence Brief" released in December of 2001. As late as 2005, the drug was being sold over-the-counter in New Zealand as a legal stimulant under the brand name Nemesis. "The pills . . . are advertised as safe, legal alternatives to illegal HIGHS. There is no age restriction on sales," according to a drug authority interviewed in the *Ashburton Guardian.*

Louise Bleakley reported in the *New Zealand Press* that benzylpiperazine tablets, commonly referred to there as "party pills," are "neither classified as a drug nor a dietary supplement so there is no requirement for them to be labeled." Casual drug users in New Zealand seemed "less cautious" about taking BZP, noted Bleakley, "because of the commonly used 'herbal' label" on their packaging. "In fact, herbal party pills [are] synthetic compounds."

According to the *New Zealand Press* in late 2004, hospital emergency departments in urban New Zealand reported seeing "at least six patients a weekend suffering severe PARANOIA and dehydration" after taking the so-called herbal drugs. "Party-goers were arriving at the hospital hysterical and requiring sedation." At that time, New Zealand's associate health minister, Jim Anderton, proposed that a new classification be added to the A, B, and C ratings given to drugs

highs: drug-induced feelings ranging from excitement and joy to extreme grogginess

paranoia: abnormal feelings of suspicion and fear

Benzylpiperazine, or BZP, is the active ingredient in some forms of herbal ecstasy. Used as party drugs, they were once legal in the United States.

there by law. These letter ratings are somewhat similar to the scheduling of drugs by number in the United States. Anderton's idea for a "D" rating, which would include party pills, has received considerable support.

Effects on the Body

Piperazines like BZP and TFMPP are PSYCHOSTIMULANTS. Because they affect the brain, the drugs cause a wide range of sensations and experiences. Sometimes these effects are considered pleasant by the user. Sometimes they are frightening. They can even be life threatening. Piperazines vary in their mind-altering properties. The drugs influence brain function by acting on chemicals called neurotransmitters, which can have profound effects on mood, learning, perceptions, and movement.

psychostimulants: pronounced SY-koh-STIM-yew-lents; stimulants that act on the brain

Animal research has shown that BZP triggers the release of neurotransmitters called DOPAMINE and NOREPINEPHRINE, two natural stimulants that the body produces on its own. TFMPP acts by stimulating nerve receptors sensitive to SEROTONIN, another neurotransmitter.

At doses of 20 milligrams to 100 milligrams, BZP and TFMPP reportedly produce a range of mental experiences lasting six to eight hours. Amphetamine-like effects include euphoria, alertness, a reduced need for both food and sleep, a heightened sense of touch and other pleasurable sensations, and a sense of emotional closeness with others. At higher doses, though, users have reported stomach pain, vomiting, and feelings of extreme anxiety and paranoia. A tingling feeling on the surface of the skin may make users feel as if insects are crawling all over them. Some users end up in emergency rooms panic-stricken, screaming, and suffering from extreme dehydration.

BZP acts very much like amphetamines or speed. Amphetamines are illegal without a prescription from a medical doctor. They can make users jumpy, irritable, and even violent. According to the U.S. Department of Justice, "BZP is about 10 to 20 times less potent than amphetamine." However, just one or two BZP tablets can have extreme negative effects on the people who take them.

Like amphetamines, piperazines increase the heart rate, blood pressure, and body temperature, which can be dangerous or even fatal. At high doses, piperazines may produce HALLUCINATIONS, convulsions, and slowed breathing that can result in death. The physical effects of piperazine use include nausea, vomiting, redness of the skin, stomach pains, thirst, dry mouth, frequent urination, bladder infection or irritation, severe headaches, and "hangover" feelings lasting up to two days. BZP and TFMPP also affect brain centers that control movement. Muscle stiffness, uncontrollable shaking, jaw clenching, and nervous tics may occur in users.

If BZP comes in contact with the eyes or skin, it can cause severe inflammation and burns. When inhaled, it irritates the respiratory tract, leaving the user with a sore throat, coughing fits, and difficulty breathing. Prolonged inhalation can cause chemical burns to the breathing tubes and the buildup of fluid in the lungs. When swallowed, piperazines are absorbed quickly through the linings of the stomach and intestines. Part of the drug is broken down by the actions of the liver and kidneys, and the rest is released from the body as urine.

Because piperazine abuse is relatively new among drug users, the harmful effects of BZP and TFMPP have not been fully determined. According to the Health and Safety Executive of the United Kingdom, piperazines are thought to have the potential to cause

dopamine: pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

norepinephrine: pronounced nor-epp-ih-NEFF-run; a natural stimulant produced by the human body

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

hallucinations: visions or other perceptions of things that are not really present

Mixing drugs is very dangerous. Obtaining them illegally is also very risky. The quality and content of illegal drugs are not checked by any government or medical agency, so users never know what they are getting. *Photo by Leitha Etheridge-Sims. Courtesy of Dan Newell.*

asthma, although how this occurs is still unknown. The effects in children and pregnant women also remain unknown.

Former speed addicts who took BZP experienced an increase in blood pressure and short-term mental experiences similar to those brought on by amphetamines. These data suggested that BZP was likely to be addictive and abused. Results of experiments conducted on rhesus monkeys, published in *Drug and Alcohol Dependence* in 2005, confirmed that BZP is as addicting as amphetamines. TFMPP taken alone, however, was not considered likely to be abused. Other animal experiments suggest that the use of piperazines can actually inhibit learning.

Reactions with Other Drugs or Substances

The DEA reports that BZP and TFMPP are sometimes deliberately mixed with ecstasy by drug dealers and then sold as ecstasy. Some users hoping for an extended or intensified high from ecstasy will

Weighty Issues

People who use BZP or TFMPP usually lose interest in food and may stop eating altogether. After about two weeks on the drug, however, the effects on food intake and weight loss level off. When the drug is stopped altogether, a "rebound effect" on the appetite center of the brain may occur, leading to excessive eating and weight gain.

knowingly combine these drugs. A DEA "Drug Intelligence Brief" described the drug-related death of a 23-year-old woman in Zurich, Switzerland, after she had consumed both BZP and ecstasy. Medical evidence suggests that the drug combination made her extremely thirsty. Before going into a coma, she consumed 10 liters of water in just 15 hours. The young woman experienced high blood pressure and brain swelling prior to her death.

Users have reported combining BZP with alcohol, Xanax (a benzodiazepine), dextromethorphan, marijuana, and hydrocodone (a steroid). They have described many of their experiences as frightening or unpleasant. A New Zealand alcohol and drug service expert was quoted in the *Ashburton Guardian* as saying that the "herbal highs" associated with BZP use are intensified by alcohol.

Warnings are given against combining prescription piperazines, used to treat parasitic infections, with certain psychiatric medications. The combination may cause violent seizures or convulsions. Piperazines are especially dangerous when used by people with kidney disease, liver disease, or a history of epilepsy.

Treatment for Habitual Users

The need for emergency room treatment rose considerably by 2004 among users of BZP and TFMPP. Both drugs are produced illegally. In many cases, users are unaware of the dosage of the tablets they take, which increases the risk of overdose and even death. Because piperazine abuse has been recognized only recently, specific programs for rehabilitation have not yet been developed. Treatment will most likely include psychological counseling.

Consequences

Piperazines are capable of disrupting a person's ability to think, communicate, and act sensibly. As with other mind-altering substances, use of BZP or TFMPP may jeopardize work or school performance, ruin relationships, and increase the likelihood of involvements in accidents. Loss of control or inappropriate behavior may cause other people to view the user with suspicion. Addiction can lead the user to abandon educational goals and engage in criminal activity.

The Law

In the United States, the Controlled Substances Act (CSA) of 1970 called for the assignment of all controlled drug substances into one of five categories called schedules. These schedules are based on a substance's medicinal value, possible harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use.

In 2003, *Drug Topics* reported that the DEA was working to have both BZP and TFMPP added to the list of Schedule I drugs under the CSA. The reasoning behind these actions was that the drugs "have hallucinogenic or amphetamine-like activity and have been abused by individuals who have bought them through Internet companies." Until they were scheduled, BZP and TFMPP could be purchased legally from chemical supply houses. However, they were not intended for human consumption. Buyers got around this specification by lying about the intended use of the drug.

On March 18, 2004, the DEA officially classified BZP as a Schedule I drug, so its use in the United States is now regulated by federal law. Any person convicted of possessing and/or selling a Schedule I drug can face a lengthy prison term and hundreds of thousands of dollars in fines. Repeat offenders receive even harsher punishment.

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See also: Amphetamines; Designer Drugs; Ecstasy (MDMA)

Caffeine

Official Drug Name: Caffeine
Also Known As: None
Drug Classifications: Not scheduled; stimulant

What Kind of Drug Is It?

Caffeine is a natural stimulant. A stimulant is a substance that increases the activity of a living organism or one of its parts. Caffeine was named after the shrubby coffee plant, which is native to the eastern African nation of Ethiopia. Although coffee is an ancient drink, it was not until 1821 that German chemist Friedlieb Ferdinand Runge finally isolated caffeine from the coffee bean.

Chemically speaking, caffeine is a bitter white ALKALOID. Its chemical formula is $C_8H_{10}N_4O_2$, and it is found especially in coffee and tea. Caffeine is considered both a drug and a psychoactive substance. Such substances alter the user's mental state or change behavior.

As a mild stimulant, it is often used medicinally to treat certain kinds of headache pain. Caffeine consumption speeds up the rate at which chemical reactions occur in the body. By increasing the heart and breathing rates, it helps more oxygen get to the brain. It also acts as a diuretic (pronounced die-er-EH-tik), a substance that reduces bodily fluids by increasing the production of urine.

Overview

Caffeine is said to be consumed on a regular basis by up to 90 percent of the world's people. Humankind's fascination with caffeine dates back to prehistoric times. Andrew Weil and Winifred Rosen retold the story of coffee's accidental discovery in *From Chocolate to Morphine.* "Legend has it that coffee was first discovered long ago by Ethiopian nomads [or wanderers] who noticed that their domestic animals became frisky" after eating the red fruit of a certain shrub. "When people tried eating the seeds," continued the authors, "they got frisky, too, and eventually they learned to make a flavorful drink from the roasted seeds." By the fifteenth century, just as the Middle Ages (c. 500–c. 1500) were coming to a close, coffee had become a popular drink in the Arab world.

Thousands of years earlier, the Chinese were already steeping and drinking tea as a beverage believed to lengthen life.

alkaloid: a nitrogen-containing substance found in plants

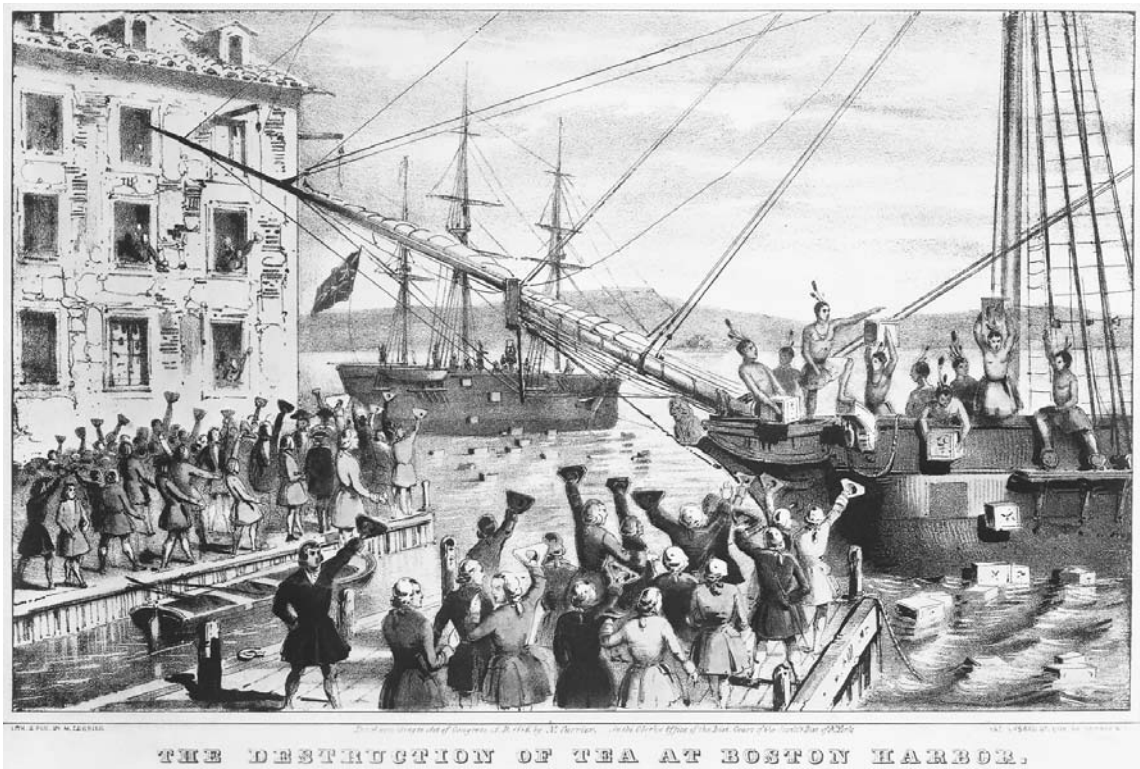
A plantation worker in Indonesia looks for mature coffee beans.

A Chinese myth about the discovery of tea dates back more than 4,000 years. According to the tale, a Chinese emperor brewed the first cup of tea after a mysterious leaf fell into the water his servant had boiled for him. The leaf, so the story goes, was from a wild tea tree.

The Road from Picking to Profits

Centuries of war, land-grabbing, oceanic explorations, and trading led to the arrival of coffee and tea in Europe by the 1500s. Coffee use spread throughout the continent and then to America. In the eighteenth century, coffee plantations were actively producing the bean in Indonesia and the West Indies.

Since then, caffeine has been credited with transforming the United States and countries in Europe from agricultural nations to industrial nations. This change has made "the modern world



The Boston Tea Party of 1773 shows the importance that American colonists placed on tea. Upset about British taxes on tea, colonists disguised themselves as Mohawk Indians and boarded several British East India Company ships. They dumped 342 crates of tea into Boston Harbor in protest of the taxes. *© Bettmann/Corbis.*

possible," wrote T. R. Reid in *National Geographic* in 2005. "Boiling water to make coffee or tea helped decrease the incidence of disease among workers in crowded cities. And the caffeine in their systems kept them from falling asleep over the machinery."

Coffee farming in the South American nation of Colombia is done the old-fashioned way, noted Ruth Morris in *Life* in 2005. The process "still relies on strained back muscles, wooden tools, and traditional methods" such as mule power "that haven't changed much since coffee was first produced here in the early 1800s." After observing coffee farmers firsthand, Morris explained: "It's a long way from these Colombian hills to 'Skim latte, no foam, please.'"

Crazy for Coffee

How much do you know about coffee? Ruth Morris' article "America's Bottomless Cup" in *Life* magazine and the Web site www.coffeekids.org offer many interesting facts about growing, producing, and drinking coffee. For example, did you know that:

- It takes 4,000 coffee beans to produce one pound of coffee; that is more beans than the average coffee tree yields in a year.
- Americans consume 3 billion pounds of coffee each year.
- Worldwide coffee consumption is estimated at 11 billion pounds per year.
- The average coffee farm in the poverty-stricken nation of Colombia makes about $1,900 each year.
- The female Colombian farm workers who pick out flawed coffee beans—by hand—from enormous troughs of beans make only $5 per day.
- In the coffee-growing regions of Mexico, Guatemala, Nicaragua, and Costa Rica, most coffee farmers earn just a few pennies per pound for their harvest.

What Is It Made Of?

Caffeine, the active substance responsible for the stimulant effect of the coffee plant's berry, is a XANTHINE. Xanthines are compounds made of the elements carbon, hydrogen, nitrogen, and oxygen. Some xanthines occur in the blood, urine, and muscle tissue of animals; others are found in certain plants.

The caffeine xanthine is one of the family of stimulants present in more than sixty different species of plants. The pure chemical is a yellowish-white, bitter crystal. Other xanthines related to caffeine include THEOPHYLLINE and THEOBROMINE. The pods of cacao beans (better known in the United States as cocoa beans) are ground to make chocolate.

How Is It Taken?

The vast majority of caffeine is ingested in a beverage such as coffee, tea, or soft drinks. Beyond beverages, caffeine is also consumed in snacks such as chocolate candy bars. Pain relievers, including aspirin, acetaminophen, and ibuprofen, may contain some caffeine. The stimulant effects of the caffeine allow the pain relievers to act more quickly.

Caffeine is also found in nonprescription aids and herbal preparations for alertness and dieting. Pure caffeine in tablet form is available over-the-counter in substances such as No-Doz and Vivarin. The caffeine in these tablets has the same effect as the caffeine found in coffee or tea—it is just more concentrated. Many abused illegal drugs contain caffeine, either for added effect or as a "filler," used in powder form to cut the strength of street drugs.

CNN medical correspondent Dr. Sanjay Gupta told interviewer Daryn Kagan that people need to be more informed about the "hidden" caffeine content in the foods they eat. "Half a cup of . . . coffee ice cream from Häagen-Dazs has actually more caffeine than a Coke," remarked Gupta. "Most people are surprised by that." Another example cited by Gupta involved carbonated soft drinks. Ounce for ounce, Sunkist orange soda—a beverage not often thought of as a high source of caffeine—has nearly the same caffeine content as a Coke.

xanthine: pronounced ZAN-thene; a compound found in animal and plant tissue

theophylline: pronounced thee-AFF-uh-lun; a xanthine found in tea leaves

theobromine: pronounced THEE-uh-BROH-meen; a xanthine found in cacao (kah-KOW) beans (the source of chocolate)

This Coca-Cola ad from the nineteenth century promotes the beverage, which contained caffeine, as being able to help the tired brain and relieve exhaustion. Early Coca-Cola products were also said to contain small amounts of cocaine. *© Bettmann/Corbis.*

Many people think that dark-colored soft drinks contain caffeine and the light-colored ones do not. However, many popular root beers contain no caffeine while the light-colored Mountain Dew contains more caffeine than a regular Coke. Some manufacturers

How Much Caffeine Is in That?

Ever wonder how much caffeine is in a certain product? Various Web sites list the caffeine content of many of the most popular products containing caffeine. Among those Web sites are: American Beverage Association <http://www.ameribev.org/health/caffeinecontent.asp> and Center for Science in the Public Interest <http://cspinet.org/new/cafchart.htm>. Here are some examples of popular products and their caffeine content:

Soft Drinks

- 12 oz. A&W Root Beer: 0 mg
- 12 oz. Coca-Cola: 34 mg
- 12 oz. Diet Coke: 45 mg
- 12 oz. Mountain Dew: 55 mg
- 12 oz. Sunkist Orange: 42 mg

Energy Drinks

- 12 oz. Red Bull: 115 mg

Coffee, Tea, Hot Chocolate

- 8 oz. coffee (brewed): 80-135 mg
- 8 oz. decaffeinated coffee (brewed): 3-5 mg
- 8 oz. tea (brewed): 40-60 mg
- 8 oz. iced tea: 15-40 mg (depending on brand)
- 8 oz. hot chocolate: 5-14 mg

Candy Bars

- 1.5 oz. milk chocolate bar: 10 mg
- 1.5 oz. dark chocolate bar: 31 mg

Over-the-Counter Pills

- 1 tablet No-Doz: 100 mg
- 1 tablet Excedrin: 65 mg
- 1 tablet Midol: 32.4 mg

now offer their popular products in caffeine-free versions as well. If in doubt, check the ingredients on the can or bottle. It will note if the beverage contains caffeine or not.

MSNBC.com reported in 2004 that "in North America, 80 percent to 90 percent of adults drink caffeine regularly." Each day in the United States, the average person consumes about 280 milligrams of caffeine, which equals roughly a mug or two of coffee or three to five cans of soft drinks.

Are There Any Medical Reasons for Taking This Substance?

Many headache medications contain caffeine, which helps speed up the action of ANALGESICS. Because caffeine cuts blood flow in the brain, it should not be used by people at risk for or recovering from a STROKE. By slowing blood flow through the brain, caffeine could starve already struggling nerve cells. Rumors of caffeine's effectiveness and safety as a weight loss agent have persisted for years, but they have never been medically proven.

analgesics: pain relievers or the qualities of pain relief

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

Breathing rates increase in response to caffeine. Theophylline has an especially strong effect on respiration, affecting the smooth muscle of the bronchial tree in the lungs. This is why theophylline is sometimes used as a treatment for ASTHMA. Doctors may recommend weak tea for their asthmatic patients with colds, as the tea will aid in clearing mucus from the respiratory tract.

Usage Trends

Ninety-five percent of all caffeine is consumed in the form of tea and coffee. In the United States and Scandinavian countries, coffee is the main source of total caffeine consumption. In the United Kingdom, tea accounts for about three-quarters of the total caffeine intake. Following water, tea is the most popular beverage in the world.

"People generally take caffeine in forms so diluted as to make it highly unlikely that excessive doses—more than 300 or 400 milligrams at a sitting—will be ingested," noted Edward M. Brecher in *The Consumers Union Report on Licit and Illicit Drugs.* "People have also developed the custom of drinking coffee and tea after a meal," he added, offering "further protection for the stomach lining."

Caffeinated water hit store shelves in the 1990s. It was offered as an alternative for people who wanted the caffeine but did not want to drink coffee, tea, or soft drinks. *AP/Wide World Photos.*

From Beans and Leaves to Power Drinks

Both health claims and controversies have followed caffeine through the centuries. Studies warning of the harmful effects of caffeine began surfacing in the 1960s. By the early 2000s, though, most follow-ups to those studies failed to duplicate the initial findings. Around the same time, youth culture began to thrive on the excessive use of caffeine. New drinks such as Red Bull, Jolt, and Adrenaline Rush purposely contained large amounts of the stimulant.

Although moderate use of caffeine has been deemed safe by medical researchers, the "power drinks" of the twenty-first century increased the risk of possible negative effects on users. While doing

asthma: pronounced AZ-muh; a lung disorder that interferes with normal breathing

Caffeine Consumption

Many people throughout the world consume caffeine every day. Caffeine is found in coffee, tea, soft drinks, chocolate, and even over-the-counter drugs, among other products. Here are more facts about this popular natural stimulant.

- Medical experts recommend that the caffeine intake for children be limited to 100 milligrams daily.
- The average daily consumption of caffeine for adults in the United States is about 280 milligrams.
- Approximately 600 milligrams of caffeine have the same stimulating effect as 20 milligrams of amphetamines (am-FETT-uh-meens). (Prescription-only stimulant drugs, amphetamines increase mental alertness, reduce appetite, and help keep users awake.)
- About 1.5 billion cups of coffee are consumed every day throughout the world.
- Most of the caffeine in soft drinks is added by the manufacturers. The kola nut, the source of some of the flavoring of cola drinks, has only a bit of caffeine, providing about 5 percent of the total amount in a standard serving.

research in London, Reid interviewed several young users of Red Bull. "I've had eight. . . . I'm flying," reported one. Another compared drinking two tins of the energy drink to "drinking a pint of SPEED."

Critics of popular beverages such as Red Bull and Adrenaline Rush suggest that the caffeine content, along with the massive doses of sugar in each can, pose a significant health risk. These drinks do provide users with an energy boost. But some researchers think they also increase the chance of dehydration among athletes and all-night dancers. The high sugar content of the drinks impairs the body's ability to replenish fluids lost through sweat.

Energy drinks are also used as mixers for alcoholic drinks. The combination of the two can cause heart damage. In addition, "people who ingest a lot of caffeine, a stimulant, along with a lot of alcohol . . . won't realize how drunk they really are," warned Elizabeth Cohen on the *CNN.com/HEALTH* Web site. This could lead people to believe they are capable of driving when they really are not.

Effects on the Body

"The reasons for the attraction" to caffeine, wrote Jennie Kim in *The Hoya,* "lie in the short-term effects . . . often referred to as a caffeine 'lift.'" Within about fifteen minutes of consumption, a caffeinated beverage will cause the drinker to feel more alert. But, according to Reid, "the instant surge is mostly placebo"—the belief that the substance will produce a desired effect in the user, even if the substance itself is not capable of producing that effect. Reid added: "[C]affeine's effects don't peak for up to an hour after it hits the bloodstream."

Whether it takes fifteen minutes or sixty minutes after consumption for a "caffeine buzz" to kick in, the stimulant effects of this substance are very real. Simple intellectual tasks are performed more readily, as are physical jobs that require endurance. However, fine motor movements may become more difficult to carry out, perhaps due to the slight hand tremors

speed: the street name for amphetamines

It takes 4,000 coffee beans to produce one pound of coffee. That is more beans than the average coffee tree yields in a year. *© Renée Comet/ PictureArts/Corbis.*

that become more pronounced with higher doses of caffeine. Larger doses of caffeine, especially in people who do not use it regularly, typically cause headache and nervousness.

The effects of caffeine last for about five hours after it is ingested. Taken near bedtime, caffeine will delay the time it takes for the user to fall asleep. It will also reduce the depth and quality of sleep. These effects are evident with the amount of caffeine present in a cup or two of coffee, approximately 80 to 250 milligrams. People who have consumed caffeine shortly before trying to sleep tend to move

around in bed more and wake up more easily than sleepers who have not consumed caffeine prior to bedtime.

More Harmful Side Effects

After being taken by mouth, caffeine dissolves easily in body fats. It does not encounter any barrier as it spreads throughout the body, so it rapidly crosses the mucosa (the mucus membrane) of the stomach and soaks through the blood-brain barrier. Caffeine affects the brain, the digestive system, heart and breathing rates, and the kidneys. When consumed in very large amounts, it can cause users to experience an increase in muscle activity, a rise in body temperature, a decrease in appetite, and problems sleeping.

In addition to increased heartbeat and rate of respiration, stomach acid production rises, sometimes causing indigestion. Urination is also stimulated. Caffeine directly affects the kidneys, cutting their ability to reabsorb ELECTROLYTES and water. For every single cup of coffee or two to three cans of caffeinated soft drink consumed, about five milligrams of calcium, an important electrolyte, are lost in the urine.

Caffeine temporarily increases blood pressure. In healthy users, the body is able to compensate for this increase and adjust back to its normal blood pressure rate. However, people with HYPERTENSION or who are at high risk for heart attacks may have a more sensitive response to the drug and are advised to minimize their caffeine intake. Even in people without heart disease, the effects of caffeine on the heart can be considerable. Rapid or irregular heartbeats can result from ingesting the substance in very large amounts.

For migraine headache sufferers, the effect of caffeine on the blood vessels around the brain is beneficial. It constricts both the inner and outer vessels, relieving pain. Also, because caffeine-containing drinks such as coffee increase the acidity in the stomach, they speed the absorption of pain medications. Some people, however, find that caffeine irritates their stomachs and intestinal tracts. It is still unclear if the effect is from the caffeine itself, or from another as-yet-undetermined substance that could be in coffee. Large amounts of caffeine may also contribute to OSTEOPOROSIS, particularly in elderly women.

electrolytes: charged atoms such as sodium, potassium, chloride, calcium, and magnesium that conduct electrical impulses in the body, and therefore are essential in nerve, muscle, and heart function

hypertension: long-term elevation of blood pressure

osteoporosis: a loss in bone density resulting in thinned and fragile bones

Caffeine Can Be Toxic

Toxic or poisonous effects, such as persistent insomnia and anxiety, only become evident when people drink more than eight

Women and Caffeine, 1969

In 1969, Dr. Avram Goldstein and Dr. Sophia Kaizer, both of the Stanford University School of Medicine, decided to examine why so many people drink coffee. They focused their study on the coffee-drinking habits of 239 young women.

The women were asked a series of questions. A full 60 percent of them claimed that they drank their first cup of coffee in the morning "because they needed it." Heavier users reported symptoms of withdrawal when they skipped their morning coffee. These symptoms ranged from "headache" and "irritability" to an "inability to work effectively."

The next phase of the experiment produced interesting results. Some of the women agreed to brew and drink nine unmarked vials of coffee—one each morning over the course of nine days. Three of the vials contained no caffeine, three contained 150 milligrams of caffeine, and three contained 300 milligrams of caffeine. Each day, the group was asked to record their moods every half hour for two hours after drinking whatever vial they brewed that day. None of them knew who was drinking what each morning.

The Goldstein–Kaizer study is credited with proving that caffeine is indeed a mind-affecting drug. Heavy coffee drinkers reported feeling nervous, sluggish, and irritable on the mornings they drank the caffeine-free coffee. Among light coffee drinkers, jittery feelings and stomach problems plagued them on mornings when they drank the highly caffeinated coffee.

The results of the Goldstein–Kaizer study were first published in the July 8, 1969, issue of *Clinical Pharmacology and Therapeutics*. The information was adapted by Edward M. Brecher for use in *The Consumers Union Report on Licit and Illicit Drugs,* 1972.

or nine cups of coffee or tea a day. Insomnia is when someone has difficulty falling asleep or an inability to sleep. Anxiety is a feeling of being extremely overwhelmed, restless, fearful, and worried.

Convulsions and delirium can follow enormous doses. Morris noted that the amount of caffeine in forty-nine eight-ounce cups of coffee can actually be fatal to a human being if consumed by mouth in a short period of time. That works out to about 4,000 to 6,600 milligrams of caffeine in a sitting.

Dangers can occur when caffeine-containing beverages are mixed with caffeine tablets such as No-Doz or Vivarin, both of which are sold without a prescription at drugstores. These tablets have high concentrations of caffeine in them. Taking them at higher than recommended doses, especially along with coffee, tea, or other caffeinated drinks, can cause toxic results.

Babies born to women who consume *extremely large amounts* of caffeine during pregnancy have demonstrated delayed growth and problems with mental or physical development. As of 2005, doctors

were advising pregnant women to keep their caffeine consumption within the bounds of a cup or two of coffee per day to ensure the good health of their babies. Pregnant women who have MISCARRIED in the past are advised to avoid caffeine totally.

Reactions with Other Drugs or Substances

Caffeine cannot sober up someone who is drunk or save someone who is overdosing on a SEDATIVE. It *can,* however, alter the rate of absorption in the digestive system. Consuming caffeine in combination with drugs such as oral contraceptives and alcohol can delay the body's ability to rid itself of the caffeine.

Treatment for Habitual Users

Legally, caffeine is not regulated as a dangerously addictive substance. Yet, WITHDRAWAL from caffeine is documented in medical literature as a recognized set of symptoms. Physical and PSYCHOLOGICAL DEPENDENCE on coffee, for instance, tends to occur at rates of five or more cups per day. Many people who regularly consume caffeine and then suddenly stop will experience headaches, irritability, muscle aches, extreme tiredness, and impaired concentration.

A major symptom of quitting caffeine abruptly is a moderate to severe headache that generally begins within eighteen hours of the last dose. The feeling has been described as a fullness in the head that turns into a throbbing pain and is worsened by physical activity. Sadness and mild nausea are also reported by a quarter of those individuals who get the withdrawal headache. Those who chronically consume 500 to 600 mg of caffeine per day are more likely to experience withdrawal if they suddenly cease their habit. *MSNBC.com* reported that 13 percent of coffee addicts "were sick enough to lose time at work" when the source of their caffeine was taken away. Withdrawal symptoms can last as long as nine days.

In "Decreasing Your Caffeine Intake," registered dietician Karen Schroeder advises users who want to cut back on their caffeine intake to do so gradually. "Decreasing over a period of time" rather than going "cold turkey" may help minimize the symptoms of withdrawal. For starters, Schroeder suggests "mixing half regular and half decaffeinated coffee" or brewing tea "for a shorter time," since "a one-minute brew contains about half of the caffeine that a three-minute brew contains."

miscarried: having lost a baby before it is born

sedative: a drug used to treat anxiety and calm people down

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

psychological dependence: the belief that a person needs to take a certain substance in order to function

Caffeine is found in chocolate. However, the amount of caffeine in candy is usually far less than what is found in a typical cup of coffee.

Consequences

As of 2005, there was no evidence that caffeine use alone was linked to the socially damaging behaviors that characterize drugs of abuse. Kim noted, however, that students who consume large amounts of caffeine to "enhance mental capacity" should be cautioned. Excessive caffeine consumption may actually bring on "symptoms unfavorable to studying, such as restlessness, anxiety, and heart palpitations. The student may struggle and would have better study habits without the caffeine."

The Law

There are no legal consequences for caffeine sale, use, or possession, since caffeine is not a scheduled substance. In 1997, the U.S. Food and Drug Administration (FDA) required labeling of the caffeine content of foods and drinks. Soft drink manufacturers are allowed to add a maximum of 6 milligrams of caffeine per ounce of beverage, which adds up to a limit of 72 milligrams per 12-ounce serving. Coffee and tea, containing caffeine naturally rather than as an additive, are not regulated for caffeine content.

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See also: Amphetamines; Ephedra; Herbal Drugs

Catha Edulis

Official Drug Name: *Catha edulis*
Also Known As: Khat (KOT); qat in Yemen, tschat in Ethiopia, miraa in Kenya; also, Abyssinian tea, African salad, Bushman's tea, chat, gat, kat, oat, qaadka, quat
Drug Classifications: Schedule I, cathinone; Schedule IV, cathine; both stimulants

What Kind of Drug Is It?

Khat is a STIMULANT that comes from the fresh leaves of a shrubby bush known as *Catha edulis.* These leaves, along with the youngest of twigs on the bush, have both a chemical structure and an effect similar to AMPHETAMINES. As the leaves age and dry out, they lose their stimulating effect. The active ingredient in khat is cathinone. *Catha edulis* is most popular in eastern Africa and the Arabian Peninsula.

Overview

The *Catha edulis* (khat) plant is a leafy, flowering shrub that is often planted in dense rows to act as a fence or boundary. Khat is believed to have originated in Ethiopia, a farming country in eastern Africa. The khat plant also grows wild in the surrounding countries of Sudan, Eritrea, Djibouti, Somalia, and Kenya. Just across the Red Sea from these East African nations lies the Republic of Yemen. Yemen, which is located in the southern portion of the Arabian Peninsula, reportedly has the largest population of khat chewers worldwide. Legend has it that the plant was first transported from Africa to Arabia by missionaries who had discovered its abilities to ward off sleep during long, nighttime meditations.

A Hearty Plant

The khat plant has extremely long roots and is actually rather hard to kill. It grows best at elevations of 4,500 to 6,500 feet (1,370 to 1,980 meters). In areas with frost, the shrub grows no higher than 5 feet tall (1.5 meters). However, in areas where the rainfall is heavy, such as the highlands of Ethiopia and regions near the equator, khat trees can reach 20 feet (6 meters) in height. Khat is an extremely hearty plant. It grows very well in areas of plentiful rainfall but also grows during periods of drought when other crops fail.

Khat's flowers are small and white, and its leaves are oval in shape. When they are young, the leaves are shiny and reddish-green in color. They become yellowish and leathery as they age. The most prized parts of the plants are the young shoots, buds, and leaves near the top. Older leaves near the middle and lower sections of the plant are also used, as

stimulant: a substance that increases the activity of a living organism or one of its parts

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

The khat plant grows wild in Ethiopia, the Sudan, Eritrea, Djibouti, Somalia, and Kenya. It is imported to Yemen, which reportedly has the largest population of khat chewers in the world. *The Gale Group.*

After a long day of work harvesting durra, a man sits and relaxes while chewing khat in Ethiopia. *Georg Gerster/Photo Researchers, Inc.*

are the stems, but these portions of the plant are considered inferior because their stimulating effects are not as great. The leaves of the *Catha edulis* are not picked until the plant is four years old.

Harvesting occurs during the dry season. Leaves gathered from plants over six years of age are most valued, possibly due to their greater ALKALOID content.

A Cultural and Traditional Influence

The ancient Egyptians considered khat to be a sacred plant—a "divine food." The Egyptians did not use khat merely for its stimulant properties but rather to unlock what they considered to be the divine aspect of their human nature.

Khat is believed to have been traded even before coffee and is used throughout Middle East countries in much the same way as coffee is used in Western culture. In addition to its use as a mild stimulant, khat use in Africa and the Arabian Peninsula is part of a daily social ritual. Its

alkaloid: a nitrogen-containing substance found in plants

intake occurs at a certain time each day and often takes place in special rooms designed strictly for that purpose.

Since ancient times, khat has also been used in religious contexts by the peoples of eastern Africa and the Arabian Peninsula. For example, khat was used, in moderation, as a stimulant to alleviate feelings of tiredness and hunger. Some members of the Islamic faith use khat during Ramadan, the ninth month of the Muslim year, which is spent fasting from sunrise to sunset.

The Economic Side

Khat growing in Ethiopia rose considerably in 2002 and 2003. The drought-ridden land and its impoverished inhabitants make far less money farming coffee than they do drugs. Sudarsan Raghavan discussed this situation in the *San Jose Mercury News.* "Faced once again with massive food shortages," some Ethiopian farmers "are uprooting their coffee trees and replacing them with khat."

Raghavan described khat as "a leafy cash crop that is chewed legally by millions of people in the Horn of Africa and the Middle East." Khat grows well even during droughts, and it resists pests that can devastate a coffee crop. "When chewed for a long time," added Raghavan, "khat has another powerful draw: It makes people feel less hungry." This could, in part, explain its use in a country with too little food to feed its people.

A similar situation exists in Yemen, where about 9 percent of the country's total cultivated area is devoted to the khat plant. Yemen also grows coffee, grapes, and maize. However, the amount of money the country makes on khat "is ten times more than those crops," explained a *Gulf News* reporter in 2002.

Chewing Khat: A Yemeni Tradition

In Yemen, khat-chewing is a way of life. Traditionally, the plant's bitter leaf was chewed primarily in social situations by older men in East Africa and Yemen.

The production and consumption of khat still play key roles in Yemeni culture. In Yemen, khat has influenced everything from poetry and music to family relations and celebrations to when restaurants open and close. Workdays typically end around 2:00 or 3:00 PM, at which time groups of ten to several dozen people convene in a home to talk and chew. (Men and women hold their khat sessions separately.)

In almost every Yemeni home there is a *mafraj,* the most pleasant room in the house. It is in this room that khat sessions are held. No food is served with khat. Only water is available to help wash the leaves' juices into one's system. Between 3.5 and 7 ounces (100 and 200 grams) of leaves are chewed over three or four hours. Tea with milk is often served at the end of a khat session.

What Is It Made Of?

Although khat contains a number of chemicals, vitamins, and minerals, its most active ingredient is cathinone. Cathinone is an alkaloid with a chemical structure similar to amphetamines. (An entry on amphetamines is also available in this

Khat vendors in Djibouti, Africa, line up along a train stopped at a station in hope of selling their product to passengers. © *Francoise de Mulder/Corbis.*

encyclopedia.) According to the *www.streetdrugs.org* Web site, "leaves less than forty-eight hours old are preferred" among khat users "to ensure a maximum potency of cathinone." As the leaves of the *Catha edulis* plant dry, cathinone turns into cathine, a far less powerful stimulant. The *www.streetdrugs.org* authors noted that "cathinone is approximately ten times more potent than cathine."

How Is It Taken?

Bitter-tasting khat leaves are typically chewed like tobacco. Users fill their mouths with fresh leaves that they chew to release the active ingredients. Khat is also sold as dried or crushed leaves, frozen leaves, or in powdered form.

Another method of ingesting khat is by chewing a paste made of khat leaves, water, and sugar or honey, sometimes flavored with herbs.

A young Kenyan man chews khat, a drug that gives people a feeling of euphoria. Scientists also are studying the plant to see if it boosts fertility in men. *AP/Wide World Photos.*

A tea made from the flowers of the khat plant—"flower of paradise" in Yemen—is considered restorative. In addition, the leaves are sometimes added to plain tea or smoked in combination with tobacco. Ethiopians often drink a juice extract made from khat leaves.

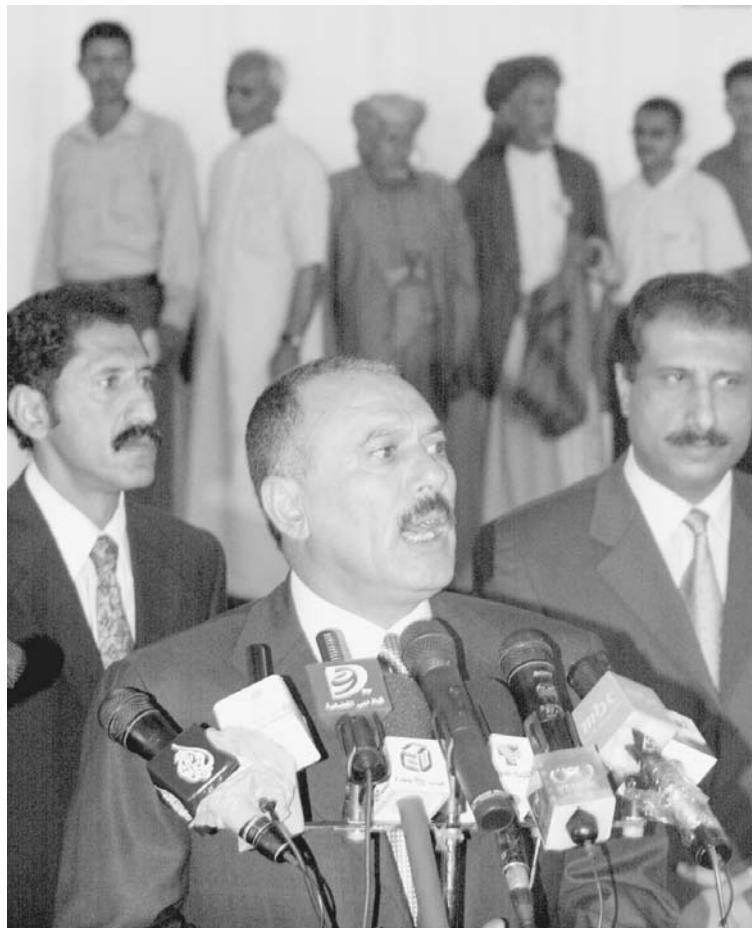
Are There Any Medical Reasons for Taking This Substance?

In the United States, khat is not approved for any medical use. Khat is mainly a RECREATIONAL DRUG used in social situations throughout Africa and the Middle East. It is sometimes used by farmers and laborers in those regions to ease fatigue and by students to improve their concentration, especially before exams. In its areas of origin, the processed leaves and roots of the khat plant are used to treat the flu, coughs, other respiratory ailments, and certain sexually transmitted diseases.

Usage Trends

For centuries, khat use was long confined to its native growing regions. This occurred because the leaves needed to reach their destination within forty-eight hours of harvesting to retain their

recreational drug: a drug used solely to achieve a high, not to treat a medical condition



President Ali Abdullah Saleh of Yemen (center) has asked citizens to follow his lead and only chew khat on weekends. Yemen reportedly has the largest population of khat chewers worldwide. *AP/Wide World Photos.*

strength. However, with improved roads and air transportation, khat use spread to many other parts of the globe.

Since the 1980s, the drug has been reported in the United States, Canada, Australia, the United Kingdom, and various countries in Western Europe. In 2002, khat was found in packages destined for U.S. cities such as Minneapolis-St.Paul, Minnesota; New York City; Kansas City, Kansas; Kansas City, Missouri; and Detroit, Michigan. Sometimes khat is smuggled into the United States by passengers on commercial jets or across the U.S.–Canadian border by car or truck.

High Use among Immigrant Populations

In the United States and the United Kingdom, khat use is most popular among immigrants from Yemen and the East African nations of Somalia and Ethiopia. In a 2004 issue of the U.K. newspaper the *Guardian,* one correspondent wrote: "In Ethiopia, Yemen, and Kenya, the plant is cultivated and several tons a week are bundled up for export; the majority ends up in Britain for use by the Somali community. Around 90 percent of Somali men in Britain are thought to chew the plant." Somalia's long history of war, political turmoil, and social unrest led many of its people to leave their homeland. Many took up residence in the United Kingdom. They report that using khat helps them deal with the chaos in their lives.

The U.S. public became more aware of khat in the 1990s, when media reports on the United Nations' mission in Somalia were broadcast regularly. According to the "Intelligence Bulletin" of the U.S. National Drug Intelligence Center (NDIC), abuse levels in the United States "are highest in cities with sizable populations" of immigrants from Somalia, Ethiopia, and Yemen. These cities "includ[e] Boston, Columbus, Dallas, Detroit, Kansas City, Los Angeles, Minneapolis, Nashville, New York, and Washington, D.C."

Khat can be purchased in the United States in various ethnic bars, restaurants, grocery stores, and smoke shops. Fresh khat leaves are most often prepared for shipment in bouquet-sized bundles, wrapped in plastic bags or banana leaves, then tied together. The bundles are sprayed with water to keep the leaves fresh and moist. Refrigeration helps to preserve them.

Effects on the Body

Like all stimulants, khat increases the users' heart rate and blood pressure, makes them feel more alert, and decreases their appetite. Chewing khat produces a "HIGH" soon after it is ingested. These effects typically lessen after one and a half to three hours, but they can last for an entire day. Users report feeling energized, content, and confident, which often leads them to talk excessively. They also claim that the drug increases their powers of concentration.

Highs and Lows

Khat has amphetamine-like effects on the body. The nerve cells activated by amphetamines are numerous in the pleasure center of the brain. When the effects of khat—or any other amphetamine-like substance—wear off, users want more.

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

"Gaggers"

Around 1990, methcathinone appeared in the United States as a drug of abuse. Methcathinone, a synthetic (or laboratory-made) form of cathinone, is an even more powerful stimulant than its natural counterpart. Sometimes referred to as "bathtub speed' or "gaggers," it is manufactured in illegal labs and sold on the street in powder or capsule form. Methcathinone can be smoked, snorted, swallowed, or injected. It became illegal in the United States in 1993.

Methcathinone is an extremely dangerous drug. In addition to the numerous health risks, its use, remarked Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use, and Abuse,* "causes a distinctive, very disagreeable body odor." This occurs as the products of the chemical breakdown exit the skin.

High doses or prolonged use of khat may make users appear very anxious and slightly over the edge emotionally. After the high begins to wear off, khat chewers often report feelings of drowsiness and depression. "In some cases," according to the *DrugScope* Web site, "it may make people feel more irritable and angry and possibly violent. PSYCHOLOGICAL DEPENDENCE can result from regular use so that users feel depressed and low unless they keep taking it."

Long-term khat use can also bring on extreme thirst, sleeplessness, hyperactivity, HALLUCINATIONS, and nightmares. It can even lead to paranoia, or abnormal feelings of suspicion and fear. Khat has also been known to impair intellectual abilities in those who use it.

The khat addict, according to a *Gulf News* reporter, "passes through different psychological moods" over a five-hour time span. The best of these moods occurs at the beginning of the khat-chewing cycle, and the worst come at the end. "Joy at the beginning, silence [in] the middle, depression and worry at the end . . . not to mention the sleeplessness." This inability to sleep sometimes leads users to seek counteracting agents such as tranquilizers and alcohol—substances that are particularly hazardous in combination with khat.

psychological dependence: the belief that a person needs to take a certain substance in order to function

hallucinations: visions or other perceptions of things that are not really present

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

parasitic skin disease: infection with parasites, which are organisms that must live with, in, or on other organisms to survive

Reactions with Other Drugs or Substances

Consuming sweet beverages with khat causes blood sugar levels to rise. Therefore, the overall effect of khat on patients with DIABETES is harmful. Combining khat with some antidepressant medications may cause a potentially dangerous increase in blood pressure. In addition, several studies suggest that khat consumption is associated with reproductive problems in men and women.

Khat should not be combined with niridazole (ny-RIDD-uh-zole), a drug used in treating a PARASITIC SKIN DISEASE called schistosomiasis (SHISS-tuh-soh-MY-uh-siss), also known as snail fever. Schistosomiasis is found throughout parts of Asia, Africa, and tropical America.

Treatment for Habitual Users

There are no known physical symptoms of khat withdrawal. However, users who decide to kick the habit often need to deal with the effects of psychological dependency. Quitting khat is frequently followed by depression in the user, along with a loss of energy and an increased desire to sleep. The severity of the depression varies and may lead to agitation and sometimes to sleep disturbances.

Consequences

Khat leaves are known to contain various species of fungi. Toxic chemicals may be sprayed on the plant to ward off a wide range of insects, diseases, and weeds. When the leaves are chewed, these toxins, if present, will enter the user's bloodstream.

Overall, khat use often leads to health problems. Brian Whitaker of the *Guardian* explained that khat "may cause mouth cancers, high blood pressure and heart attacks, and may also rot the teeth." Dr. Mohamed Khodr, a native Yemeni, noted in the *New York Times* that khat chewers in his native country often indulge in cigarette smoking and tobacco chewing. He added that this "lead[s] to an epidemic of cardiovascular diseases at younger ages than in the West."

Reducing khat consumption, according to researchers, would relieve several million people, mostly men, of a costly and potentially addictive habit. "Widespread frequent use of khat impacts productivity because it tends to reduce worker motivation," noted the authors of the DEA's "Drug Intelligence Brief." Some researchers argue that khat use has increased over the years because of economic decline in Africa and Yemen.

The growing khat habit could be tied to feelings of hopelessness in the face of rising poverty and joblessness in many African and Middle Eastern countries. Khat use has also spread to a greater number of women and children, indicating that the social and economic conditions in those countries were challenging at the turn of the twenty-first century.

The Law

In 1980, the World Health Organization (WHO) deemed khat a drug of abuse. But laws governing the use and possession of khat can be difficult to understand. For instance, the latest information available from *DrugScope* as of 2005 stated that "the khat plant itself is not controlled under the [U.K.] Misuse of

A family in Somalia carries a bag of fresh khat from a cargo plane at the airport. In Somalia chewing khat after a meal is common. In the United States and Canada, it is illegal. *© Liba Taylor/Corbis.*

Drugs Act, but the active ingredients, cathinone and cathine, are Class C drugs."

Khat in any form is illegal in the United States and Canada. Under the terms of the U.S. Controlled Substances Act, cathinone is considered a Schedule I drug and cathine is considered a Schedule IV drug. Schedule I drugs (including heroin and the so-called designer drugs such as 2C-B and ecstasy) have no accepted medical value in the United States and are considered highly addictive. Penalties for distributing Schedule I drugs range from a minimum of five years to a maximum of life in prison. Schedule IV drugs have a lower potential for abuse but may lead to psychological dependence in the user. Cathinone and cathine are also controlled under the United Nations' Convention on Psychotropic Substances.

Bushman's Tea

The *U.S. Department of Justice* and the *DrugScope* Web sites, among others, provide various statistics about *Catha edulis* and khat. For example, did you know that:

- The *Catha edulis* plant is probably older than the coffee plant and the two are often planted side by side.
- The term *edulis* is derived from a Greek word meaning "edible."
- References to khat in medical literature date back to the thirteenth century.
- Khat is sometimes brewed into a tea and has acquired the street name Bushman's tea.
- As of mid-2002, about 80 percent of all men in Yemen chewed khat daily.
- Between a third and a half of the average Yemeni family's budget is spent on khat.
- The women of Yemen have taken up the habit in growing numbers, with about 40 percent of the country's female population using it almost every day.
- In the United States and the United Kingdom, khat use is most popular among immigrants from Yemen and the East African nations.

More Khat Seen in the United States

Khat leaves have been illegally bundled and shipped into the United States in increasing amounts since the 1990s. According to the statistics available from the NDIC at the beginning of 2005, "the amount of khat seized by federal law enforcement officers [in the United States] increased dramatically from 14 metric tons [about 31,000 pounds] in 1995 to 37 metric tons [about 82,000 pounds] in 2001. Moreover, in the first six months of 2002, federal officers seized nearly 30 metric tons [about 66,000 pounds] of the drug."

Khat was introduced on college campuses in the United States in the 1990s. A growing number of students began using the stimulant to stay up later at night. According to the U.S. Drug Enforcement Administration (DEA), khat has not really caught on in the United States, though, probably because the high it produces is not as intense as the high produced by amphetamines. A pill called Hagigat, made of powdered khat leaves, was on the market briefly in 2004. Hagigat originated in Israel and was used for its stimulant effects, but it was quickly banned.

More than 2,200 pounds (998 kilograms) of khat were seized at the Dublin Airport in 2003. The bundles were being sent to New York from London when they were intercepted in Ireland. Raghavan reported in late 2002 that "khat fetches as much as $200 a pound" in the United States. That translates to about $30 to $50 per bundle.

Despite these sizable seizures, law enforcement efforts directed against khat use in the United States have been minimal. The NDIC predicts that "khat likely will become increasingly available in the United States" but will not become as popular on the streets as cocaine and methamphetamines. According to the "Intelligence Bulletin," "abuse of the drug will remain most prevalent in communities with large Somali, Ethiopian, and Yemeni populations."

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See also: Amphetamines

Cocaine

Official Drug Name: Powder cocaine (cocaine hydrochloride), crack cocaine
Also Known As: Blow, C, coke, nose candy, powder, snow; crack cocaine sometimes referred to as rock
Drug Classifications: Schedule II, stimulant

What Kind of Drug Is It?

Cocaine is a natural substance that comes from the leaves of the coca (pronounced KOH-kuh) plant. This plant should not be confused with the cocoa (pronounced KOH-koh) plant, which is the source of chocolate. Cocaine acts as both a STIMULANT and an ANESTHETIC.

Overview

The coca plant grows in only one part of the world: the northwestern and central regions of South America. A huge portion of the great Andes Mountain system lies along the western coast of the continent. The warm, humid air and rich soil found among these mountain highlands are well suited for the growth of coca. More than a third of the world's supply of coca leaf is grown in Colombia, a South American coastal nation surrounded by the Pacific Ocean to the west and the Caribbean Sea to the north. The rest is grown in the nearby countries of Peru and Bolivia, which share portions of the massive mountain ranges.

Since the mid-1960s, the huge cocaine trade has been the source of violence and political unrest in Colombia. According to Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use, and Abuse,* nearly 700 million pounds of coca leaf is produced in South America each year. That is enough leaves to produce well over 500 tons of cocaine. Gahlinger explained that the majority of it "is destined for the United States." The southern part of Colombia is the location of coca leaf processing laboratories. From these labs, converted cocaine powder is shipped to the United States, usually arriving through Mexico; Puerto Rico; Miami, Florida; or New York City.

A Longtime South American Tradition

South Americans in the Andes Mountains have chewed coca leaves for generations. For more than 4,000 years, the mountain people have used coca in much the same way Europeans and North Americans use coffee: for its mild stimulating effects. The leaves are not simply plucked and chewed. Rather, a bit of lime or plant ash is added to the leaves and then the mixture is chewed together. This process helps the naturally

stimulant: a substance that increases the activity of a living organism or one of its parts

anesthetic: a substance used to deaden pain

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The Gale Group.

From the 1860s through the early 1900s, cocaine was thought to be a "cure-all." The drug was used in various products, including elixirs and hair tonics, before the dangers of the drug were known. This hair product advertisement appeared in 1886. © *Bettmann/Corbis.*

occurring cocaine ALKALOID to be released and absorbed into the user's cheek. After about a half an hour, the wad is spit out.

The leaves are also recognized for their medicinal value. When chewed or made into tea, they reportedly ease digestive troubles and reduce the symptoms of certain psychological ills. When used in whole-leaf form, cocaine does not produce a "HIGH" and is not ADDICTIVE.

Attempts to introduce coca leaves to North American and European nations were largely unsuccessful. The leaves of the coca plant tend to rot quickly. This caused considerable problems with shipping, because the stimulating effects and the medicinal value of the plant were both lost before it could reach its destination. In 1858, however, German chemist Albert Niemann managed to separate cocaine from the coca leaf. In doing so, he unleashed the world's most powerful naturally occurring stimulant. The salt form (cocaine hydrochloride), commonly known as POWDER COCAINE, travels quite well. Soon, large quantities were being consumed far beyond the Andes Mountains.

alkaloid: a nitrogen-containing substance found in plants

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

addictive: any substance that is habit-forming

powder cocaine: (cocaine hydrochloride) an addictive psychoactive substance derived from coca leaves; it is either snorted into the nose or mixed with water and injected into the veins

Cure-All or Curse?

From the 1860s through the early 1900s, cocaine was thought to be a "cure-all." Medical experts mistakenly believed that, like the whole-leaf form, powder cocaine was also non-addictive. For more than four decades, cocaine use was unregulated and widespread in both Europe and the United States. No prescription was necessary

to obtain the drug, and it could easily be purchased at grocery stores, at drugstores, and through mail-order catalogs. Containers of 99.9 percent pure powder cocaine were available for sale on the open market.

Cocaine-laced beverages were extremely popular as well. One coca wine known as Vin Mariani was widely recommended by doctors for improving health. The original formula for Coca-Cola, a beverage created by John Pemberton in the 1880s, is said to have contained 60 milligrams of cocaine per serving. However, claims about the exact amount used have not been backed up by solid evidence. (Coca-Cola no longer uses any cocaine in its products.) Cocaine was seen as a remedy for many conditions, including fatigue, toothaches, hay fever, asthma, seasickness, and vomiting during pregnancy.

The Real Thing

It is true that when Coca-Cola was first produced in the mid-1880s, it contained cocaine. In fact, the drink derives its name from its two main ingredients—South American coca leaves and African kola nuts. By 1905 all cocaine had been eliminated from Coca-Cola, but the term "Coca" has remained a part of the popular beverage's name for more than a century.

Although experts maintained that powder cocaine was not an addictive drug, frequent and heavy users began showing unmistakable signs of physical and PSYCHOLOGICAL DEPENDENCE. By the close of the nineteenth century, reports of nasal damage, addiction, and cocaine-related deaths had surfaced. The toxic and addictive nature of cocaine became public knowledge. By the time the U.S. government stepped in to ban cocaine in 1914, most people were already shunning it.

Usage Decreases until the 1970s

Over the next fifty or so years, cocaine use and abuse was very low. Then, in the 1970s, powder cocaine use began to skyrocket. This trend was followed in the 1980s by a surge in the use of a new form of cocaine called crack. Because CRACK COCAINE is cheaper than powder, it became more readily available to the young and the poor. Crack addiction and crime began to increase rapidly. Television coverage of the epidemic was massive. In response to public concern, the Anti-Drug Abuse Act of 1986 and 1988 was passed. This federal law includes mandatory minimum sentences for first-time offenders. The penalties are much harsher for possession of crack cocaine than powder cocaine.

Andrew Weil and Winifred Rosen noted in their book *From Chocolate to Morphine:* "Many people can't leave this drug alone if they have it, even though all they get from it after a while is the unpleasant effects characteristic of all stimulants used in excess: anxiety, insomnia, and general feelings of discomfort." Because of

psychological dependence: the belief that a person needs to take a certain substance in order to function

crack cocaine: a highly addictive, smokable freebase cocaine made by combining powder cocaine with water and sodium bicarbonate

A police officer holds individual bags of crack cocaine seized during a drug raid in Miami, Florida. © *Steve Starr/Corbis.*

its addictive and destructive nature, a worldwide effort is under way to reduce the production and ILLICIT use of cocaine.

What Is It Made Of?

Cocaine is the most powerful naturally occurring stimulant known. It is found as an alkaloid in the leaves of the *Erythroxylon coca* trees native to the Andes Mountains. Coca leaves contain 0.5–1.8 percent cocaine, which can be refined to nearly 100 percent purity. The chemical formula for cocaine is $C_{17}H_{21}NO_4$.

Cocaine in Its Various Forms: Leaves, Paste, Powder, and Freebase

"Drugs and Chemicals of Concern: Cocaine," part of the *U.S. Department of Justice, Drug Enforcement Administration (DEA), Diversion Control Program* Web site, states that "all mucous membranes readily absorb cocaine." That is why it can be taken in so many different forms. Cocaine is ingested in its mildest form by chewing coca leaves. In addition to cocaine, the leaves contain protein, minerals, vitamins, and more than a dozen alkaloids. Instead of

illicit: unlawful

experiencing a RUSH or a high, chewers first notice numbness of the mouth followed by increased alertness and a general sense of well-being. This form of cocaine use is completely legal and socially acceptable in the mountain regions of South America. Chewing coca leaves is part of the people's religious tradition as well. The leaves can also be made into tea. Coca leaves are not smoked because the temperature needed to burn them destroys the cocaine alkaloid before it can be inhaled.

COCA PASTE is a psychoactive drug that produces a rush followed by a high in those who smoke it. (Psychoactive drugs alter the user's mental state or change behavior.) To make the paste, lime water, kerosene (a type of fuel), and sulfuric acid are added to coca leaves. After the bulky leaf matter is removed, an unpleasant-smelling residue remains. This residue, called coca paste, is usually added to tobacco or marijuana cigarettes and smoked.

With additional processing, coca paste can be converted into powder cocaine (cocaine hydrochloride), which can be more than a hundred times more powerful than coca leaves. This powder is diluted with fillers before it is sold on the street in the United States. Common fillers include cheaper drugs such as AMPHETAMINES or sugars such as lactose. Average street powder cocaine is about 60 percent pure.

The most common way to use powder is to snort it into the nose, but it can also be dissolved in water and injected into the veins. Powder cocaine cannot be smoked, but it can be turned into another substance called FREEBASE, which is smokable. Powder cocaine is addictive regardless of the way it is taken.

There are three freebase forms of cocaine, and all of them are highly addictive. The first, coca paste, has already been mentioned. It is made directly from coca leaves and is usually mixed with tobacco or marijuana before being smoked. The second form, simply called freebase, was developed in the mid-1970s. In this process, powder cocaine is converted into freebase by using water, ammonia, and a liquid anesthetic called ether.

Freebasing is a dangerous process because the chemicals are highly explosive and may ignite. Comedian Richard Pryor was badly burned while freebasing. The third and by far the most common form of freebase is crack. Crack forms when cocaine, water, and SODIUM BICARBONATE are combined.

rush: a feeling of euphoria or extreme happiness and well-being

coca paste: an impure freebase made from coca leaves and used mainly in South America; coca paste is smoked and is highly addictive

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

freebase: term referring to the three highly addictive forms of cocaine that can be smoked: 1) coca paste, which is made from processed coca leaves, 2) freebase, which is made with powder cocaine, ammonia, and ether, and 3) crack, which is made with powder cocaine and sodium bicarbonate

sodium bicarbonate: a fizzy, liquid, over-the-counter antacid taken by mouth to relieve upset stomachs

Crack Cocaine: The Drug of the Eighties

Crack is a form of freebase cocaine made from powder cocaine combined with water and sodium bicarbonate. After the resulting

A U.S.-trained "Jungle Commando," a member of the National Police, takes part in an anti-drug operation on a coca plantation in Colombia in 2000. The soldier is shown here among the coca plants. © *Reuters/Corbis.*

mixture is allowed to dry, it is cut into "rocks" weighing between one-tenth and one-half a gram. These rocks resemble human teeth in size, shape, and color. Ten grams of powder cocaine will convert to 8.9 grams of nearly pure crack.

A rock of crack is smoked in a glass pipe. As the crack heats up, the vapors are released and inhaled through the pipe. Sodium bicarbonate is the ingredient that gave crack its name, since it makes a crackling sound when lit. Because crack is inexpensive and delivers large amounts of cocaine to the lungs, it became the most popular form of cocaine shortly after its creation in the 1980s. Although all forms of cocaine are addictive, crack is known as the most highly addictive.

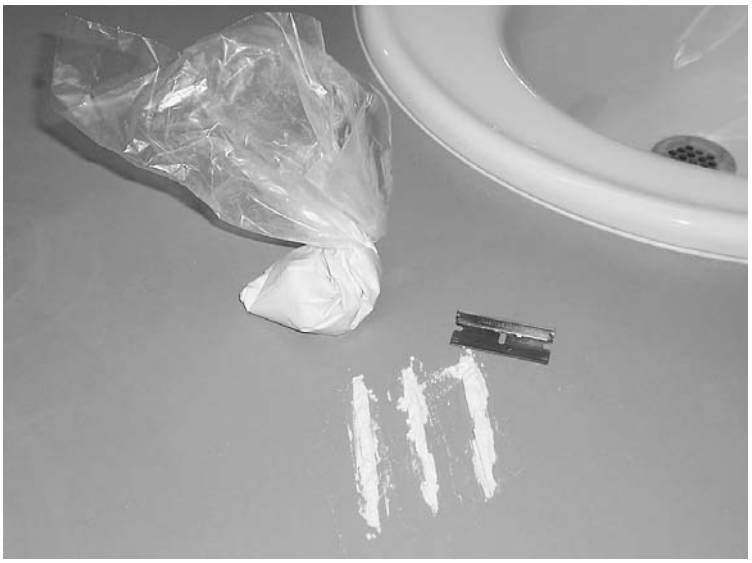
How Is It Taken?

The speed at which cocaine reaches the brain depends on how it is taken. The faster and more intense the high produced in the user, the greater the risk of addiction. Drug researchers have determined patterns in cocaine use. Cocaine abusers are more likely to take the drug at night rather than earlier in the day. They also tend to use up whatever supply they have in one sitting, snorting or injecting the drug over several hours until all of it is gone.

Cocaine is taken in one of four ways. The leaves of the coca plant, combined with lime or plant ash, are chewed, releasing small amounts of cocaine alkaloid in the process. Some of the cocaine is absorbed by the mucous membranes of the mouth and the intestines absorb some of the juice as it is swallowed. The small amount of cocaine entering the bloodstream numbs the mouth, decreases the feeling of hunger, and has a stimulant effect. Rather than feeling a high, users report feelings of well-being that can last one to two hours.

Snorted, Injected, or Smoked—They Are All Addicting

Powder cocaine is snorted through the nose in 20 to 30 milligram doses called "lines." Lines of powder cocaine, about the width of a straw, are placed on a smooth surface and inhaled through one



Lines of cocaine are placed on a smooth surface so they can be inhaled through one nostril at a time. In less than a minute, the cocaine travels through the network of blood vessels in the nasal cavity and reaches the brain. *Photo by Lezlie Light.*

nostril at a time. In less than a minute, the cocaine travels through the network of blood vessels in the nasal cavity and reaches the brain. The high obtained from snorting powder cocaine is the least intense of all methods of ingestion. The drug causes the blood vessels in the nose to constrict, or tighten up. Thus, the high that is produced is milder, but longer lasting than the high achieved by the remaining two ingestion methods: injecting and smoking.

Some users take powder cocaine, dissolve it in water, and inject the solution directly into their bloodstream through veins. The INTRAVENOUS, OR IV, METHOD of taking cocaine is considered the most dangerous method because it involves the use of needles. In a matter of seconds, the injected cocaine reaches the brain, resulting in an almost immediate rush. IV cocaine use is highly addictive because the rush generally lasts only a few minutes, and the remaining high drops off quickly. To maintain the high, users inject another dose after about fifteen minutes.

Cocaine is also smoked. Users change the cocaine powder into paste or rock form in order to smoke it. If inhaled deeply into the lungs, cocaine vapors will enter the bloodstream in just three seconds. The immediate brain rush occurs slightly faster than the

intravenous, or IV, method: injection of a liquid form of a drug directly into the bloodstream

Did You Know?

How much do you know about cocaine? Did you know that:

- In 2003, an estimated 2.3 million Americans were current cocaine users. That is nearly 1 percent of the U.S. population. One out of every four of those 2.3 million users was considered "hooked" or dependent on cocaine.
- Research reveals that the coca plant produces cocaine to kill insects that prey on it.
- Cocaine is the second most commonly used illicit drug in the United States, according to Heather Lehr Wagner's 2003 book *Cocaine*. About 10 percent of Americans over the age of 12 have tried cocaine at least once in their lifetimes. About 2 percent have tried crack. And nearly 1 percent of all Americans are currently using cocaine.

injection method and is achieved without the use of needles. Smoking cocaine is highly addictive because it creates the fastest and most intense rush and subsequent high.

Are There Any Medical Reasons for Taking This Substance?

The age-old tradition of chewing coca leaves continues to be part of the daily culture of South American Indians. This practice has often been compared to the American coffee break. Coca leaves are chewed to increase energy and reduce feelings of nausea in users.

After 1860, cocaine was being processed into powder and shipped to the United States and Europe. When mixed with water and taken by mouth in its liquid form, it was considered a common nonprescription remedy for hay fever, children's toothaches, asthma, and nausea. Snorting and injecting cocaine were somewhat less popular methods of ingestion through the early 1900s.

Only Acceptable Use Is as an Anesthetic

As more and more people used cocaine, it became increasingly obvious that the drug was harmful. Users were getting addicted. In 1914, the Harrison Narcotic Act banned the use of cocaine in the United States, except when used by a physician as a LOCAL ANESTHETIC.

Cocaine was the first local, or topically applied, anesthetic ever used. In 1884, physician Carl Koller (1857–1944) started using the drug as a topical anesthetic for eye surgery. Soon it was being used by dentists and veterinarians to deaden pain at the site of surgical incisions. But it was William S. Halsted, the father of modern surgery, who found that cocaine injected under the skin (rather than just rubbed on top of the skin) made an even more effective local anesthetic for surgery. When used in this way, cocaine numbs the site of application almost immediately and lessens bleeding.

local anesthetic: a painkiller applied directly to the skin or mucus membranes

Typically, a 1–4 percent cocaine solution is used for surgical purposes. This highly diluted solution does not have a psychoactive or changing effect on the brain. While cocaine is still used for ear,

nose, and throat surgery, another drug called lidocaine has replaced it as the most widely used local anesthetic of modern times.

Usage Trends

When cocaine became popular in the late 1870s, it was thought to be a non-addictive "cure-all." The drug was routinely found in family medicine cabinets, and its use was completely legal. Cocaine use was accepted among factory workers to boost energy and ensure peak efficiency. But by the 1890s, cocaine had become an increasingly abused recreational drug, taken purely for the high it produced in users. During this time of widespread use, medical journals began to report on the toxic and addictive properties of cocaine.

The Era of Prohibition

Public support turned against cocaine around the same time that efforts were being made to ban alcohol in the United States. From 1920 to 1933, a nationwide ban existed on the manufacture and sale of all alcoholic beverages. This was known as the era of PROHIBITION. At that time, alcohol was viewed as a destructive force in society. Crime, poverty, gambling, prostitution, and declining family values were blamed on excessive alcohol use. Even before this great push for Prohibition, however, the Harrison Act of 1914 was passed. This act classified cocaine as a NARCOTIC and prohibited its use in the United States except as a local anesthetic. Tough drug laws were passed between the 1930s and the 1960s, and cocaine use dropped dramatically.

It was not until the 1970s that cocaine use began to rise once more. The drug became part of the disco scene, an era well known for its glittery nightlife, brightly lit dance clubs, outrageous outfits, and distinctive music. Cocaine gave clubbers the energy to dance the night away. Powder cocaine was quite expensive, though, and by the 1980s a new and cheaper form of the drug was being manufactured. It was called crack cocaine, and it was inexpensive enough to appeal to middle- and lower-income buyers. Crack can be smoked, it delivers a more intense high than powder cocaine, and it costs about one-tenth the price. Drug dealers had opened up a whole new market, and hundreds of thousands of new users became hooked on crack.

Prohibition: a ban on the manufacture and sale of alcoholic beverages

Cocaine use peaked in 1985 when the number of Americans who had ever used cocaine soared to 25 million. In response to the increase in cocaine-related hospital emergency visits, crack gained

narcotic: a painkiller that may become habit-forming; in a broader sense, any illegally purchased drug

Crack cocaine gained a reputation as the most destructive and addictive drug of the 1980s. *© Lester Lefkowitz/Corbis.*

a reputation as the most destructive and addictive drug of the 1980s. The Anti-Drug Abuse Act of 1986 and 1988 was passed, making possession of crack a far more serious offense than possession of powder cocaine.

By the time the law was passed, cocaine use was already on its way down. It declined steeply until 1992, when the trend once again reversed. According to the U.S. Department of Health and Human Services, the cocaine-using population had crept back up to about 3 million people by 1993. The gradual increase continued. By 1999, reported cocaine use hit 3.7 million or 1.7 percent of Americans.

Four years later, the 2003 National Survey on Drug Use and Health (NSDUH), conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), showed a downward trend in cocaine use among Americans. About 2.3 million persons were classified as "current cocaine users" that year, and 604,000 of those users smoked crack. Rates of use were highest among people age eighteen to twenty-five, with 2.2 percent of that age group using powder cocaine.

User Characteristics

The typical cocaine user comes from a large metropolitan area rather than a small town, but these metropolitan areas span the entire country. In other words, cocaine is abused widely throughout the big cities of the United States, with no concentration of use showing up in any specific state or section of the country.

According to "Pulse Check," a report available on the *Office of National Drug Control Policy* Web site, as of January 2004, the characteristics of powder cocaine users had not changed. The crack-using population, however, was aging considerably. Only in Cleveland, Ohio, and St. Louis, Missouri, were there reports of new use among young people. The results of the Monitoring the Future (MTF) survey, a joint effort of the University of Michigan and the National Institute on Drug Abuse (NIDA), seemed to back up these results. Annual use of powder cocaine among tenth and twelfth graders rose about one-half of 1 percent between 2003 and 2004. However, increases in crack cocaine use were reported to be much lower.

No single risk factor predicts cocaine use, but a person's willingness to take risks is often a factor in his or her decision to try it for the first time. Young people who smoke cigarettes are ten times as likely to use an illegal drug than their nonsmoking peers. In the past, students who used cocaine had to be willing to be very different from the norm. The trend of acceptance began changing in the 1990s, however. According to the 2004 MTF study, the perceived risk and disapproval of powder cocaine and crack use decreased among eighth, tenth, and twelfth graders.

Effects on the Body

When smoked or injected, cocaine quickly brings on an intense rush in the user, followed by a high. Snorting the drug does not produce the rush, and the high is slightly delayed because constricted blood vessels release the cocaine into the system at a slower rate.

Small doses of cocaine can cause users to feel self-confident, uninhibited, talkative, clever, and in control. Users have reported that they feel as if they can take on and accomplish just about any task. Their energy levels increase, and their appetites decrease. Larger doses and heavy use can cause the opposite effects. Heavy users often have difficulty expressing themselves verbally. They just cannot seem to find the right words to say what they want to say. They may also suffer memory problems, become extremely confused, and show signs of aggression, antisocial behavior, and PARANOIA.

The pleasurable feelings from cocaine use last only twenty to thirty minutes if it is snorted and only five to ten minutes if it is smoked or injected into the veins. When the high is over, the user feels tired, sluggish, and low. This cycle can trigger a dangerous

paranoia: abnormal feelings of suspicion and fear

Cocaine Bugs

Heavy users of cocaine can experience paranoia, mood disturbances, and hallucinations (visions or perceptions of things that are not really there) of all sorts. A tactile hallucination (one involving the sense of touch) called "cocaine bugs" causes users to feel imaginary bugs or even snakes crawling under their skin. Users frequently scratch themselves until they bleed—using tweezers or a knife—to try to remove the imagined "bugs" from their bodies.

pattern of repeated cocaine use as the user tries to recapture the first high. As the user "takes more of the drug," explained Elaine Landau in *Cocaine,* "he or she develops a TOLERANCE for it. The same amount of cocaine will no longer make that person feel as good as it once did. Higher cocaine doses and increasingly frequent use of the drug become necessary. Many cocaine users say that in time they [need] significant amounts of the drug just to feel normal."

Harm to the Brain

In 1999, two NIDA-funded studies confirmed that heavy cocaine use could cause long-lasting brain impairment. Because cocaine reduces blood flow to the brain, some abusers develop problems with their attention span, memory, and problem-solving skills. Even a month after their last use, heavy users still found it difficult to perform tasks involving planning and reasoning. Users can become psychologically dependent on cocaine, using the drug to take the place of real-life experiences and problem-solving strategies. People who become dependent and then quit using cocaine often experience an intense craving for the drug long after the last use.

It has been known for years that cocaine use narrows blood vessels, raises blood pressure and body temperature, and increases the user's heart rate. These changes put a user at a high risk for life-threatening events. Sudden death can result from heart failure, respiratory failure, seizures, and STROKES. In 2003, even more evidence came to light about cocaine's negative effects on the heart and circulatory system. Patrick Zickler reported in *NIDA Notes* that heavy users of cocaine also seem to "have elevated levels of . . . a blood protein that increases in concentration" among people at risk for a heart attack.

The Dopamine Connection

Drug researchers found out long ago that cocaine interferes with the regulation of the brain's DOPAMINE levels. Dopamine is a NEUROTRANSMITTER and acts on the part of the brain responsible for filtering incoming information, making choices, judging behavior, and deciding when and how to act. Dopamine levels are associated with movement, emotional response, and the ability to experience pleasure.

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

strokes: loss of feeling, consciousness, or movement caused by the breaking or blocking of blood vessels in the brain

dopamine: pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

Cocaine blocks the normal flow of dopamine, allowing greater-than-normal amounts of the chemical to build up in the spaces between the neurons. Too much dopamine in the brain produces negative effects: dopamine receptors become over-stimulated, and this can cause the brain to lose the ability to produce feelings of pleasure on its own. Although a cocaine-induced high typically lasts from fifteen to thirty minutes, the low can last from one to two days. Scientists suspect that continued use of cocaine actually reduces both the amount of dopamine and the number of dopamine receptors in the brain. So, once the cocaine-induced high is over, the user can fall into a period of deep and lasting depression. "In the same way that [the] brain will interpret the presence of cocaine as one of the most pleasurable experiences," wrote Heather Lehr Wagner in *Cocaine,* "it will interpret the absence of cocaine as one of the most painful."

The Myth of Nonaddiction

As late as the 1980s, there was a myth that cocaine was not addictive. Addiction occurs when drug use is no longer a voluntary choice but an uncontrollable compulsion. Some crack users report addiction after just one use.

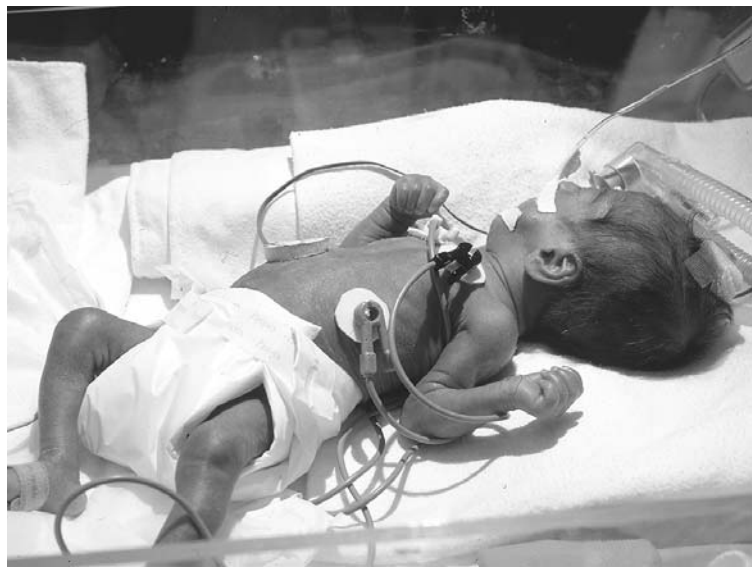
When a person addicted to a substance stops taking that substance, he or she experiences unpleasant WITHDRAWAL symptoms. Cocaine withdrawal symptoms include an intense and irresistible craving for the drug, along with depression, irritability, exhaustion, extreme hunger, and sometimes paranoia. It is now known that cocaine is extremely addictive. In fact, it is one of the easiest drugs to get animals to take willingly. Animal research indicates that after repeated ingestion of cocaine, nearly 100 percent of monkeys and rats tested will continue to self-administer the drug whenever they are given the chance.

The most serious effect of using cocaine is the possibility of sudden death. It can happen after the first use or anytime thereafter. Sudden death can occur with cocaine use alone, but is more common when combined with alcohol or other drugs. Other side effects include irreversible damage to the heart and liver, along with damage inflicted by strokes and seizures.

And There Is More. . . .

The point of ingestion determines the specific side effects cocaine will cause in a user. For instance, snorting powder cocaine over time will damage the septum and ulcerate the mucous membrane of the nose. Users who snort cocaine are prone to nosebleeds.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug



Children born to mothers who take cocaine when they are pregnant usually have lower-than-average birth weights, small heads, and the potential for more behavioral problems than other children. *John Chiasson/Getty Images.*

The bleeding may occur without warning and could cause considerable disruption if it happens in public. For instance, schools are required to evacuate and thoroughly clean areas where human blood has spilled. This precaution must be taken to decrease the risk of transmitting blood-borne viruses such as HIV (the human immunodeficiency virus), which causes AIDS (acquired immunodeficiency syndrome).

Smoking crack cocaine can cause lung trauma and bleeding. Injecting cocaine into the veins often causes inflammation and infections. It also carries a greater risk for contracting HIV/AIDS and hepatitis because users sometimes share needles. Cocaine also has a reputation for lowering users' INHIBITIONS. Users may take unusual risks that can lead to long-term consequences. These risks can range from unsafe sexual encounters to automobile crashes caused by poor judgment or aggression.

New information released by NIDA in 2004 revealed that cocaine might negatively affect a user's immune system. "Cocaine itself has a direct biological effect that may decrease an abuser's ability to fight off infections," wrote Patrick Zickler in *NIDA Notes.* This information, reported by a team of doctors at Harvard Medical School and the McLean Hospital Alcohol and Drug Abuse Research

inhibitions: inner thoughts that keep people from engaging in certain activities

Center, could help explain why drug abusers have such a high incidence of infections.

Other research findings published in *NIDA Notes* show that cocaine has a definite negative effect on unborn babies. Children born to mothers who took cocaine when they were pregnant usually have lower-than-average birth weights, small heads, and the potential for more behavioral problems than other children. "At age two," wrote Robert Mathias, "cocaine-exposed children did significantly poorer in mental development than children" who were not exposed to cocaine.

These findings suggest that cocaine-exposed children may require extra assistance to overcome learning difficulties. Experts such as Dr. Lynn Singer of Case Western Reserve University believe that early educational programs can help these youths develop the skills they will need to succeed in school.

Reactions with Other Drugs or Substances

Cocaine is almost always used with other drugs, including alcohol, heroin, amphetamines, and marijuana. Combining drugs increases the chances of overdosing or experiencing serious side effects. The most common drug to be combined with cocaine is alcohol. Alcoholic beverages prolong the cocaine high and tend to reduce drug-induced paranoia. This combination creates a new substance, COCAETHYLENE. Cocaethylene is as powerful as cocaine, and its effects last longer. However, it can be more toxic to the heart. NIDA statistics indicate that the combination of cocaine and alcohol results in more deaths than any other illegal drug combination.

The combination of cocaine and heroin is called a "SPEEDBALL." It is especially dangerous because cocaine speeds up the respiratory system, while heroin depresses it, or slows it down. At very high doses, however, cocaine can begin to depress the respiratory system as well. In speedballing, cocaine and heroin are typically ingested at the same time, but some users ingest the drugs alternately to feel either more energetic or more relaxed. This combination can be more toxic than using either drug alone. Comedian John Belushi died from speedballing in 1982.

Amphetamines are often combined with cocaine to extend the high. Cocaine creates a rush but it is short-lived. Adding amphetamines extends the high for up to ten hours. Using these drugs together increases the chances of an overdose and increases toxic effects.

cocaethylene: a substance formed by the body when cocaine and alcohol are consumed together; it increases the chances of serious adverse reactions or sudden death from cocaine

speedball: a combination of cocaine (a stimulant) and heroin (a depressant); this combination increases the chances of serious adverse reactions and can be more toxic than either drug alone

Addicts and Addiction

Some people believe that drug addiction is a voluntary behavior—that addicts simply choose to use drugs again and again. However, with continued use over a period of weeks or months, a person can go from being a voluntary drug user to being a compulsive, out-of-control drug user. Addictive drugs can actually change the brain in ways that result in more and more drug use.

Drug use is a very hard habit to break, even for the most determined individuals. It really does not matter which drug a person is abusing. In general, many drugs of abuse have similar effects on the brain. Such effects are discussed in Alan I. Leshner's article "Exploring Myths about Drug Abuse" on the *NIDA* Web site. Among the effects are:

- changes in the chemical makeup of brain cells
- a shift in mood
- transformation in memory processes
- alteration of motor skills needed to walk and talk.

These changes greatly impact the addict's behavior. The user's biggest motivation in life becomes obtaining and using the drug. Such behavior is not the result of a weak will or a character flaw. Rather, the drug use has caused major changes in the structure and the functioning of the user's brain—changes that are beyond the user's control.

Treatment for Habitual Users

In an article for the *New York Times,* Linda Carroll reported that certain people are more likely to become addicted to cocaine than others. The reason for this seems to be some sort of inborn flaw in the brain's wiring. "The leading suspect," noted Carroll, "is a defect in the dopamine system." Studies conducted on monkeys seem to back up this theory. Five monkeys involved in a Wake Forest University medical school experiment were allowed to take cocaine whenever they wanted for a whole year. At the end of the year, the "addicted monkeys ended up with a 15 percent to 20 percent decrease in dopamine receptors," wrote Carroll. The five monkeys were reexamined nine months after the conclusion of the experiment. The brains of three of them had returned to normal, but the brains of the other two still had lower-than-normal amounts of dopamine receptors in them.

The biggest challenge to cocaine treatment and rehabilitation is preventing relapse (the return to using drugs) caused by a persistent and intense craving for cocaine. Although cocaine addiction can be treated successfully, there is no single program that is effective for

Frustrated by her failed attempts to give up crack cocaine, a young woman intentionally cut her arm. Addiction to crack is a hard habit to break even when the individual is determined to succeed.

everyone. NIDA recommends a dual approach to treatment, healing both the body and the mind. It suggests behavioral therapies, medications, rehabilitation, and social services. The idea is to treat the whole person.

Regarding medication, NIDA research reports that medications that act on dopamine receptors might reduce the intense craving and depression in former cocaine users. Behavioral therapies can include group and/or individual counseling, popular twelve-step programs, and chemical dependency inpatient and outpatient programs.

A Drug Enforcement Administration (DEA) agent stands guard next to 5,137 pounds of cocaine seized from a Panamanian vessel near Miami, Florida.
AP/Wide World Photos.

A Simple but Promising New Treatment Approach

On January 5, 2005, the National Institutes of Health (NIH) announced that peer counseling actually helped reduce cocaine and heroin abuse. The study was conducted by doctors at Boston University Schools of Medicine and Public Health and involved 1,175 male and female drug abusers. The process took only twenty minutes and consisted of "a motivational interview with a substance abuse outreach worker who also was a recovering addict," according to the NIH press release.

Members of the study were also given referrals to drug abuse treatment programs and a list of different types of treatment methods. In addition, they received a phone call ten days later to check on their progress. These simple interventions motivated a significantly higher percentage of abusers to stay away from drugs over a six-month period.

Consequences

When cocaine use progresses to a point of dependence, it can be devastating. At this stage, drug seeking often becomes the user's first

priority. Suddenly, values such as love of family and friends and commitment to work can take second place to finding, buying, and using cocaine. "Cocaine addiction almost always interferes with social and economic functioning," stated Weil and Rosen. Addicts may end up spending "phenomenal amounts of money on their habits ($15,000 a year and more)," the authors explained. "They become paranoid, isolated, and depressed, unable to stop thinking about their next dose."

Habitual users often find themselves trapped in a web of deception and criminal behavior. Users desperate for more drugs may turn to robbery or prostitution in order to finance their habit. *NIDA Notes* stated that "cocaine use in 'crack' exchanges also contribute[s] to transmission of HIV/AIDS." Conviction of an illegal drug offense can trigger minimum mandatory prison sentences. Also, students convicted of cocaine possession can be disqualified from obtaining federal college grants and loans. In addition, NIDA-funded research shows that drug abusers cost employers about twice as much in medical and workers' compensation claims than drug-free workers. As a result, more and more businesses are requiring drug screening for employees.

The Law

Under the U.S. Controlled Substance Act of 1970, cocaine is a Schedule II drug. This means that cocaine has a high potential for abuse and that abuse may lead to severe physical and psychological dependence. It also means that cocaine has accepted medical uses with severe restrictions. The only legal use of cocaine in the United States is as a local anesthetic.

The Anti-Drug Abuse Act of 1986 and 1988 established mandatory minimum drug sentencing guidelines for cocaine use and possession. Federal law carries a much harsher penalty for crack cocaine than for powder cocaine. Because more African Americans tend to use crack than powder, this law continues to result in harsher prison terms for blacks. Possession of 5 grams of crack or 500 grams of powder carries a first-offense penalty of not less than five years in prison. Despite the severity of this penalty, according to Landau, about "85 percent of those imprisoned for drug abuse" will continue to "use cocaine or other drugs after leaving prison."

In the United Kingdom, cocaine and crack are considered Class A drugs under the 1971 Misuse of Drugs Act. Possession of the drugs can result in a fine and a prison term of up to seven years. Supplying, or selling, either form of cocaine can lead to a lifetime prison sentence.

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See also: Alcohol; Amphetamines; Heroin; Marijuana

Codeine

Official Drug Name: Codeine, codeine phosphate, codeine sulfate, methyl morphine
Also Known As: T-threes, schoolboy, coties, dors and fours; cough syrup with codeine is known as: syrup, barr, karo, lean, nods, down, drank
Drug Classifications: Schedule I, codeine methylbromide and codeine-N-oxide; Schedule II, methyl morphine; Schedule III, codeine combinations with acetaminophen, aspirin, or ibuprofen; Schedule V, prescription cough syrup preparations containing codeine

What Kind of Drug Is It?

Codeine is an opiate analgesic, meaning it is a pain reliever derived from the opium poppy plant. Its powers of pain relief—and its side effects—are many times weaker than the related opiates MORPHINE and heroin. (An entry for each of these drugs is available in this encyclopedia.)

Doctors sometimes prescribe pills containing combinations of codeine and over-the-counter (OTC) analgesics, such as Tylenol (acetaminophen) or aspirin, for pain relief after minor surgery, or for bone breaks and sprains, migraine headaches, or other pain that is expected to pass fairly quickly. The other most common use for codeine is in cough syrup. The drug acts on the part of the brain that controls coughing.

In the United States and many other countries, a prescription is necessary to obtain products containing codeine. This is because the drug is addictive, or habit-forming. It also can produce unpleasant side effects such as CONSTIPATION and NAUSEA. When codeine is abused, it is either ingested in its cough syrup form at greater-than-prescribed doses or extracted from prescription pills through chemical "cooking." In either case, taking a large dose of codeine can be fatal, because it can cause the user to stop breathing.

According to Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use, and Abuse,* codeine "is by far the most commonly used NARCOTIC in the world," especially in the form of cough syrup. Codeine's qualities as a pain reliever have been recognized since the early 1800s. Chemically speaking, opiate medications such as codeine mimic the brain's own natural mechanisms for suppressing pain. Codeine actually reduces the ability of the brain's nerve cells to transmit pain signals. The reason it works better than the body's own mechanisms is because it floods the brain with chemical messages in a more powerful way than the brain's chemistry can on its own.

RECREATIONAL USE of codeine, in the absence of pain, can produce feelings of euphoria (pronounced yu-FOR-ee-yuh). Such feelings bring on a state of extreme happiness and well-being in users. However, when the effects of the drug wear off, the user is often

morphine: an addictive opiate that is used to kill pain and bring on relaxation and sleep

constipation: an inability to have a bowel movement

nausea: upset stomach, sometimes with vomiting

narcotic: a painkiller that may become habit-forming; in a broader sense, any illegally purchased drug

recreational use: using a drug solely to achieve a high, not to treat a medical condition

Codeine is prescribed to relieve pain after minor surgeries as well as pain resulting from broken bones, sprains, and migraine headaches.

left with a sensation of depression or nervousness. This leads to a desire to take more of the drug. This is how the cycle of addiction begins. For this reason, doctors and pharmacists use caution when prescribing or dispensing medications containing codeine. Still, codeine abusers have found ways to obtain the drug illegally. In some parts of the United States, cough syrup abuse has contributed to growing numbers of emergency room visits for drug overdoses.

Overview

Humans like to experiment. They do this in art, music, medicine, technology, science, and other fields. For thousands of years, some have also experimented with using mind-altering drugs found in plants and animals. The first real evidence of opium poppy use in the historical record dates back 6,000 years to ancient Mesopotamia (the current nation of Iraq). Descriptions of poppy use for pain relief can be found in Egyptian papyrus records. Later, ancient Greek farmers learned that the most potent, or strongest, part of the poppy plant was found in the sap that oozes from the ripened seed bulbs. The word "opium" is actually derived from a Greek word meaning "sap." Historical records also reveal that ancient Romans used opium as a painkiller, a poison, and a means of suicide, varying their doses accordingly.

During the Middle Ages (c. 500–c. 1500) and the Renaissance period (spanning the fourteenth through the seventeenth centuries), physicians and ALCHEMISTS experimented with poppy sap. In 1524, Swiss scientist Paracelsus (1493–1541) created laudanum, a mixture of opium and alcohol. All by itself, laudanum is a bitter-tasting substance. When mixed with wine, better-tasting herbs, or syrups, however, it became one of the most popular cure-alls of the late 1800s and early 1900s. The use of TINCTURES and ELIXIRS containing opium became so commonplace in nineteenth-century Europe that the practice even found its way into literature. Fictional detective Sherlock Holmes, created by Sir Arthur Conan Doyle (1859–1930), even visited an OPIUM DEN to solve a crime.

Morphine, the most active ingredient in opium, was discovered in 1803 by a young German pharmacist's assistant, Friedrich Sertürner (1783–1841). The drug was far more powerful than crude opium and also far more addictive. Attempts to lessen the habit-forming aspects of morphine led to further experimentation with poppy sap. In 1832, the codeine compound was separated from the sap for the first time. Its name comes from the Greek word *kodeia,* meaning "poppy head."

alchemists: those who study or practice medieval chemical science aimed at discovering a cure for all illnesses

tinctures: combinations of an active drug and a liquid alcohol

elixirs: pronounced ih-LIK-suhrs; medicines made of drugs in a sweetened alcohol solution

opium den: darkly lit establishment, often in the Chinatown section of big cities, where people went to smoke opium; many dens had beds, boards, or sofas upon which people could recline while experiencing the effects of the drug

The name "codeine" comes from the Greek word *kodeia,* meaning "poppy head." The drug is derived from opium poppy sap.

At first, nineteenth-century scientists thought they had finally found what they had been seeking: a painkiller that did not produce euphoric side effects and was not addictive. However, they were wrong. When taken in large doses, codeine produces the same effects as morphine, including addiction. The only difference is that it is five to ten times weaker than morphine.

Scientists did discover some qualities of codeine that made it popular. It works as a painkiller when taken orally (by mouth). In comparison, morphine and heroin are usually injected or snorted through the nose. Codeine also was effective at suppressing coughs, and it quickly found its way into cough syrups. Like the more powerful opiates, codeine causes constipation by working on the nerves and muscles in the intestines. Therefore, it was used to treat diarrhea.

Throughout the twentieth century, knowledge about opiate analgesics increased. In 1900, codeine could be found in a variety of OTC medications for adults and children. The Harrison Narcotics Act of 1914 set new regulations on the sale of opiates, making them illegal unless prescribed to a patient by a licensed physician. Since then, drug companies have developed analgesics that contain combinations of painkillers such as aspirin and codeine, or Tylenol and codeine. A prescription for pure codeine, however, is rarely ever given.

By 2000, all OTC sales of codeine-containing products had ended in the United States. The drug is legally available in America

only if prescribed by a doctor, a dentist, or a veterinarian. Nevertheless, it is still manufactured in large quantities. At the turn of the twenty-first century, total codeine production worldwide approached 300 tons.

What Is It Made Of?

Codeine is a controlled substance in the United States. This means that the U.S. Food and Drug Administration (FDA) and the Drug Enforcement Administration (DEA) supervise its manufacture and distribution. Opium is sometimes harvested by slicing the plant's seed pods and extracting the sap. In 2005, however, machines were available to slice the entire mature poppy plant into bits and grind those bits into powder. According to Gahlinger, "Each year, more than 600 tons of opium powder are legally imported into the United States for legitimate medical use."

Pure opium can be separated into three different drugs: morphine, codeine, and thebaine. Most of the codeine used in the United States is SYNTHESIZED from morphine by a process called methylation (pronounced meh-thuh-LAY-shun). Codeine is an ORGANIC, or naturally occurring, compound that contains carbon, hydrogen, nitrogen, and oxygen. Its chemical formula is $C_{18}H_{21}NO_3$. Codeine is also an ALKALOID. Curiously, while most of the prescription codeine is derived from morphine, when the drug is ingested, the human liver turns the codeine back into morphine. Therefore, the compound works on the brain in the same way morphine does.

synthesized: made in a laboratory

organic: a term used to describe chemical compounds that contain carbon

alkaloid: a nitrogen-containing substance found in plants

expectorant: a cough remedy used to bring up mucus from the throat or bronchial tubes; expectorants cause users to spit up thick secretions from their clogged breathing passages

phlegm: pronounced FLEM; thick, germ-filled mucus secreted by the respiratory system

How Is It Taken?

Prescription codeine is available in several forms. Tylenol 3, for instance, is a pill containing 300 milligrams of acetaminophen and 30 milligrams of codeine. Some oral medications containing codeine also contain low doses of caffeine to counteract the sedating effects of the codeine. Pill-form medications containing codeine are swallowed, and their pain-relieving effects can last from three to six hours.

Liquid cough syrups containing various strengths of codeine are usually combined with an EXPECTORANT agent for clearing the airways of PHLEGM. Phlegm must be spit up, or expectorated, to improve a patient's breathing. Cough remedies with codeine and expectorants are taken by the spoonful every four hours with a full glass of water.

"Tylenol by the Numbers"

People experiencing levels of pain that will not respond to over-the-counter drugs can sometimes receive prescription pain relievers containing various dosages of codeine. Tylenol-brand acetaminophen is one product that contains codeine in its prescription form. These drugs are assigned the numbers one through four to indicate their various strengths. Here's a quick rundown of "Tylenol by the Numbers":

- Tylenol with Codeine No. 1 (more commonly referred to as Tylenol 1) contains 8 milligrams of codeine and 300 milligrams of acetaminophen.
- Tylenol with Codeine No. 2 (more commonly referred to as Tylenol 2) contains 15 milligrams of codeine and 300 milligrams of acetaminophen.
- Tylenol with Codeine No. 3 (more commonly referred to as Tylenol 3) contains 30 milligrams of codeine and 300 milligrams of acetaminophen.
- Tylenol with Codeine No. 4 (more commonly referred to as Tylenol 4) contains 60 milligrams of codeine and 300 milligrams of acetaminophen.

Tylenol 3 contains codeine and is available by prescription only.

The brand-name product Fiorinal with Codeine contains aspirin, butalbital (a barbiturate), caffeine (a stimulant), and codeine. This prescription drug is used primarily for relief of migraine headache pain.

Are There Any Medical Reasons for Taking This Substance?

Codeine-containing medications are usually prescribed to relieve pain or control coughs. Pills containing codeine and other analgesics are typically used for mild to moderate pain that is expected to go away within days or weeks. Cough syrups containing codeine are usually prescribed for dry coughs that keep a patient up at night.

To Cough, or Not to Cough

It is important to note that cough syrups containing codeine can actually be dangerous for patients with certain

kinds of respiratory illnesses. Coughing is the body's natural way of clearing fluids out of the lungs and bronchial tubes. Because codeine works on the brain to quiet a cough, users may experience a buildup of unwanted fluids that block their airways. As noted in the journal *Pediatrics,* "Cough suppression may adversely affect patients . . . by pooling of secretions, airway obstruction, [and] secondary infection." In other words, patients run the risk of choking on their own secretions, and these secretions may serve as a source of infection that can spread throughout the body. Therefore, cough syrups with codeine are not prescribed for patients with asthma, allergies, cystic fibrosis, or pneumonia.

In the early part of the twentieth century, codeine was commonly prescribed for diarrhea. However, it is rarely used for that purpose anymore. Likewise, the use of codeine-enhanced products for migraine headaches is being phased out with the introduction of more effective non-narcotic medications for migraine pain.

How Effective Is Codeine?

Reports in *Chemist & Druggist* and the *Western Journal of Medicine* both cited recent studies comparing codeine-containing and noncodeine-containing pain relievers. The evidence suggests that pain relievers with codeine prove no more effective than plain, over-the-counter analgesics. In addition, "patients receiving codeine were more likely to stop therapy because of side effects," wrote Sanjay Arora and Mel E. Herbert in the *Western Journal of Medicine.* The researchers went on to state that codeine's pain-relieving powers are largely a "myth."

Usage Trends

The continued research on opiates, both natural and SYNTHETIC, has produced a new generation of pain-fighting drugs that are related to but more powerful than codeine. Brand-name pills such as Percocet, Percodan, and OxyContin contain oxycodone, which is synthesized from thebaine. (An entry on oxycodone is available in this encyclopedia.) Hydrocodone, another relative of codeine, is six times stronger than codeine and can be found in generic form or in brand-name pills such as Vicodin, Lortab, and Lorcet.

According to a 2003 online report by the Drug Abuse Warning Network (DAWN), abuse of prescription painkillers "has risen

synthetic: made in a laboratory

dramatically in the U.S. Of particular concern is the abuse of pain medications containing opiates." Unlike club drugs or DESIGNER DRUGS, opiates can be obtained from a doctor legally. This has led to addiction among senior citizens, who sometimes fail to understand the dosage directions, as well as upper- and middle-class users of any age who would tend to shun illegal street drugs. Celebrities such as political commentator Rush Limbaugh and comedian George Carlin have made the news for undergoing treatment for prescription opiate addiction.

Although prescription opiate abuse is rising, the trend of codeine abuse, in particular, fell more than 60 percent between 1994 and 2001, according to the 2003 *DAWN Report.* Because codeine is dispensed most commonly in combination with other agents, it is less likely to be a drug of choice for an abuser, particularly if that abuser can obtain OxyContin, Vicodin, or other stronger medications.

In certain regions of the United States, however, codeine abuse continues to be a problem. In Houston, Texas, an entire culture has sprung up around cough syrup abuse, including a type of rap music called "screw." In this type of rap, songs are re-mixed, slowed down, and chopped to sound like a skipped recording. One of the pioneers of SCREW MUSIC, Robert Davis Jr. (1971–2000), also known as DJ Screw, died of a codeine overdose at his recording studio.

In Houston, Texas, an entire culture has sprung up around cough syrup abuse, including a type of rap music called "screw." © *Chris Coxwell/Corbis.*

The popularity of screw music—and cough syrup abuse—is reported to be spreading across the southern United States. Kristen Mack noted in the *Houston Chronicle* that a Memphis, Tennessee-based rap group, Three 6 Mafia, had a locally popular single called "Sippin on Syrup." Mack wrote that in 2001, Houston-area "police confiscated 125 gallons of illegal codeine. Each year, they say, they encounter more abuse and more people coming to Houston looking for 'syrup.'. . . Everyone agrees that Houston is ground zero for this 'quiet epidemic.'"

designer drugs: harmful and addictive substances that are manufactured illegally in homemade labs

screw music: an engineered music inspired by codeine use that uses existing songs but slows them down and makes certain segments repetitive

Cough syrup with codeine is more readily available in Texas because codeine is sold in small quantities over-the-counter in Mexico. Smugglers stockpile as many doses as they can, take them across the Mexican-U.S. border, and sell them on the street. Mack reported that in 2002, eight ounces of cough syrup could fetch $200 on the BLACK MARKET. Users typically mix the medication with soft drinks or alcohol.

Effects on the Body

Most people who use codeine for its prescribed purposes experience few side effects. A bothersome cough disappears, perhaps with some drowsiness. Post-surgical pain decreases, perhaps with some nausea. When the medical problem goes away, the patient stops using the pills or cough syrup with no significant after-effects.

Ingesting the drug at higher-than-prescribed doses, some users may experience a sense of well-being, along with a loss of INHIBITIONS and feelings of drowsiness or light-headedness. Other users have reported the opposite effect: a sense of discomfort and restlessness. Because codeine is taken orally, the user might not feel the effects of the drug for a half an hour to an hour after ingestion. The sensations last several hours and then slowly diminish. Users might feel nauseated or their skin might itch. An overdose can cause users—especially children—to stop breathing. In the event that a codeine abuser stops breathing, rapid administration of the drug naloxone (Narcan) will reverse the effects of the opiate. However, the patient must be diagnosed by a doctor very quickly.

The most profound effect of codeine and other related opiates is psychological. Flooding the brain with opioids from drug use causes the brain to stop producing naturally occurring ENDORPHINS, or pleasure-enhancing hormones. Then, when the effects of the drug wear off, the user may feel uncomfortable, anxious, and irritable. He or she might have trouble relaxing or sleeping. Many abusers take another high dose of the opiate in order to restore that feeling of well-being. Such abuse leads to serious problems with addiction.

Addiction to opiates like codeine can happen swiftly; WITHDRAWAL can be a difficult and lengthy ordeal. Almost immediately, the codeine abuser who stops taking the drug experiences a host of unpleasant symptoms, including restlessness, anxiety, INSOMNIA, muscle and bone pain, diarrhea, chills that produce goose bumps (hence the term "cold turkey"), and leg tremors ("kicking the habit"). The patient may yawn frequently and feel more sensitivity to pain. These flu-like symptoms usually last for a few days.

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

inhibitions: inner thoughts that keep people from engaging in certain activities

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

insomnia: difficulty falling asleep or an inability to sleep

What makes opiate addiction so hard to beat is the lasting effects on the brain. The recovering codeine abuser will just "not feel good" psychologically as the brain readjusts to producing its own endorphins. Cynthia Kuhn, Scott Swartzwelder, and Wilkie Wilson described this situation in *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy.* "There is a DYSPHORIA (the just-feeling-lousy feeling), which may be the reverse of opiate-induced euphoria. Withdrawing opiate addicts just feel *bad,* and they feel bad in a way that they know [taking more] opiates will solve. The craving for a fix can last for months, long after the physical symptoms have abated," or gone away.

Reactions with Other Drugs or Substances

Pharmacists dispensing drugs containing codeine usually warn users that side effects can include drowsiness, dizziness, nausea, and constipation. These substances should not be used with other tranquilizers or SEDATIVES, with BENZODIAZEPINES, with the antidepressant drugs known as monoamine oxidase inhibitors (MAOIs), or with ANTIHISTAMINES, AMPHETAMINES, or alcohol. Patients taking products that contain codeine must use care when operating automobiles or machinery. When used briefly and specifically for its prescribed purpose, a product containing codeine will not produce extreme side effects.

Doctors prescribing pain relievers containing codeine must carefully check the patient's records for other medications that will adversely interact with codeine. These substances include sleeping pills, tranquilizers, antihistamines, anti-anxiety medications, and any other medicine that produces sedation. Using alcohol and codeine at the same time greatly increases the likelihood of breathing problems. Mixing codeine with illegal substances such as HALLUCINOGENS or designer drugs can be fatal.

Additionally, higher doses of prescription pain relief pills containing codeine and/or acetaminophen, ibuprofen, and aspirin can cause severe, sometimes fatal, reactions. Over-the-counter analgesics taken in large doses can lead to stomach bleeding, liver failure, and other organ damage.

Treatment for Habitual Users

As previously described, stopping opiate use abruptly (or going "cold turkey") takes both a physical and psychological toll on the user. Someone wishing to end a codeine addiction can find

dysphoria: pronounced diss-FOR-ee-yuh; an abnormal feeling of anxiety, discontent, or discomfort; the opposite of euphoria

sedatives: drugs used to treat anxiety and calm people down

benzodiazepines: a type of drug used to treat anxiety

antihistamines: drugs that block *histamine,* a chemical that causes nasal congestion related to allergies

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

hallucinogens: substances that bring on hallucinations, which alter the user's perceptions of reality

Words from a "Junkie"

Experimental American author William S. Burroughs (1914–1997) was very honest and open about his experiences as an opiate addict. Here, in a passage from his novel *Junkie,* he describes the process of drug withdrawal.

"The last of the codeine was running out. My nose and eyes began to run, sweat soaked through my clothes. Hot and cold flashes hit me as if a furnace door was swinging open and shut. I lay down on the bunk, too weak to move. My legs ached and twitched so that any position was intolerable, and I moved from one side to the other, sloshing about in my sweaty clothes." Burroughs added: "Almost worse than the sickness is the depression that goes with it. One afternoon I closed my eyes and saw New York in ruins. Huge centipedes and scorpions crawled in and out of empty bars and cafeterias and drugstores on Forty-second Street. Weeds were growing up through cracks and holes in the pavement. There was no one in sight."

assistance from a licensed physician who may prescribe methadone to ease the symptoms of withdrawal. Methadone is itself an opiate, but it works differently in the body. It releases slowly, so that the user does not feel a rush of euphoria or a backlash when the euphoria ends. Recovering addicts slowly reduce the dosage of methadone under a doctor's care until they become drug-free. (An entry on methadone is available in this encyclopedia.) Another drug, buprenorphine, also provides some sedating effects while blocking the brain's absorption of opiates.

Any successful drug-treatment program requires some sort of psychological intervention. Former users have reported remarkable benefits from talk therapy and the support of other recovering addicts. Narcotics Anonymous is built on the philosophy of the better-known Alcoholics Anonymous. The organization offers free group therapy, online information, telephone hotlines, and other services to recovering addicts worldwide, no matter what type of drug abuse led to their addiction.

Consequences

Interestingly enough, opiate use alone does not produce any lasting damage to the brain or other organs. But that does not mean that codeine can be abused without harmful consequences. Codeine users are likely to combine the drug with other substances ranging from alcohol to hallucinogens, sometimes with fatal results. Attraction to codeine may encourage users to try its stronger relatives, heroin and morphine. Even if the user restricts ingestion simply to codeine, addiction changes behavior in self-destructive ways. In order to obtain their supply of drugs, users may engage in burglary, theft, drug dealing, or prostitution. Under the influence of opiates, addicts eat poorly and ignore symptoms of bad health. So while codeine abuse may not lead to organ damage, its effect on the overall level of good health can be devastating.

The Law

Codeine is a controlled substance. The FDA and the DEA strictly oversee its legal production. Therefore, possession of codeine without a prescription is illegal. Laws for possession and distribution of codeine vary from state to state and may even vary depending on the strength of the dose. For instance, in Massachusetts, possession of pure codeine is a "Class A" offense, carrying a penalty of up to two years in prison and $2,000 in fines. But Massachusetts also has a "Class C" distinction, with lesser penalties, for some prescription opiates containing lower dosages of the drug. In 2002, possession of small quantities of codeine in Texas was considered a misdemeanor with a minimal fine.

Federal penalties for possession of a controlled substance include up to a year in jail for the first conviction, and between $1,000 and $100,000 in fines. A second conviction carries the penalty of fifteen days to two years in prison with up to $250,000 in fines. A third conviction requires ninety days to five years in prison with a maximum $250,000 fine.

Fact or Fiction: Codeine's Reputation

Some people think that prescription opiates are always addictive, and those who use them for any amount of time will become drug addicts. This is not true. Studies show that when prescription painkillers are used as directed, and discontinued when no longer needed, they carry no danger of addiction.

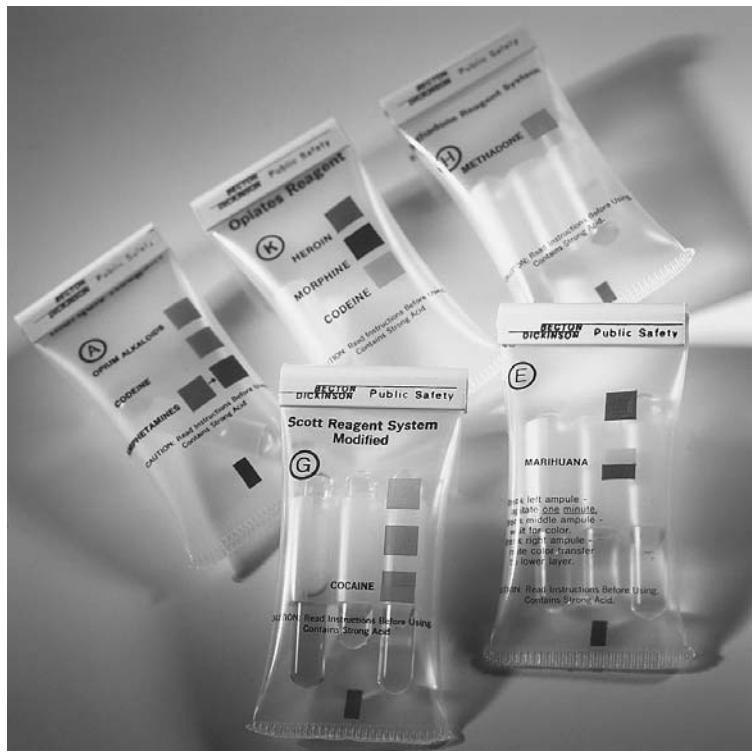
Over time, certain drugs begin to lose their effectiveness, and users need to take more and more of the drug to achieve the original results. Some critics think that codeine users with chronic pain will develop a tolerance to opiates, but this theory has not been proven. Increased doses of codeine only seem to be necessary if the degree of pain experienced by patients worsens as a serious disease progresses.

Prescription painkillers containing codeine have a reputation for bringing on troublesome side effects. Some of the side effects are rumored to be so horrible that patients refuse to take the drug. This is not necessarily the case. In fact, carefully supervised use of prescription painkillers results in a few, easily tolerated side effects.

There are other ways to break the law in search of codeine. It is illegal to "doctor shop." This is a process whereby a user seeks multiple prescriptions by visiting more than one doctor and "fakes" a set of symptoms that might lead those doctors to prescribe the drug the user wants. It is illegal to bring over-the-counter purchases of codeine into the United States from other countries that sell it. It is also illegal to extract the codeine from analgesic compounds like Tylenol 3. Again, jail time and fines vary from state to state.

Drug Tests

Because the liver turns codeine into morphine, the use of prescription products containing codeine can produce a positive urine test for codeine *and* morphine. Positive tests for the drug can be obtained as many as three to four days after the last use. Curiously enough, as much as a teaspoon of poppy seeds used in baking and on



Various drug kits are available to determine if people are using drugs illegally. Tests are available for codeine, amphetamines, cocaine, heroin, marijuana, methadone, morphine, and opium alkaloids, among others.

TEK Image/Photo Researchers, Inc.

bagels can also produce a positive drug test for opiates. According to Gahlinger, there is "no direct way to be sure whether a urine test positive for morphine or codeine is due to poppy seeds or to drugs. Eating a single poppy seed bagel can result in a positive drug test for up to three days."

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See also: Heroin; Methadone; Morphine; Opium; Oxycodone

Creatine

Official Drug Name: Creatine monohydrate (KREE-uh-teen *or* KREE-uh-tin mon-oh-HY-drate)
Also Known As: Dietary supplements, supps
Drug Classifications: Creatine is not a controlled substance

What Kind of Drug Is It?

Creatine monohydrate can be found in numerous DIETARY SUPPLEMENTS, in pill, powder, liquid, or even chewing gum form. It is a combination of three AMINO ACIDS that are found in the muscles of humans and all animals with backbones. Creatine provides fuel to muscles during moments of rapid exertion, working within the muscle cells as a substance called creatine phosphate. Some studies suggest that it helps to repair and restore muscles after intense physical activity.

Human beings and other animals store creatine naturally in their muscle cells. The body manufactures it in the liver, kidneys, and pancreas. Additionally, creatine can be absorbed from natural outside sources such as meat and fish during the digestion process. According to Robert Monaco and Terry Malloy in *Creatine and Other Natural Muscle Boosters,* "the average man has about 120 grams [or 4 ounces] of creatine in his body, with about 95 percent in skeletal muscles." New creatine is created within the body at a rate of about two grams per day.

Safety Concerns, Especially for Teens

Some athletes have begun to use dietary supplements containing creatine to build muscle mass and reduce recovery times between workouts. Creatine supplements can be found in health food stores, on the Internet, and through mail-order companies. No one breaks the law by buying or selling creatine. It is not a controlled substance. Short-term studies have proven that creatine does contribute in a small way to increased strength during short bursts of activity, such as weight lifting, shot put, or batting a baseball.

Since creatine is not regulated by the U.S. Food and Drug Administration (FDA), many questions remain not only on its true effectiveness, but also on the possible damage it can do to the body, especially with prolonged use. How it affects the growing bodies of teenagers and younger children is not known. Although it is legal, creatine should be used by adults

dietary supplements: products including vitamins, herbal extractions, and synthetic amino acids sold for specific uses such as weight loss, muscle building, or prevention of disease

amino acids: any of a group of chemical compounds that form the basis for proteins

with extreme caution, under the close supervision of a medical doctor. Children and adolescents should avoid it.

Overview

Creatine was first isolated and named in 1832 by French chemist Michel-Eugène Chevreul (1786–1889). By the end of the nineteenth century, scientists had determined that intense muscular activity caused concentrations of creatine to build up in—and strengthen—muscle tissue. Further study determined that creatine levels could be raised in the body by eating a diet rich in meat. Eating great quantities of meat is not considered a healthy habit, so in the 1950s an Illinois company named Pfanstiehl Laboratories created and marketed the first synthetic, or manufactured, creatine.

Creatine was first isolated and named in 1832 by French chemist Michel-Eugène Chevreul. *Photo courtesy of the Library of Congress.*

Use by Olympic Athletes

As early as the 1960s, competitive athletes in the former Soviet Union were using creatine, along with anabolic STEROIDS, to increase their strength and durability. (An entry on steroids is available in this encyclopedia.) In those years competitors were not tested for drugs prior to the Olympic Games. However, the apparent physical superiority of the Soviet, Eastern European, and Chinese athletes raised many suspicions. As the 1970s progressed, sports authorities in many nations, as well as the International Olympic Committee, instituted blood tests to check for performance-enhancing substances.

It is possible to test athletes for elevated levels of ANABOLIC AGENTS such as testosterone, androstenedione (ann-druh-STEEN-dee-ohn), and dehydroepiandrosterone (dee-HY-droh-epp-ee-ann-DROSS-tuh-rone). No tests, however, exist for measuring creatine levels. By the end of the twentieth century, a number of famous professional and amateur athletes and bodybuilders were using creatine supplements legally. In fact, they were even touting the substance's powers. Home run champions Mark McGwire and Sammy Sosa

steroids: drugs that mimic the actions of testosterone, a hormone found in greater quantities in males than in females, and help build muscle mass and strength

anabolic agents: substances that promote muscle growth

Creatine is known as a bulking supplement that is used by weightlifters, bodybuilders, and other athletes. *© Najlah Feanny/Corbis.*

have both admitted taking creatine. Use of the supplement has been linked to former professional quarterbacks Troy Aikman and John Elway and Olympic runner Michael Johnson, to name only a few.

A June 2000 article for *Time* magazine discussed the safety of creatine. The writer reported that half of the athletes surveyed by the magazine, "many of them Olympians, admitted . . . that they'd be willing to take a drug even if it was sure to kill them eventually, so long as it would let them win every event they entered five years in a row." This "win at all costs" mindset filters down from the professional and Olympic level to high school and even middle school athletes. Many youth are feeling that they will have no chance of succeeding at the highest levels if they do not use supplements such as creatine.

What Is It Made Of?

ENDOGENOUS, or natural, creatine is produced from three amino acids: arginine (AHR-juh-neen), glycine (GLY-seen), and methionine (meh-THY-uh-neen). It can be found in most of the body's organs. However, the vast majority of it resides within the muscle cells that power the body's movements.

Creatine is part of a complex chemical process that creates and restores ADENOSINE TRIPHOSPHATE (ATP), the fuel that muscles feed on as they contract. In quick movements, ATP converts to adenosine phosphate (ADP), releasing a burst of energy in the process. As Monaco noted in his book, "Normally, muscles contain only enough ATP to provide energy for between five and ten seconds, depending on the amount of effort required for the activity. Then, the muscles need creatine to make more ATP."

About two-thirds of the creatine in the body is creatine phosphate. This chemical comes into play when the muscle's store of ATP has been depleted, or used up. Creatine phosphate breaks down into creatine and phosphate, restoring the levels of ATP. The reason muscles ache after a difficult workout is that levels of ATP and creatine have fallen. As the body restores the chemical balance, the aches fade and the muscles become stronger.

Endogenous creatine is manufactured in the liver, kidneys, and pancreas. A normal, active human being manufactures about two grams of creatine daily, taking in perhaps one or two grams more through foods. Vegetarians tend to store less creatine in their bodies, since they do not eat meat.

Mark McGwire

In September of 1998, while working toward setting a new single-season home run record, St. Louis Cardinals slugger Mark McGwire talked with reporters at his locker in the stadium clubhouse. A photographer snapped a shot of McGwire's locker, showing a bottle of creatine supplements.

On March 17, 2005, McGwire was called to testify in Washington, D.C., before the House Committee on Governmental Reform. Facing tough questions from members of Congress, McGwire dodged the issue about whether he used performance-enhancing products. As reported in the *Philadelphia Daily News,* McGwire stated: "I cannot answer these questions without jeopardizing my friends, my family, and myself." McGwire wept when parents whose sons had died of complications of steroid abuse told the committee that their sons idolized McGwire and wanted to be like him.

How Is It Taken?

Supplemental creatine is available in pill form, as a powder dissolved into beverages, or as a gum or candy. Because it is not considered a drug, the substance is not regulated for purity

endogenous: pronounced en-DAH-juh-nuss; produced within the body

adenosine triphosphate (ATP): an important energy-carrying chemical, created with the assistance of creatine

Fast Facts about Creatine

Did you know the following facts about creatine supplements?

- Half of the athletes surveyed by *Time* magazine in 2000 said they would be willing to take a deadly drug if it would allow them to win every event they entered for five years.
- In 2001, $400 million worth of creatine supplements were sold in the United States.
- Creatine supplements have not been banned by any professional or amateur sports authority, except the National Collegiate Athletic Association (NCAA), where it is classified as a "non-permissible" substance.
- In 2001, survey findings suggested that 390,000 children between the ages of ten and fourteen had tried some sort of performance-enhancing product.

in its many different products. Sometimes the dosage per unit varies from the information printed on the label. Sometimes extra ingredients are added to the pills or powders, and some of these can act as steroids in the body.

Two athletes, American bobsledder Pavle Javanovic and Norwegian wrestler Fritz Aanes tested positive for steroid use prior to the Olympic Games and received two-year suspensions. Both men claimed they used only creatine. A test of Aanes's dietary supplement revealed that it contained a banned substance called nandrolone, which was not listed on the label. In a random test of creatine supplements conducted by *ConsumerLab.com* in 2003, only half of the products tested were found to have the ingredients they listed at the dosages they claimed. The other half made false claims of dosages or were found to contain other unlabeled ingredients.

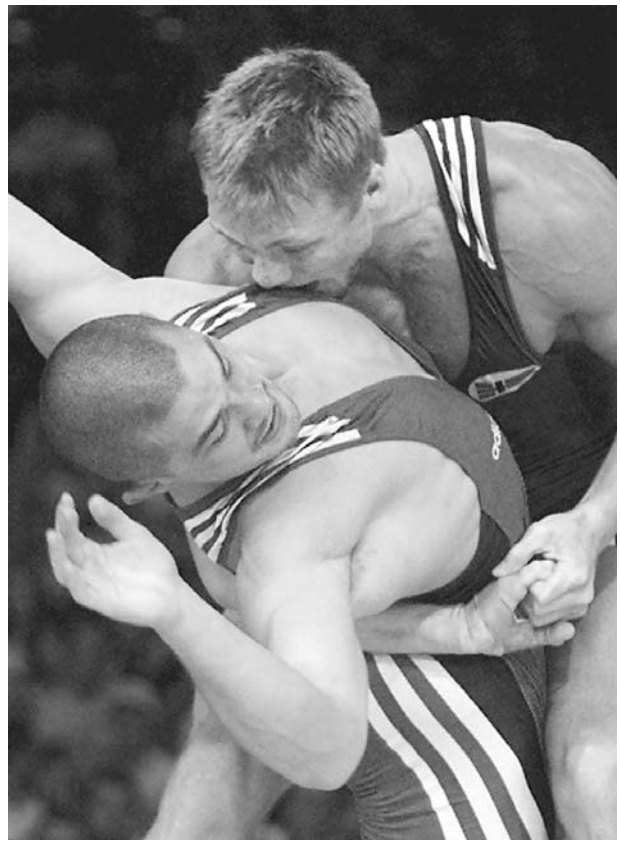
Are There Any Medical Reasons for Taking This Substance?

A very small number of children are born with a condition called guanidinoacetate methyltransferase deficiency (GMAT; pronounced GWAN-ih-deen-oh-AH-suh-tate METH-uhl-TRANZ-fuh-rase). This extremely serious illness causes muscle wasting and seizures from the time of birth onward. Some of its symptoms are eased by high doses of supplemental creatine.

Small research studies show creatine supplements benefit people who have diseases that cause muscle degeneration, such as amyotrophic (ay-my-oh-TROH-fik) lateral sclerosis (ALS, or "Lou Gehrig's Disease"), myasthenia gravis (my-us-THEE-nee-uh GRAH-vuss), muscular dystrophy, Huntington's disease, Parkinson's disease, and McArdle's disease. It is important to note that creatine supplementation may slow the symptoms of these diseases, but it does not cure them.

People who face long periods in bed recovering from surgery or from multiple broken bones may speed the restoration

of their muscles by taking extra creatine. Creatine also appears to improve the exercise capacity in patients suffering from heart problems. Also, there is some evidence to suggest that the supplement helps elderly people retain balance and muscle control later in life.



When Norwegian wrestler Fritz Aanes (top) tested positive for steroid use prior to the Olympic Games, he claimed he had used only creatine. © *Reuters/Corbis.*

Usage Trends

Since the late 1990s, there has been a huge surge in the purchase of creatine supplements. According to the *Knight Ridder/Tribune Business News,* Americans purchased $400 million worth of creatine in 2001. A *Sports Illustrated* piece claimed that over-the-counter dietary supplements for sports nutrition were a $1.7 billion industry in 2003. Most of the buyers are teenagers and grown men and women who want to build muscle. Some creatine products are especially targeting "the upmarket youth," according to Suhit Kelkar in the *Asia Africa Intelligence Wire.*

In a survey conducted by *Time* magazine in 2000, 44 percent of high school seniors said they used creatine to improve athletic performance. No legal restrictions exist on the purchase of creatine, so teenagers can buy it without the advice or consent of their parents. Peer pressure, along with the desire to win in competition, can be powerful agents of persuasion for those considering creatine supplementation.

Effects on the Body

Creatine supplement use has been shown to raise the levels of stored creatine in muscles. Plus, research has revealed it does lead to modest gains in strength during ANAEROBIC EXERCISE. In most people, use of creatine supplements does not improve performance in AEROBIC EXERCISES or sustained periods of activity. Creatine users claim that the substance helps them to "bulk up,"

anaerobic exercise: short, strenuous exercises that require sudden bursts of strength, such as weight lifting and batting a baseball

aerobic exercises: exercises performed to increase heart health and stamina, such as jogging, biking, and swimming, usually lasting between twenty minutes and an hour

Small research studies show creatine supplements benefit people who have diseases that cause muscle degeneration, such as muscular dystrophy. © *Gerhard Gscheidle/Peter Arnold, Inc.*

or gain muscle mass. This is the case, but the weight gain stems only from retained water within muscle cells.

Not Enough Information Available

The water retention is just one of the dangers of creatine use. One of the most common side effects of using creatine supplements is dehydration, or a drying-out of body tissues. Taking creatine mixed in a caffeinated beverage, such as coffee or some soft drinks, increases the risk of dehydration. Athletes who work out briskly at higher temperatures risk HEAT STROKE and, ultimately, kidney damage due to dehydration. Other reported side effects of high doses of creatine include nausea, diarrhea, indigestion, and an increased risk of muscle strain.

Whether muscle strain is linked to creatine use is highly debated. Some studies suggest that creatine use encourages athletes to work out harder and longer, while their bodies reap little benefit from the extra creatine. This psychological component of creatine use can be a factor in painful muscle strains or cramping.

How does using creatine affect children and teens who are still growing? As of 2005, no answers were available. Long-range studies of creatine use had not been completed. Doctors recommend that children and teens avoid all use of creatine, no matter how tempted they might be to "bulk up." A *Sports Illustrated* story on sports supplements quoted Dr. Arthur Grollman of the State University of New York at Stony Brook. He observed: "Basically, anyone who uses these products is a human lab rat."

Case in point: In the *Journal of Toxicology: Clinical Toxicology,* Christine A. Haller and her colleagues discussed whether seizures are linked to dietary supplements. They noted that although creatine has not been linked with seizures in published studies, "the California Poison Control System has received a few . . . reports of seizures in young athletes who were allegedly taking only creatine. This potential association between creatine use and seizures requires further investigation."

heat stroke: a condition resulting from longtime exposure to high temperatures; symptoms include an inability to sweat, a very high body temperature, and, eventually, passing out

Creatine Chronology

1832 French chemist Michel-Eugène Chevreul isolates creatine within muscle cells and names it after the Greek word for "flesh."

1926 An article in a British medical journal links creatine consumption in meats to weight gain as muscle mass.

1954 Pfanstiehl Laboratories Inc. of Illinois produces synthetic creatine in bulk and markets it to catalog resellers.

1992 British sprinters Linford Christie and Sally Gunnel win Olympic gold medals after having trained using creatine supplements.

1998 Mark McGwire, working toward breaking the single-season home run record for Major League Baseball, is photographed with a bottle of creatine supplements in his stadium locker.

2005 Mark McGwire testifies before Congress about steroid use in Major League Baseball. He dodges questions about whether he used performance-enhancing products.

Reactions with Other Drugs or Substances

Creatine and caffeine do not mix well. Both tend to dehydrate the body. Taken together, they can lead to heat stroke. Few studies have been done about the body's reaction to creatine supplements when taken with prescription medications, over-the-counter medications, or even other dietary supplements. Some fitness magazines warn against mixing creatine powder with drinks that are high in sugar or glucose content. Sweetened beverages carry their own dangers, including encouraging DIABETES and weight gain.

Although the purchase of creatine is legal, the substance has not been proven safe, even for adults. Before taking creatine supplements, adults should first consult a licensed doctor and carefully review any other medications that they are using daily. People with kidney problems should never take creatine supplements. Doctors will take periodic blood tests to make sure that creatine use is not damaging internal organs such as the liver and kidneys. Coaches, personal trainers, and sports nutritionists are not qualified to recommend creatine supplementation. They do not have the extensive medical education and training that licensed medical doctors have.

Treatment for Habitual Users

The use of creatine supplements has not been shown to cause the human body to stop making its own endogenous

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

Home run champion Mark McGwire was photographed with a bottle of creatine in his locker in 1998. In 2005 he appeared before Congress to discuss steroid use in baseball. The use of performing-enhancing products by star baseball players is a subject of much debate.

AP/Wide World Photos.

creatine. Also, creatine monohydrate is not a habit-forming substance. Withdrawal from creatine supplements does not plunge the user into a period of muscle weakness or other difficulties. Still, users can develop a PSYCHOLOGICAL DEPENDENCE on the drug and become convinced that extra creatine will make them better athletes. This may cause them to use the substance longer, or in higher doses, than anyone would recommend.

psychological dependence: the belief that a person needs to take a certain substance in order to function

As of 2005, no studies had been done on the long-term use of creatine supplements. Experts suggest that young athletes never begin using creatine supplements at all. Those who have already begun should consult a doctor about continued use.

Consequences

Are creatine supplements safe? As of 2005, the bodybuilding industry and its periodicals claimed creatine was safe. However, various medical journals offered a different opinion. They noted that nothing was known about the long-term effects of creatine use, particularly for young people. Plus, since creatine was already available on the market and fairly inexpensive, drug companies have been reluctant to conduct trials to prove the medical benefits of taking the supplement.

What this means is that those using creatine supplements in the early twenty-first century will provide the only long-term data on creatine's possible ill effects, since these users were the first to buy the supplement in great numbers. Because the long-term effects of creatine are not yet known, users could learn one day that the substance has various health risks.

Building Muscles without Supplements

All athletes should be wary of any substance that promises quick results. Health professionals note that there is simply no substitute for a carefully chosen exercise program and good dietary habits. In its August 2003 edition, *Prevention* magazine offered teens various tips for building muscle without the pills and the powders. For example, the editors recommended:

- When exercising vigorously, add twenty-eight grams of protein to your diet daily. Instead of protein powders, consume larger quantities of milk, eggs, lean meats, and beans.
- After exercising, eat a snack high in carbohydrates, such as trail mix, apples, fruit juices, or whole grain breads.
- Cramped, sore, or stiff muscles are the body's sign that it is being overworked. Take longer breaks between intense workouts, and vary the types and duration of exercise routines. A long run or bike ride one day might be followed by some weight lifting the next day.

The Law

Anyone of any age can buy creatine supplements and use them. They are legal. The burden of keeping them out of the hands of growing children and young adults falls on parents, doctors, coaches, and the young people themselves. Nutritional supplements have not been proven to turn an average, or even above-average athlete, into a sports star, like Mark McGwire. The odds of receiving a contract to play professional sports—in any sport—are very slim. A study published in *NCAA News Online* in 2000 stated that only 2 percent of college football players go on to play professional football. The percentage of high school players who win pro contracts is far smaller than that.

Since the long-term effects of creatine use are unknown, experts suggest that young athletes never begin using the supplements at all. Hard work and exercise should be used instead. *© Jose Luis Pelaez, Inc./Corbis.*

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See also: Diuretics; Ephedra; Melatonin; Steroids

Designer Drugs

Official Drug Name: 2C-B (4-bromo-2, 5-dimethoxyphenethylamine; pronounced BROH-moh dy-meth-OCK-sy-FENN-eh-THY-luh-meen)
Also Known As: Afro, bees, bromo, cloud-9, eve, nexus, toonies, utopia, venus
Drug Classifications: Schedule I, hallucinogen

Official Drug Name: Ecstasy (MDMA; 3, 4-methylenedioxymethamphetamine; pronounced METH-uhl-een-die-OCK-sy-meth-am-FETT-uh-meen)
Also Known As: Adam, disco biscuit, E, hug drug, Stacy, X, XTC
Drug Classifications: Schedule I, hallucinogen

Official Drug Name: GHB (gamma hydroxybutyrate; pronounced GAMM-uh hy-DROK-see-BYOO-tuh-rate)
Also Known As: Cherry meth, Georgia home boy, goop, grievous bodily harm, max, soap
Drug Classifications: Schedule I, depressant

Official Drug Name: Ketamine (pronounced KEET-uh-meen; brand names include Ketaset and Ketalar)
Also Known As: Cat valium, jet, K, ket, special K, vitamin K
Drug Classifications: Schedule III, hallucinogen

Official Drug Name: Methamphetamine (pronounced meth-am-FETT-uh-meen)
Also Known As: Chalk, crank, crystal, crystal meth, ice, glass, meth, speed
Drug Classifications: Schedule II, stimulant

Official Drug Name: PCP (phencyclidine; pronounced fenn-SICK-luh-deen or fenn-SIKE-luh-deen)
Also Known As: Angel dust, cadillac, dust, embalming fluid, fry
Drug Classifications: Schedule II, hallucinogen

What Kind of Drug Is It?

Designer drugs are illicit (unlawful) and dangerous substances made in illegal labs. It is against the law to make, possess, sell, or use them. The designer drugs discussed here include 2C-B (nexus), ecstasy (MDMA), GHB, ketamine, methamphetamine, and PCP (phencyclidine). (Separate entries on each of these drugs with more in-depth information are available in this encyclopedia.)

Overview

Designer drugs were deliberately created by underground chemists to get around the laws set forth in the U.S. Controlled Substances Act (CSA) of 1970. The CSA called for the federal regulation of certain drugs. Under the terms of the act, all federally regulated substances must be categorized into one of five schedules. These schedules are based on a substance's medicinal value, possible harmfulness, and potential for abuse and addiction.

Schedule I is reserved for the most dangerous drugs that have no recognized medical use. 2C-B, ecstasy (MDMA), and GHB are all Schedule I drugs. Schedule II and Schedule III drugs have limited medical uses when prescribed by a physician, but the possibility of abuse and addiction among users remains a cause for concern. Methamphetamine and PCP are Schedule II drugs, and ketamine is a Schedule III drug.

Gary Henderson, a University of California professor, came up with the term "designer drug" back in the early 1980s. These designer drugs are synthesized, meaning that they are made in labs. As Lawrence Clayton explained in his book *Designer Drugs,* these synthetic substances "are made to mimic the feeling and the 'high' caused by other drugs." However, they "cost less than the drugs they are modeled after."

Illegal Labs

Amateur drug makers sought to create homemade drugs that would not qualify as controlled substances but would still appeal to

Designer drugs are popular at all-night dance parties called raves. The illegal drugs are said to intensify the rave experience and help the user dance longer. Such drugs have been known to cause death among party-goers.

illegal drug users. With a slight change to the chemical structure of a controlled substance, a newly created designer drug would no longer be considered "controlled"—at least not technically. For more than fifteen years after the passage of the CSA, more and more illegal labs sprang up. These labs were "where new drugs that would bypass the CSA could be made," explained Elizabeth Russell Connelly in *Psychological Disorders Related to Designer Drugs.*

In the middle and late 1980s, however, further laws were passed that made designer drugs illegal as well. The U.S. government added existing designer drugs to the Drug Enforcement Administration's (DEA) list of controlled substances. In addition, the 1988 Chemical Diversion and Trafficking Act cut down on the availability of some of the ingredients necessary to concoct designer drugs. "Yet,"

commented Connelly, "designer drugs continue to be manufactured and sold for profit."

The popularity of RAVES in Europe and the United States contributed significantly to the increase in designer drug use. Raves generally appeal to young audiences. The term "club drugs" was coined to describe the many drugs that are often used by ravegoers to heighten the party experience. It is important to note, however, that not all "club drugs" or "rave drugs" are designer drugs, although the terms are often used interchangeably.

Shocking Ingredients

People are often shocked to learn what ingredients are used in designer drugs. Many of the ingredients are products that one would never dream of consuming. One good example is GHB. Few people realize that GHB is synthesized in household laboratories by mixing ingredients such as floor cleaning products, nail polish, and super glue removers with sodium hydroxide in the form of lye. Lye is made from wood ashes and used to make soap. Unintentional poisonings from bad homemade batches of GHB are not uncommon.

What Is It Made Of?

Designer drugs are often made with common household substances by inexperienced drug makers. Connelly reported that "illegal labs have been found in remote mountain cabins and rural farms, as well as in single and multifamily homes in city and suburban neighborhoods. These operations can be moved fairly quickly to new locations, in order to avoid detection by police or federal Drug Enforcement Administration (DEA) agents."

Although the ingredients in them are often quite ordinary, the illegal production of designer drugs is a dangerous business for both the producer and the user. Secret labs have been known to blow up during the drug-making process, and botched batches of drugs can be deadly when ingested. Myra Weatherly, writing in *Ecstasy and Other Designer Drug Dangers,* commented: "These imitation drugs mixed by 'BATHTUB CHEMISTS' can be much more POTENT than the real thing. Not only are these drugs dangerous in themselves, but a goof in the lab—such as overheating a substance—can mean death."

The chemical compositions for the six drugs discussed in this entry are listed below.

- 2C-B: $C_2H_8NO_2Br$
- ecstasy: $C_{11}H_{15}NO_2$
- GHB: $C_4H_3O_3$
- ketamine: $C_{13}H_{16}ClNOHCl$
- methamphetamine: $C_{10}H_{15}N$
- PCP: $C_{17}H_{25}N$

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

bathtub chemists: inexperienced and illegal drug makers who concoct homemade drugs; also referred to as "kitchen chemists" or "underground chemists"

potent: powerful

How Is It Taken?

2C-B, ecstasy, and methamphetamine are usually sold and distributed in tablets or capsules that are swallowed. Users have also been known to crush the tablets and snort these drugs. Methamphetamine addicts often liquefy the powdered form of the drug and inject the mixture directly into their veins.

GHB is usually sold and consumed as a liquid in small glass or plastic bottles (about 30 milliliters in size). This reportedly provides enough of the drug for three moderate doses. GHB can also be purchased in capsule form or as a powder packaged in a bag. Because it is both odorless and colorless, GHB often goes undetected when added to a drink. It has been used in cases of date rape.

When used by physicians or veterinarians as an ANESTHETIC, ketamine comes in liquid form and is packaged in small glass vials. Illicit drug users often inject the liquid into their veins, but some abusers dry out the substance by cooking it, then crush and snort it.

PCP is available in the form of tablets, capsules, liquid, and powder. In its base form, PCP is a white crystalline powder that is snorted, pressed into tablets, or mixed together with water or alcohol. The liquid form is often sprayed on leafy material such as oregano, mint, or marijuana and sold to users in the form of joints to be smoked. (Separate entries on alcohol and marijuana are included in this encyclopedia.)

Are There Any Medical Reasons for Taking This Substance?

The Schedule I drugs 2C-B, ecstasy, and GHB had no known medical uses for humans as of 2005.

Ketamine, a Schedule III drug, was approved for use as an anesthetic in animals and humans in 1970. About 90 percent of legally sold ketamine is intended for veterinary use.

Methamphetamine produced by legal drug companies is available with a doctor's prescription for the treatment of NARCOLEPSY and ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD). It is categorized as a Schedule II stimulant.

PCP is also a Schedule II drug. At one time, it was given to surgical patients as an anesthetic. Because of disturbing psychological side effects, however, it is no longer used for that purpose. As of the early 2000s, PCP was being investigated for potential use in patients who have suffered a heart attack or a stroke.

anesthetic: a substance used to deaden pain

narcolepsy: a rare sleep disorder characterized by daytime tiredness and sudden attacks of sleep

attention-deficit/hyperactivity disorder (ADHD): a disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning

Erin Rose, left, appears with her mother, Maryanne, at a press conference to warn others about the dangers of ketamine use. Rose suffered brain damage after using ketamine. *AP/Wide World Photos.*

Usage Trends

"New designer drugs are being developed all the time," noted Clayton, as are new ways to market these drugs. According to "Pulse Check," a publication of the Executive Office of the President, the Internet is playing an increasingly large part in the sale of designer drugs. The "Pulse Check," report, which was published in 2004, states that "law enforcement is way behind dealers and users technologically, especially at the local and state levels."

Designer drug use seemed to explode between the 1990s and 2002. Drug Abuse Warning Network (DAWN) statistics tell the story. According to DAWN, annual hospital emergency room visits associated with club and designer drug use jumped from a few hundred or less in 1995 to several thousand or more in 2002. Most statistics available on designer drug use are delayed by a year or two.

As of 2005, however, reports showed that designer drug usage was going down. The 2004 Monitoring the Future (MTF) survey and the 2003 National Survey on Drug Use and Health (NSDUH) both reported an overall decrease in users of drugs such as ecstasy and GHB.

Effects on the Body

"Every designer drug," noted Weatherly, "has the potential to kill the user." Strength and purity of dosages varies from batch to batch, and from dealer to dealer. So, a user who feels that a particular designer drug is "safe" based on prior use can never be sure what the next dose will be like. In addition, the long-term effects of these drugs on the body remain unknown. According to a 2005 report from "NIDA InfoFacts," however, "current science . . . is showing changes to critical parts of the brain" from the use of ecstasy, GHB, and ketamine, among other drugs.

2C-B

Small doses of 2C-B reportedly produce relaxation in the user, but larger doses may bring on HALLUCINATIONS. Recreational users—those who use the drug to get high—say that 2C-B greatly heightens their reaction and sensitivity to music and enhances the enjoyment of dancing. At high doses, however, some users report seeing horrifying images, and others experience panic attacks. Such attacks are unexpected episodes of severe anxiety that can cause physical symptoms such as shortness of breath, dizziness, sweating, and shaking.

2C-B is also associated with increased feelings of anger and PARANOIA. The mood-altering effects of the drug can last for days. Unpleasant physical side effects of 2C-B use include nausea, diarrhea, cramps, and gas.

Ecstasy

Ecstasy probably has the highest name recognition among designer drugs. Known to many as the "hug drug," ecstasy lowers INHIBITIONS and encourages people to act on their impulses. Its use has been linked to casual sexual encounters, which can contribute to the spread of HIV (the human immunodeficiency virus) and eventually AIDS (acquired immunodeficiency syndrome).

The side effects of ecstasy may include nausea, dizziness, confusion, and anxiety. The drug acts on the body's muscular system, causing muscle tension, involuntary teeth clenching, and rapid eye movement. "Ecstasy deaths are a fact of life," noted Decca Aitkenhead in the *Independent.* High doses of the drug can bring on

hallucinations: visions or other perceptions of things that are not really present

paranoia: abnormal feelings of suspicion and fear

inhibitions: inner thoughts that keep people from engaging in certain activities

Ecstasy is classified as a Schedule I drug, meaning that it is illegal and has no recognized medical value.

hyperthermia, a dangerously high increase in body temperature. This condition can damage internal organs such as the liver, kidneys, heart, and even the brain. Drug researchers have confirmed that ecstasy has the potential to cause permanent brain damage.

Because of high demand, ecstasy pills are frequently mixed with fillers and other active substances, most commonly amphetamines and caffeine. (Separate entries on these drugs are available in this encyclopedia.)

GHB

GHB was sold over-the-counter in the mid-1980s and used mainly by bodybuilders seeking to bulk up their muscles. The DEA later banned the drug. Recreational users report increased sociability, relaxation, and a positive mood while on GHB. People taking the substance often become talkative and giddy. They may become incoherent or hard to follow. Slurred speech is also common.

To help people test their drinks for possible date rape drugs such as GHB, various companies have developed testing kits. The effectiveness of such tests is highly debated, however. *AP/Wide World Photos.*

Because it is a depressant, GHB can bring on breathing difficulties, seizures, brain damage, and even comas in users who overdose. The drug becomes even more toxic when mixed with alcohol or other nervous system depressants such as BENZODIAZEPINES, painkillers, allergy medications, or sleeping pills. Combining even a low GHB dose with alcohol can trigger an overdose, leaving the user unconscious and barely breathing. Such effects have led to the use of GHB as a date rape drug.

Ketamine

benzodiazepines: a type of drug used to treat anxiety

The effects produced by ketamine are intense, but they do not last for long. This drug is often used as a booster to draw

out the desired effects of other drugs. Because ketamine is an anesthetic, it produces significant effects when taken alone. Abusers of ketamine report immediate effects including numbness all over the body, altered vision, muffled hearing, and a floating sensation. The drug takes effect so quickly that users may collapse suddenly, injuring themselves in the process. After using the drug once, many people will never use it again, at least not knowingly. At higher doses, ketamine leads to hallucinations, the onset of a dreamy state, and so-called "out-of-body experiences." Some users have claimed they saw visions of angels after taking ketamine.

Combining ketamine with drugs such as alcohol or BARBITURATES can create a life-threatening situation. (A separate entry on barbiturates is included in this encyclopedia.) Users mixing these drugs risk slowing their breathing and heart rates to dangerously low levels. This can starve the brain of oxygen, thus increasing the chances of permanent brain damage, coma, or death.

Methamphetamine

Methamphetamine is taken illicitly for its HALLUCINOGENIC "feel-good" effects. Even small amounts of the drug are said to produce extreme alertness, increased energy, decreased appetite, and EUPHORIA. Such effects are those generally sought by users.

Methamphetamine reduces users' inhibitions and increases their sensitivity to sound, light, and touch. Because it is a stimulant, which increases activity, this drug gives club-goers energy to dance well into the morning hours. Some users stay awake for two to three days while on a meth binge. People also report feeling especially witty, clever, and in control while under the influence of methamphetamine.

Methamphetamine users often want to extend the high brought on by the drug. The so-called "crash" that results when the effects wear off is quite unpleasant. Irritability, confusion, anxiety, and difficulty sleeping are common side effects.

Methamphetamine is highly addictive, and users who try to quit typically suffer from WITHDRAWAL symptoms. These include severe depression, extreme anxiety, tiredness, tremors, convulsions, aggression, and intense drug cravings. Long-term abuse of methamphetamine may cause dangerously high blood pressure, INSOMNIA, paranoia, and violent behavior that sets the stage for users to harm themselves or others.

barbiturates: pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers"

hallucinogenic: ability to bring on hallucinations, which alter the user's perception of reality

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

insomnia: difficulty falling asleep or an inability to sleep

When police raid methamphetamine labs, they have to wear protective suits because the chemicals used in the product are considered hazardous materials. Bottles of the drug seized in a raid in Tennessee are shown here. *AP/Wide World Photos.*

PCP

PCP is another veterinary anesthetic used illicitly as a PSYCHEDELIC DRUG. Individual responses to PCP at low and moderate doses are varied. Users generally feel detached and distant when they first take the drug, and later experience a surging sense of power and strength.

Some users report having bizarre hallucinations—seeing people with enlarged or detached heads and limbs—and disturbing feelings of isolation and numbness. Because PCP users typically cannot feel pain when under the influence of the drug, they may engage in acts of self-mutilation or violence. Self-mutilation involves deliberately cutting or injuring oneself in some way.

psychedelic drug: a drug that can produce hallucinations and distort reality

At high doses, PCP prompts a drop in blood pressure, pulse rate, and breathing. These reactions may be accompanied by nausea, vomiting, blurred vision, uncontrolled eye movement, drooling, loss of balance, seizures, coma, and death. Taking PCP in combination

with depressants such as alcohol or benzodiazepines increases the risk of overdose.

Reactions with Other Drugs or Substances

Designer drugs are rarely taken alone. This complicates matters for paramedics, emergency room doctors, and nurses in cases of overdose. If medical personnel cannot pinpoint which drugs the user has taken, it makes treatment of the overdosing patient much more difficult.

Dosage Confusion

The effects of many designer drugs can be tripled or quadrupled in intensity with only minor increases in dosage. A 150-milligram dose of ecstasy, for example, can produce double the effects of a 120-milligram dose. Because most designer drugs are manufactured in illegal laboratories and are usually cooked up by inexperienced drug makers, the concentration of active ingredients in each batch can vary significantly.

Treatment for Habitual Users

Drug addiction is curable. Common forms of treatment include individual therapy, group therapy, day-long outpatient programs, and short-term inpatient programs. The National Institute on Drug Abuse (NIDA) confirms that the most successful drug rehabilitation programs are those that tailor treatment to the user. Connelly pointed out that "individual therapy may uncover issues of poor self-esteem, depression, severe family problems, and/or preexisting psychological disorders" that are at the root of an individual's drug use. The primary goals of therapy include helping the patient to quit drugs, improving the patient's coping abilities and outlook on life, and reducing the risk of relapse.

Consequences

Frequent drug users often find that their habit damages their relationships with family members and friends who do not use drugs. School-related and work-related performance may also suffer as physical or PSYCHOLOGICAL DEPENDENCE on drugs progresses. Repeated use of certain drugs brings about dramatic changes in both the structure and function of the brain. Methamphetamine use leads to extreme dependence that can quickly turn a recreational user into an addict. Many designer drugs (ecstasy, GHB, ketamine, and PCP) have the potential to produce hallucinations that can trigger traumatic emotional episodes in some users.

psychological dependence: the belief that a person needs to take a certain substance in order to function

Designer Drug Lingo

Designer drug talk has its own vocabulary. Here are some examples:

- Ketamine is frequently mixed with a stimulant like cocaine or methamphetamine. When taken at the same time, this combination is referred to as "trail mix."
- "Candy flipping," or the practice of using ecstasy and the hallucinogenic drug LSD together, has landed many users in the hospital.
- "Embalming fluid" is a common street slang term for PCP. Confusion about the origin of the term may have led to a dangerous trend: experimental drug users have actually mixed PCP with formaldehyde (or other embalming chemicals) and used it as a recreational psychoactive drug—a drug that alters the user's mental state or changes behavior.
- Hospitals report that the physical effects of highs associated with "wet" or "dipsticks" (marijuana rolled into joints that are then dipped in embalming fluid) are nearly identical to those long associated with PCP use.

The Law

Under the Controlled Substances Act, the manufacture, distribution, and possession of designer drugs carries the same penalties as the manufacture, distribution, and possession of controlled substances.

Anyone who possesses, manufactures, or sells a Schedule I drug risks hefty fines and a prison sentence of twenty years. Repeat offenders receive even harsher punishment. If the drug manufactured or sold by someone results in a user's death, the drug maker and dealer risk life in prison. 2C-B, ecstasy, and GHB are considered Schedule I drugs.

Involvement with Schedule II and Schedule III drugs is also illegal and can result in jail terms and thousands of dollars in fines. The designer drugs methamphetamine and PCP are Schedule II drugs. Ketamine is a Schedule III drug.

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See also: 2C-B; Ecstasy (MDMA); GHB; Ketamine; Methamphetamine; PCP (Phencyclidine)

Dextroamphetamine

Official Drug Name: Dextroamphetamine (DEKS-troh-am-FETT-uh-meen), D-amphetamine, dextroamphetamine sulfate (Dexedrine [DEKS-uh-dreen], DextroStat [DEKS-troh-statt])
Also Known As: Copilots, dexies, go-pills, pep pills, speed, uppers
Drug Classifications: Schedule II, stimulant

What Kind of Drug Is It?

Dextroamphetamines are stimulants—substances that increase the activity of a living organism or one of its parts. Stimulants create a temporary "HIGH" that elevates users' moods, but these effects do not last long. A "low," which can sometimes be overwhelming, follows once the drug's effects wear off.

Like other AMPHETAMINES, dextroamphetamines also give people more energy, allowing them to do more and stay awake longer without getting tired. This effect of "speeding up" people's actions explains how the drugs came to be known by the street names "go-pills," "pep pills," "speed," and "uppers."

Overview

Dextroamphetamines are addictive drugs that have a high rate of abuse. The prefix "dextro" in the drug name dextroamphetamine refers to dextrose, a type of sugar. Dextroamphetamines are simply amphetamines that contain sugar molecules. (An entry on amphetamines is also available in this encyclopedia.)

The history of amphetamines stretches back to the late nineteenth century. The drug was first synthesized, or made in a laboratory, in 1887. However, it was not used until 1932 when the drug manufacturer Smith, Kline and French introduced Benzedrine. Packaged as an over-the-counter inhaler, the amphetamine drug Benzedrine helped relieve nasal congestion.

Dextroamphetamine: The Drug with Multiple Uses

Throughout the 1930s, doctors in Europe prescribed amphetamines to treat colds, hay fever, and asthma. That same decade, amphetamines became available in tablet form for the treatment of the daytime sleeping disorder known as NARCOLEPSY, a fairly rare condition that causes people to fall asleep quickly and unexpectedly. Later, many Americans became hooked on amphetamines—specifically the dextroamphetamine sulfate Dexedrine—after finding that users could lose weight quickly and effortlessly. Only then did researchers begin to realize that these drugs could be dangerous and addictive.

high: drug-induced feelings ranging from excitement and joy to extreme grogginess

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

narcolepsy: a rare sleep disorder characterized by daytime tiredness and sudden attacks of sleep

One of dextroamphetamine's street names is "copilot." The drug is still routinely used by Air Force pilots on long missions to help keep them awake and alert. *© Aero Graphics, Inc./Corbis.*

During World War II (1939–1945), amphetamines were distributed among soldiers from the United States, the United Kingdom, Germany, and Japan to keep them awake and alert on the battlefield. Back on the home front, people who worked in factories manufacturing goods for the war effort were also using the drug to boost their productivity. After the war, use of the drug continued, both in the United States and abroad.

Access to Amphetamines Is Restricted

Amphetamines and dextroamphetamines became the drug of choice for people who needed a lift or who needed to stay alert.

Night-shift workers, students cramming for exams, and truck drivers on long hauls were among the most common users. The addictive nature of the drugs contributed to the growing demand for them. In 1970, drug companies in the United States produced about 12 million amphetamine tablets. A large percentage of these drugs fell into the wrong hands and made their way to the BLACK MARKET. That year, the U.S. Congress passed the Controlled Substances Act (CSA) in an effort to stop the huge increase in drug use. The new law restricted the use of amphetamines and classified them as Schedule II drugs—drugs with genuine medical uses that nevertheless possess a high potential for abuse and dependency.

What Is It Made Of?

All amphetamines are SYNTHETIC, or manufactured, substances. They cannot be grown in a garden or dug up from the ground. The composition of amphetamine pills or capsules is actually a combination of various types of crystalline compounds called amphetamine salts. The difference between amphetamine and dextroamphetamine is a few molecules of dextrose, which is a type of sugar.

The chemical formula for dextroamphetamine is $(C_9H_{13}N)_2$. The chemical formula for dextroamphetamine sulfate is $C_{18}H_{28}N_2O_4S$.

How Is It Taken?

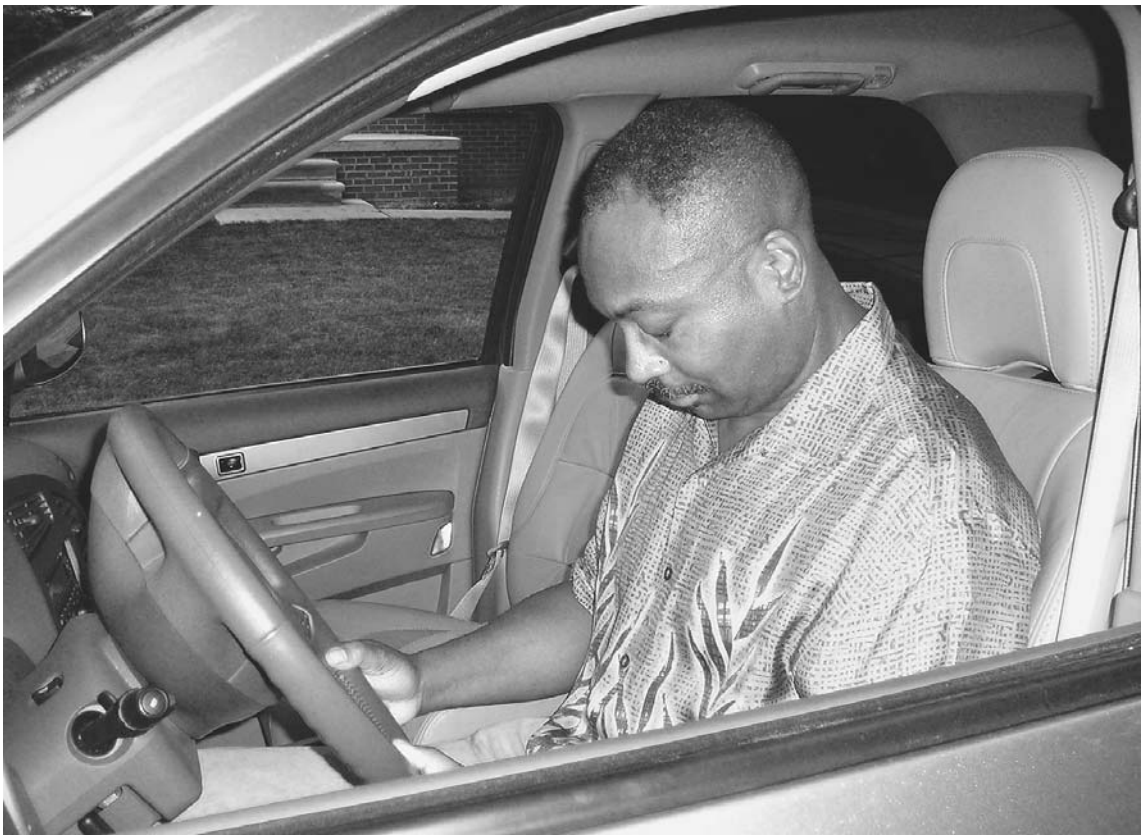
Dextroamphetamine sulfate is manufactured in capsule and tablet form and is usually swallowed. Dexedrine capsules have one brown end and one clear end and are filled with two types of tiny drug pellets. One type of pellet dissolves shortly after the capsule is ingested. The other type is time-released, allowing for a gradual release of the rest of the medication throughout the day. The capsules are available in 5-milligram, 10-milligram, and 15-milligram doses. Dexedrine also comes in tablet form. The 5-milligram pills are triangular and orange. DextroStat, another dextroamphetamine sulfate, is only available in 5-milligram and 10-milligram tablets. The pills are yellow and round.

For the treatment of narcolepsy, patients are typically prescribed 5 milligrams to 60 milligrams of dextroamphetamine per day. Patients age six or older with ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) usually take 5 milligrams to 40 milligrams per day, depending on their age and response to the drug. The youngest ADHD patients—ages three to five—may be given half of a 5-milligram tablet.

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

synthetic: made in a laboratory

attention-deficit/hyperactivity disorder (ADHD): a disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning

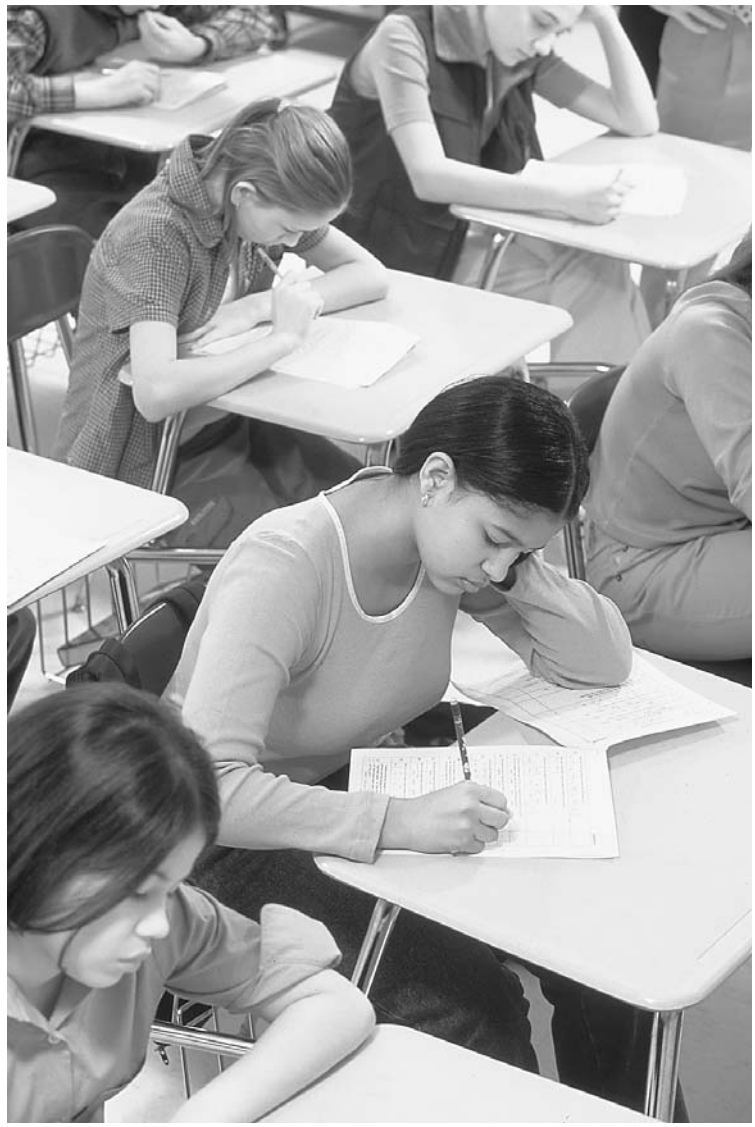


Dextroamphetamine is prescribed for the treatment of narcolepsy, a rare sleeping disorder characterized by daytime tiredness and sudden attacks of sleep. People with narcolepsy have been known to fall asleep while driving, talking, and eating, among other things. *Photograph by Leitha Etheridge-Sims.*

Are There Any Medical Reasons for Taking This Substance?

Amphetamines such as Dexedrine and DextroStat (dextroamphetamine sulfate) and Adderall (a combination of amphetamine and dextroamphetamine sulfate referred to as a "mixed amphetamine") are used to treat ADHD and narcolepsy. (An entry on Adderall is also available in this encyclopedia.) Dextroamphetamines are useful in the treatment of ADHD because they improve the user's ability to concentrate. The drug helps patients with narcolepsy by speeding up bodily functions and increasing alertness.

In the 1970s, dextroamphetamines were approved for use as antiobesity drugs. Because they decrease feelings of hunger in people who



Some students use dextroamphetamines to help them stay alert when cramming for tests. Other students believe that using drugs to improve school performance is cheating. Should students be checked for drugs before taking tests? This question is of concern to many students, parents, and teachers. *© Gabe Palmer/Corbis.*

take them, dextroamphetamines and other amphetamines have often been abused by dieters. This is exactly what happened with Dexedrine. By the start of the twenty-first century, research was underway on a variety of different diet pills. Dextroamphetamines like Dexedrine, however, were no longer being prescribed for weight loss in the United States.

Usage Trends

Problems undoubtedly develop when dextroamphetamine pills and capsules are taken by individuals who have no medical need for the drug. All amphetamines are PSYCHOSTIMULANTS, meaning that they act primarily on the brain. Amphetamines are extremely addictive, and high doses can affect the brain in negative ways. Regardless of the dangers, their power to increase concentration and decrease the need for sleep has led to a new trend known as stimulant "sharing." (See separate entries in this encyclopedia on "Adderall" and "Ritalin and Other Methylphenidates.")

Reports from the United States, Canada, and the United Kingdom in the first five years of the twenty-first century indicate that prescription dextroamphetamines are being shared—or sold—among adolescents and college students. ILLICIT drug users claim they receive the stimulants from other young people who use them for medical purposes. In some cases, the drugs are stolen or simply lifted from the family medicine cabinet.

The reasons for the abuse of dextroamphetamines at the high school and college levels vary. Nicholas Zamiska commented in the *Wall Street Journal* that the "unapproved use" of drugs like Adderall seem to stem from increased pressure on students to perform well on standardized tests. Illicit RECREATIONAL DRUG USE occurs as well.

Major Studies on Amphetamine Use and Abuse

DAWN and NSDUH: The Drug Abuse Warning Network (DAWN) operates through the Substance Abuse and Mental Health Services Administration (SAMHSA), a division of the U.S. Department of Health and Human Services. DAWN monitors drug-related visits to hospital emergency departments (EDs). In the last two quarters of 2003, the DAWN report estimated that the use of stimulants resulted in 42,538 emergency department visits in 260 hospitals across the United States. Of those visits, 18,129 of them were attributed directly to amphetamines and dextroamphetamines.

SAMHSA's own annual study, known as the National Survey on Drug Use and Health (NSDUH), tracks nonmedical drug use among

psychostimulants: pronounced SY-koh-STIM-yew-lents; stimulants that act on the brain

illicit: unlawful

recreational drug use: using a drug solely to achieve a high, not to treat a medical condition

Americans of all ages. The latest statistics available from SAMHSA as of mid-2005 were from 2003. That year, 4 percent of all youths age twelve to seventeen reported using prescription-type drugs, including stimulants. The percentage was higher among eighteen- to twenty-five-year-olds. Six percent of this age group admitted to using prescription drugs for nonmedical reasons. About 1.9 percent of adults age twenty-six and older reported illicit prescription drug use.

Generation Rx?: On April 21, 2005, the Partnership for a Drug-Free America (PDFA) released the findings of its 2004 study on the abuse of drugs among U.S. teenagers. The PDFA's Partnership Attitude Tracking Study, better known as PATS, indicated that the trend in teen drug use in the early part of the twenty-first century involves prescription (Rx) and over-the-counter (OTC) medications. The authors of the study see this as a sign that "Rx and OTC medicine abuse has penetrated teen culture."

Millions of teens are using prescription drugs without a doctor's order, prompting the media to dub these young adults "Generation Rx." According to PATS, 10 percent of American teenagers, or 2.3 million young people, have tried prescription stimulants like Adderall without a doctor's prescription. The teens in the study reported that they obtained the stimulants from fellow classmates or from their own home medicine cabinets.

Monitoring the Future . . . **and Beyond:** The PATS statistics mirror the results of the 2004 Monitoring the Future (MTF) study. An annual survey of drug use among eighth, tenth, and twelfth-grade students, the MTF is performed by the University of Michigan and funded by the National Institute on Drug Abuse (NIDA). Although amphetamine use was down slightly among eighth and tenth graders, about 10 percent of high school seniors reported recreational use of the drug in 2004.

A study conducted by University of Michigan Substance Abuse Research Center scientists, detailed in the journal *Addiction* in 2005, tracked the usage of amphetamines beyond high school. Of nearly 11,000 randomly selected college students, 6.9 percent of them reported nonmedical prescription stimulant use at least once in their lives. About 4.1 percent admitted using prescription stimulants in the past year, and 2.1 percent used them in the past month. The authors of the study concluded that "high-risk behavior" such as this "should be monitored further." They added, "intervention efforts are needed to curb this form of drug abuse."

Blurred vision is one of the side effects of taking high doses of dextroamphetamine. Other medical problems that can result include fever, an unusually fast heartbeat, chest pain, nervous tics, tremors, moodiness, and even aggression.

Effects on the Body

Common side effects of dextroamphetamine use include dry mouth, headache, nausea, dizziness, restlessness, increased blood pressure and pulse rate, loss of appetite, difficulty sleeping, and either diarrhea or constipation. Higher doses can result in fever, an unusually fast heartbeat, chest pain, blurred vision, TICS, tremors, moodiness, and even aggression.

Amphetamine Psychosis

High-dose dextroamphetamine abusers can develop "amphetamine psychosis" after a week or so of continuous use. Amphetamine PSYCHOSIS affects the way the mind functions, causing feelings of severe PARANOIA, and all kinds of hallucinations—visual, auditory, and tactile. Tactile hallucinations make the user feel as if bugs, worms, or snakes are crawling on their skin. Such

tics: repetitive, involuntary jerky movements, eye blinking, or vocal sounds that patients cannot suppress on their own

psychosis: pronounced sy-KOH-sis; a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined

paranoia: abnormal feelings of suspicion and fear

Finding the Right Treatment

Dextroamphetamines such as Dexedrine and amphetamine/dextroamphetamine mixtures such as Adderall are commonly prescribed by physicians to treat ADHD. Finding the right drug to treat a child or an adult with ADHD is often a process of "trial and error." Doctors try one drug, observe the effects, and decide whether an alternate form of treatment is advisable.

Establishing a safe and effective drug treatment can be especially difficult when it comes to children. Some evidence indicates that children experiencing ADHD-like symptoms may actually be suffering from severe anxiety, or a severe state of fear or worry, which is worsened by the use of stimulants. In these very rare cases, amphetamines and dextroamphetamines can cause overstimulation in the child.

In one case reported in the May 2004, issue of *Pediatrics,* doctors raised the question about whether dextroamphetamines may have contributed to psychotic behavior in a seven-year-old ADHD patient. His symptoms, including extreme agitation, an elevated temperature, ranting and raving, and hallucinations, all disappeared when the stimulant prescription was discontinued and an anti-anxiety drug was administered. Results such as these suggest that the child was suffering from severe anxiety rather than ADHD, even though his symptoms mirrored those of a typical ADHD patient.

sensations are very real, and therefore extremely frightening, to the individual who is experiencing them. As a result, violent reactions sometimes occur during amphetamine psychosis. Once the amphetamine abuser is free of the drug, however, the psychosis goes away. Symptoms such as mental confusion and memory problems may linger, however.

Monitoring Dosage

When used for medical purposes, dextroamphetamines are prescribed at the lowest possible dosage. The dosage is then raised gradually by a doctor until the desired action is achieved. All amphetamines are highly addictive. According to the 59th edition of the *Physicians' Desk Reference:* "There are reports of patients who have increased the dosage to many times that recommended," leading to "tolerance, extreme PSYCHOLOGICAL DEPENDENCE, and severe social disability."

Tolerance occurs when it takes more and more of the drug to achieve the effect or high originally produced by smaller doses. Tolerance to amphetamines can occur quickly and often leads to overdose. Symptoms of dextroamphetamine overdose include extreme confusion and anxiety, hallucinations, severe tics or shaking, an irregular heartbeat, extremely high blood pressure, vomiting, stomach cramps, convulsions, and coma. An overdose of dextroamphetamine—or any other amphetamine, for that matter—can be fatal.

Dextroamphetamine as a Treatment for ADHD

Amphetamines and dextroamphetamines typically give the user a boost of energy. In people with attention-deficit/hyperactivity disorder (ADHD), however, these very same drugs help to calm them down, allowing them to better focus their energy. Individuals with ADHD typically have a short attention span, and they tend to get distracted quite easily. They may also show signs of

psychological dependence: the belief that a person needs to take a certain substance in order to function

hyperactivity, impulsive behavior, and emotional instability. It can be a challenge for people with untreated ADHD to concentrate their attention and control their behavior. Drugs like Dexedrine, a dextroamphetamine sulfate, and Adderall, a combination of amphetamine and dextroamphetamine salts, help manage the symptoms of ADHD by acting on the part of the brain that decides when and how to act.

According to an article in *Phi Delta Kappan,* it is essential that parents or caregivers of children and teens with ADHD: 1) be informed about the effects of the drugs that have been prescribed for treatment; 2) know the consequences that might arise if these drugs are discontinued; and 3) accept the responsibility to stay in close touch with the child's doctor and therapist. In most cases, drug treatment for ADHD must be combined with some sort of counseling or therapy to achieve the highest success rates. One of the most popular and successful therapeutic methods as of 2005 was COGNITIVE BEHAVIORAL THERAPY (CBT), or "talk" therapy. Cognitive behavioral therapy helps patients develop better coping skills and change their negative patterns of thinking and behavior into positive ones.

Reactions with Other Drugs or Substances

The stimulating effects of dextroamphetamine can be intensified when the drug is combined with other stimulants such as cocaine or nicotine. (Entries on cocaine and nicotine are also available in this encyclopedia.) Dextroamphetamines should never be mixed with alcohol or other depressants.

Some medications can cause severe reactions in the user when mixed with stimulants. In addition, people with certain medical conditions should stay away from these drugs. Specifically, dextroamphetamines should not be taken by pregnant women, nursing mothers, or individuals with any of the following conditions:

- heart disease
- high blood pressure
- THYROID disease
- TOURETTE'S SYNDROME, or any other tic disorder
- a history of drug abuse
- depression that is being treated with prescription drugs
- severe pain that is being treated with the prescription drug meperidine. (A separate entry on meperidine is available in this encyclopedia.)

cognitive behavioral therapy (CBT): a type of therapy that helps people recognize and change negative patterns of thinking and behavior

thyroid: an important gland, or group of cells, in the body that secretes chemical messengers called hormones; these hormones control metabolism, the process by which food is converted to energy that the body uses to function

Tourette's syndrome: a severe tic disorder that causes distress and significant impairment to those affected by it

Patti Davis (right), daughter of Nancy Reagan (left) and former U.S. President Ronald Reagan, battled a drug addiction when she was younger. During her husband's presidency, Nancy Reagan became a spokesperson for the "Just Say No" to drugs campaign. *AP/Wide World Photos.*

Treatment for Habitual Users

WITHDRAWAL from amphetamines can be a long and difficult process for many users. Psychological dependence is made even worse by the intense cravings for the drug that users experience. Unpleasant and sometimes frightening symptoms develop as the body tries to adjust to the absence of the stimulant. The withdrawal process causes depression and may also bring on fatigue, vivid dreams, irregular sleep patterns, and increased appetite.

Experts in the treatment of substance abuse and addiction report that behavioral therapy and emotional support are essential for the successful rehabilitation of amphetamine abusers. An individual recovering from drug addiction must avoid all psychoactive drugs, including alcohol. Amphetamine and dextroamphetamine cravings can be extremely powerful and may last for years after a former user has kicked the habit.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

Patti Davis, daughter of former U.S. President Ronald Reagan and his wife, Nancy, talked about her past drug addiction in the article "Dope: A Love Story" in *Time* magazine. In the article, Davis wrote that she often wondered "why the world is so hard for some

people" that they "run for the refuge of drugs." This observation shows why an effective drug rehabilitation program must help patients identify and deal with the underlying emotional issues surrounding their drug use.

The reasons for drug use are numerous. *The Merck Manual of Medical Information* noted that "some amphetamine abusers are depressed and seek the mood-elevating effects of these stimulants to temporarily relieve the depression." Davis pointed out that some people are afraid of the world. Drugs "take you away—far away; they let you hide, which is what frightened people do," she commented. Recovering drug abusers need a solid support system to remain drug free.

Consequences

Amphetamine addicts frequently allow their need for the drug to take over their lives. Users can become so obsessed with satisfying their drug habit that they ignore the most important people in their lives. Relationships with family and friends frequently deteriorate, and money problems may begin to develop as the addiction grows. In general, substance abuse is associated with increased rates of school failure, theft (usually to fund the drug habit), domestic violence, sexual assault, unemployment, and homelessness. People who are high on amphetamines are more likely to engage in risky behavior than people who do not take drugs. This can contribute to the spread of sexually transmitted diseases, including HIV (the human immunodeficiency virus, which can lead to acquired immunodeficiency syndrome [AIDS]).

The Law

Abuse of any amphetamine can have serious legal consequences. Amphetamines are controlled substances, meaning their use is regulated by certain federal laws. Under the terms of the Controlled Substances Act (CSA) of 1970, amphetamines are classified as Schedule II drugs. Schedule II drugs are prescription medications that have genuine medical uses but also pose a high risk for abuse and addiction. Schedule II drugs like dextroamphetamines require a doctor's prescription and carry a warning that states they "should be prescribed or dispensed sparingly." Pharmacies and hospitals that dispense Schedule II drugs must register with the U.S. Drug Enforcement Administration. In addition, limits are placed on the amount of dextroamphetamine produced by manufacturers for the United States each year.

"Go-Pills" and the Military

Dextroamphetamines have a long history of use by the military and were even given to astronauts to fight motion sickness and fatigue during space flights. The drug's routine use by air force pilots has given new meaning to the term "copilot," one of several street names for dextroamphetamine.

The U.S. Air Force has used Dexedrine, known in military circles as "go-pills," since 1960. A 1995 report from Langley Air Force Base revealed widespread amphetamine use in Operation Desert Storm. Gene Collier, writing in the *Post-Gazette,* reported that 60 percent of U.S. pilots in the Gulf War said they took Dexedrine during their missions. In a study performed by the U.S. Army Aeromedical Research Laboratory in 2000, one pilot was able to stay awake for sixty-four hours straight by taking Dexedrine.

Dextroamphetamine reportedly improves alertness and flight performance by fighting fatigue, confusion, and air sickness in the cockpit. It has been shown to increase accuracy, improve short-term memory, and speed up reaction time. But Dexedrine, like all amphetamines, is a habit-forming drug with potentially serious side effects. A tragic incident occurred in 2002 involving two American pilots who were taking the drug. This incident called the use of Dexedrine by the military into serious question.

Deadly Consequences

The two pilots, Major Harry Schmidt and Major William Umbach, were flying separate F-16s back from a mission in Afghanistan. On the night of April 17, 2002, twelve Canadian soldiers in Afghanistan were hit by a quarter-ton bomb dropped by Major Schmidt from his F-16. Four of the soldiers were killed, the other eight were wounded. The Canadians had been conducting a live-fire exercise with anti-tank guns that night—an exercise that U.S. Air Force officials apparently had been told about earlier. According to the Canadian inquiry report on the case, as reported by *CBC News*, "Until the moment the bombs struck, Canadian forces had no knowledge of impending danger."

Both U.S. pilots stated that they believed they were under attack when they saw the flashes of gunfire on the ground below. Schmidt wanted

Since the passage of the CSA, according to Andrew Weil and Winifred Rosen in *From Chocolate to Morphine,* "most cases of amphetamine abuse have involved legally manufactured and prescribed drugs." Most of the illicit dextroamphetamine supply, then, comes from actual prescriptions that are obtained, used, and sold illegally.

Anyone convicted of transporting or dealing in dextroamphetamine in the United States faces up to twenty years in prison and a hefty fine for a first offense. Repeat offenders face even stiffer penalties. In the United Kingdom, amphetamines are designated a class B drug under the 1971 Misuse of Drugs Act. Possession carries a penalty of imprisonment for three months to five years, and dealing carries a sentence of six months to fourteen years, along with a possible fine.

U.S. Air Force pilots Harry Schmidt (left) and William Umbach were involved in a "friendly fire" incident in Afghanistan. *AP/Wide World Photos.*

to return fire, but, according to the *Post-Gazette,* was told by Umbach, "Let's just make sure that it's not friendlies, that's all." By "friendlies," Umbach was referring to soldiers fighting on the same side as the Americans. Cockpit voice recordings indicate that Major Schmidt was instructed to hold his fire, but he remained convinced that he was under attack and responded, "I am rolling in in self-defense."

The American pilot who dropped the 500-pound bomb had taken a 20-milligram dose of Dexedrine about an hour before the incident. Some observers felt that the drug "may have been a factor in the decision to drop a bomb on allied soldiers," noted *CBC News.* American Air Force officials argued that hundreds of earlier patrols had been flown safely and successfully over Afghanistan by pilots on Dexedrine.

The outcome of the so-called "friendly fire" case was decided on July 6, 2004. According to *CBC News,* the text of the U.S. Air Force verdict stated that Schmidt exhibited "arrogance and a lack of flight discipline" for not taking "a series of evasive actions and remain[ing] at a safe distance to await further instructions." Instead, he "closed on the target and blatantly disobeyed the direction to 'hold fire.'" Schmidt's actions were deemed "inexcusable," and he was found guilty of dereliction of duty—abandoning duty or showing negligence—for his actions.

The use of Dexedrine by the military remains a hot topic of debate.

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See also: Adderall; Amphetamines; Methamphetamine; Ritalin and Other Methylphenidates

Dextromethorphan

Official Drug Name: d-3-methoxy-N-methylmorphinan (commonly called dextromethorphan, pronounced deks-troh-meth-ORR-fan); sometimes referred to by shortened name DXM
Also Known As: DM, DXM, dex, drex, red devils, robo, robo-tripping, skittles, triple-C, tussin, velvet, vitamin D
Drug Classifications: The U.S. Department of Justice, Drug Enforcement Administration Diversion Control Program does not list dextromethorphan as a controlled substance; it has no Schedule listing

What Kind of Drug Is It?

Dextromethorphan (DXM) is an ingredient in more than 100 over-the-counter (OTC) cold, flu, and cough remedies. It is used specifically to suppress coughs. The drug is widely used in OTC medications because, at normal dosages, it does not produce side effects in most people. Dextromethorphan is a synthetic drug, meaning that it is manufactured in a laboratory.

The chemical is derived from levomethorphan—a synthetic substance that mimics the behavior of OPIATES such as heroin, morphine, or codeine. In its pure form, levomethorphan shows many similarities to the opiates, including the potential for addiction. Separated from the levomethorphan, dextromethorphan loses its painkilling component and is also thought to be non-addicting.

Higher Doses and Dangerous Combinations

Because so many easily purchased products contain dextromethorphan, it can be obtained legally for abuse in higher doses. It is not a controlled substance, and no one needs a prescription to purchase it. Nevertheless, emergency doctors, pharmacists, and law enforcement officials are aware of the problems that the drug can cause when abused. They warn of the drug's potential for producing a whole host of dangerous effects on the brain and central nervous system when taken in high doses or in combination with other drugs or alcohol.

opiates: drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

psychotic behavior: a dangerous loss of contact with reality, sometimes leading to violence against self or others

Dextromethorphan has been described as a "dissociative anesthetic." This means that it is a substance that alters perception. As one young user told *People Weekly* magazine in 2004, "You start feeling numb. And finally, you're gone. You're out of your body. You're not there anymore." This is a basic description of "dissociative" feelings.

The drug is also well known for producing: 1) hallucinations—visions or other perceptions of things that are not really present; and 2) an inability to walk or communicate. In worse case scenarios, the drug has caused PSYCHOTIC BEHAVIOR.

Using dextromethorphan with other drugs from one's medicine cabinet can be dangerous. © *Andrew Brookes/Corbis.*

Robert Finn compared the use of dextromethorphan to the use of the HALLUCINOGENIC drug PCP (phencyclidine) in a 2004 article for *Family Practice News.* Finn wrote: "While some symptoms of DXM intoxication are similar to those of PCP intoxication, there's one important difference: People on PCP are able to walk and they're able to become violent. On the other hand, people on DXM become immobilized." (An entry on PCP [phencyclidine] is also available in this encyclopedia.)

One of the greatest dangers of dextromethorphan use is that it is commonly sold in combination with other medications. These include: 1) acetaminophen (pronounced uh-SEE-tuh-MINN-uh fenn), a non-aspirin pain reliever, such as Tylenol; 2) antihistamines, drugs that block *histamine,* a chemical that causes nasal congestion related to allergies; and 3) guaifenesin (pronounced gwy-FENN-ess-inn) or other EXPECTORANTS. Multi-symptom cold and cough medications are formulated for correct use by the proper dosage. The use of larger doses not only delivers high quantities of dextromethorphan, it can also deliver large doses of the other ingredients. This can lead to nausea, anxiety, and organ damage.

Abusers of dextromethorphan try to find it in preparations that do not contain these other ingredients, sometimes even purchasing it in powdered form from Internet sites. In this

hallucinogenic: ability to bring on hallucinations, which alter the user's perception of reality

expectorants: a cough remedy used to bring up mucus from the throat or bronchial tubes; expectorants cause users to spit up thick secretions from their clogged breathing passages

Dangerous in High Doses

Medications available in the local drug store can be very dangerous, even deadly, when taken in high doses or combined with other drugs. Over-the-counter medications sometimes combine dextromethorphan with other ingredients meant to ease the multiple symptoms of colds and flu. Some of these other ingredients, and their potential as poisons, include:

- Acetaminophen (uh-SEE-tuh-MINN-uh-fenn), a pain reliever such as Tylenol. In high doses, this substance causes severe damage to the liver and other internal organs. It can lead to death.
- Guaifenesin (gwy-FENN-ess-inn), a mucus-thinner and expectorant. In high doses, it causes nausea and vomiting.
- Pseudoephedrine hydrochloride (SUE-doh-ih-FEH-drinn high-droh-KLOR-ide), a decongestant. Overdoses of this medication can lead to nervousness, insomnia, heart palpitations, and breathing problems.
- Chlorpheniramine maleate (KLOR-fenn-ear-uh-mene MAL-ee-ate), an antihistamine such as Chlor-Trimeton. This drug is broken down by the same liver enzyme as dextromethorphan. Overdoses of the two drugs taken together can be fatal.

case, problems arise with doses. Unlike many abused drugs, which act predictably as dosage increases, dextromethorphan works as a "PLATEAU" drug. High doses cause a different set of reactions in the brain than low doses. Thus, a mismanaged use of dextromethorphan can cause an inexperienced abuser to undergo a bewildering hallucination-filled TRIP, possibly ending in a seizure or a coma.

Overview

In 1949, American chemists applied for a patent on dextromethorphan, after having isolated it from its parent drug, levomethorphan, a synthetic OPIOID. During the 1950s, abuse of cough syrups containing codeine was a serious problem for adults and teenagers. This led manufacturers of cough and cold remedies to search for a product that would suppress coughs without causing drowsiness or promoting addiction. Dextromethorphan seemed to be the answer. By 1959, it had won approval by the U.S. Food and Drug Administration (FDA) for use as a cough remedy. In the 1960s, a dextromethorphan-only pill, Romilar, was introduced as an over-the-counter medication. However, it was pulled from the market when its potential for abuse became known.

plateau: a level or step

trip: an intense and usually very visual experience produced by an hallucinogenic drug

opioid: a substance created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine

The World Health Organization (WHO) classified dextromethorphan as a non-analgesic, non-addictive substance in the late 1960s. (An analgesic is a drug that relieves pain.) Yet, pharmaceutical companies decided to use the drug in combination form with other agents. The era of multi-symptom cough, cold, and flu remedies was born, with a variety of products for adults and children.

Cough syrup abuse can lead to many side effects, including double vision. The side effects get worse when dextromethorphan is taken in combination with other drugs.

Lauren Shear/Photo Researchers, Inc.

So Easy to Get

Modern pharmacies, grocery stores, and even convenience stores stock cough remedies with dextromethorphan. The drug can be found in brand-name products such as Coricidin, Robitussin, Vicks NyQuil, Dimetapp DM, Alka-Seltzer Plus Cold and Cough, Sudafed cough products, Tylenol cold products, and Vicks Formula 44. The street names "triple-C" and "skittles" have been coined to describe Coricidin. "Robo-tripping" is slang for abuse of liquid cough syrups such as Robitussin.

According to the Cleveland *Plain Dealer,* reported cases of teen dextromethorphan abuse more than doubled nationwide between 2000 and 2003. An increase of dextromethorphan abuse among teenagers sparked parent groups, legislators, and pharmacies to take action. *Drug Topics* magazine noted that some national chain pharmacies, such as CVS and Wal-Mart, have programmed their computer scanners to ask for an age identification before selling DXM products. Others, including Walgreens, restrict the number of packages a customer can buy. Some drugstores have even moved these medications from the main aisles into the pharmacy area, so the sale of these drugs can be monitored. By September of 2004, several states were considering legislation that would prohibit anyone under the age of eighteen from buying products containing dextromethorphan.

The easy availability of dextromethorphan sometimes makes it the first choice for abuse among teens who might feel uncomfortable buying illegal drugs. However, in high doses it is as dangerous and unpredictable in its effects as PCP and ketamine. (An entry on ketamine is also available in this encyclopedia.)

In the *Palm Beach Post,* Carolyn Susman detailed the "laundry list" of side effects from dextromethorphan abuse, including "DISSOCIATION . . . confusion, dizziness, double or blurred vision, slurred speech, impaired physical coordination, abdominal pain, nausea and vomiting, rapid heart beat, drowsiness, numbness of fingers and toes, and disorientation." This list does not include the even more dangerous symptoms associated with use of dextromethorphan in combination with other drugs.

What Is It Made Of?

Dextromethorphan is a synthetic substance, meaning it is manufactured in a lab. It was first developed by modifying levomethorphan, a non-carbon-containing opioid. While the brain "reads" levomethorphan like an opiate, it does not "read" dextromethorphan the same way. Thus, at recommended doses, dextromethorphan does not cause drowsiness, dizziness, or sedation.

Some people—about seven in every one hundred—have a genetic trait called CYP2D6 deficiency. This is the lack of a liver ENZYME that works to break down dextromethorphan. For these people, even the recommended dose of products containing dextromethorphan can produce unpleasant feelings of anxiety, restlessness, or "jitters." Anyone with the CYP2D6 deficiency who abuses dextromethorphan can experience a psychotic episode, or a period of intense fear, PARANOIA, and powerlessness. People with this enzyme deficiency also face a greater risk of fatal poisoning by dextromethorphan.

How Is It Taken?

Products containing dextromethorphan include pills, cough syrups, and liquid cold and flu medications. Dextromethorphan is not snorted through the nostrils or injected, even in its pure powdered form. Over-the-counter cold and flu remedies list all active and inactive ingredients as well as specific dosage charts. Physicians and pharmacists recommend that patients taking liquid medications use precise measuring cups, often provided with the products, rather than teaspoons or tablespoons from a kitchen drawer. If the product does not come with a measuring cup, pharmacies have them in stock and will provide one upon request.

dissociation: a psychological syndrome in which the mind seems detached from the body; sometimes referred to as an "out of body" experience

enzyme: a substance that speeds up chemical reactions in the body

paranoia: abnormal feelings of suspicion and fear

When taking cough medicine, it is important to measure it precisely to avoid taking too much. Measuring cups are usually provided by the product's manufacturer. *Photograph by Leitha Etheridge-Sims.*

Are There Any Medical Reasons for Taking This Substance?

Dextromethorphan is recommended for quieting coughs. It does not work on the nose or the throat, but rather on the brain and the central nervous system, to lessen the body's chemical signals to cough.

According to a 1997 report in the journal *Pediatrics*, dextromethorphan may not be safe for use in children even though it can be found in pediatric products. First, parents may administer too

much medicine to a child, leading to negative side effects. Second, very young children also have immature livers that cannot properly METABOLIZE dextromethorphan and other cold remedies.

Most important, for children *and* adults, coughs serve a practical purpose. They clear the airways of fluids, allowing for better breathing. Some illnesses, including asthma, cystic fibrosis, allergies, and pneumonia, can actually be made worse by the use of dextromethorphan. The drug is only recommended for brief episodes of coughing, such as those accompanying colds and flu. Patients with chronic, or long-term coughing, should be seen by a doctor.

Usage Trends

Between 2000 and 2003, the number of dextromethorphan abuse cases reported to national poison control centers more than doubled, from 1,623 to 3,271, according to the Cleveland *Plain Dealer.* The vast majority of dextromethorphan abusers are teenagers or young adults. The main way they get the drug is by buying it in over-the-counter medications.

Deaths from Over-the-Counter Drugs?

Since 2000, newspapers and magazines have reported numerous deaths associated with dextromethorphan abuse. A twenty-year-old Colorado man was found dead in his bed of a Coricidin HBP overdose in May of 2004, as reported in the *Rocky Mountain News.* A few months earlier, *People Weekly* magazine detailed the similar death of a twenty-two-year-old college honor student who overdosed on powder he bought on the Internet. The same *People Weekly* article mentioned a fourteen-year-old Colorado boy who was killed by an automobile when trying to cross a busy highway to purchase more pills.

Two mothers who found their teenagers abusing dextromethorphan have started a parents' awareness group in Oregon. One of those mothers told the Eugene, Oregon *Register-Guard:* "What parents should do if their child is on these pills, they need to take them to the doctor or the hospital because of the damage that can be done. Definitely get medical help."

In a scientific study published in the journal *Adolescence,* Momodou N. Darboe suggested that cough syrup provides "an attractive choice for experimental abuse or misuse." Darboe found several reasons for the abuse of over-the-counter cough syrups. First, of course, is availability, then *affordability.* Teens with limited

metabolize: break down to provide energy

spending money—and perhaps a fear of breaking the law—can purchase cough syrups with dextromethorphan.

The second reason for cough syrup abuse, according to Darboe, is the "fear factor." The author explained: "Taking three or more pills of anything bears the threat . . . of suicide. Powders or needles, if not prescribed, are often associated with harder, more addictive, illicit, and dangerous drugs and substances. Since cough syrup, on the other hand, [does not have] these qualities or connotations, it is relatively easier for a curious teenager to [want] to experiment with it."

Darboe made another observation in the *Adolescence* report. According to the author, "other studies show abuse of licit [legal] drugs to be a precursor of illicit drug use." Put simply, a person who takes chances abusing dextromethorphan, an easily obtainable drug, may be more likely to begin taking illegal and more addictive drugs.

Signs of DXM Abuse

To help people know if someone they care about is abusing DXM, health professionals note the following warning signs:

- Stockpiles of cold and cough medications, more than anyone would need for a bout of the flu.
- Empty pill packets or bottles of cough syrup found in odd places, such as under beds, in dresser drawers, or in wooded areas near homes or schools.
- The presence of strange-looking tablets in various shapes and colors, evidence of purchase from the Internet.
- Bookmarked Web sites or emails that encourage DXM use.

Various Web sites, such as *Kids Health for Parents* (http://kidshealth.org/parent/), provide information on DXM and other drug abuse warning signs.

Effects on the Body

Taken in its recommended doses, dextromethorphan sends a chemical signal to the brain to quiet a persistent cough. The medicine's effects begin about fifteen to thirty minutes after taking it, and they last between three and six hours. Most doctors do not recommend using over-the-counter cold medications for more than a week. Cold symptoms that last longer than a week might be the first signs of a more serious illness and a doctor should be consulted. At its normal dosage level, dextromethorphan does not cause any side effects, and it is not habit-forming.

What Are the Plateaus for Dextromethorphan Overdose?

As an abused drug, dextromethorphan has been compared to HALLUCINOGENS such as ketamine and PCP. Four "plateaus" have been identified for dextromethorphan overdose. Each plateau carries a different set of symptoms and behaviors. The higher the plateau of abuse, the greater the chances of permanent brain damage, PSYCHOLOGICAL ADDICTION, or lasting behavioral problems in the user.

hallucinogens: substances that bring on hallucinations, which alter the user's perception of reality

psychological addiction: the belief that a person needs to take a certain substance in order to function

DXM Plateaus

The symptoms of dextromethorphan abuse are categorized according to the strength of the dosage taken by the user. These categories are called plateaus. According to the article "What Every Parent Needs to Know about Cough Medicine Abuse," available on the *Drug Free AZ* Web site, common symptoms of abuse at the various plateaus include:

- First plateau: mild euphoria, mild dizziness, mild distortions of color or sound.
- Second plateau: visual hallucinations, blurred vision, slurred speech, drowsiness, nausea, and vomiting.
- Third plateau: double vision, disorientation, hallucinations, rapid movements of the eyes, paranoia, difficulty speaking and walking.
- Fourth plateau: "out of body" experiences, complete loss of motor control, altered sense of time and altered sense of reality, hallucinations involving vision, hearing, and touch.

Users undergoing withdrawal from dextromethorphan may have difficulty sleeping and suffer from depression or feelings of hopelessness.

At the first plateau, users report mild sensations of dizziness or EUPHORIA. They might perceive music as either more pleasant or as strangely distorted. A first-plateau dextromethorphan abuser can still move and carry on conversations, but perceptions are altered to the point where driving a car or making other value judgments might be very difficult.

At the second plateau, users begin to experience visual hallucinations—colors swirling through the vision field with eyes closed. At this level, users also experience nausea, often with vomiting, and they have more trouble walking and communicating. To an outside observer, second plateau dextromethorphan abusers are clearly "on something." They behave as if drunk or stoned. Double vision can also occur.

Upon reaching the third plateau, users experience a wider variety of hallucinations. All sensory input is altered to some degree. An abuser might see visions that are not there or misunderstand what he or she is actually seeing. Walking and talking become very difficult, and the user becomes disoriented and out of touch with reality. This can lead to bouts of paranoia (a feeling of great personal danger) or to the recall of forgotten memories, both pleasant and unpleasant. Because motor skills become seriously impaired at this level, abusers can be a danger to themselves just from tripping and falling. Judgment is altered, leading to the possibility of self-destructive behavior.

The fourth plateau experience is extremely dangerous and sometimes deadly. At this level, the dissociation, or split between mind and body, occurs. Bizarre thoughts and hallucinations abound. Meanwhile, the abuser has little or no motor control and simply cannot move. An immobilized user may choke on his or her vomit and suffocate, or suffer seizures and brain damage. Those who abuse dextromethorphan at these highest dosages are at the greatest risk of sudden death. Survivors of fourth plateau use may become psychologically addicted to dextromethorphan and continue abusing it in search of more hallucinations and that "out of body" feeling.

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

Reactions with Other Drugs or Substances

As previously stated, over-the-counter multi-symptom cold and cough products contain several ingredients that can be poisonous at high doses. The dextromethorphan abuser may unknowingly risk fatal organ damage by taking too much acetaminophen. Breathing problems can occur if too much DECONGESTANT is consumed with DXM. Combining dextromethorphan with prescription drugs, controlled substances, or alcohol can prove fatal.

Even at normal doses, dextromethorphan can react negatively with prescription sedatives, antidepressant drugs known as MAO inhibitors, and the antidepressant family of drugs that includes Desyrel (trazadone) or Serzone (nefazodone). Any amount of dextromethorphan combined with a selective serotonin reuptake inhibitor (SSRI), such as Prozac, Paxil, or Zoloft, can cause chemical imbalances in the brain. Dextromethorphan is also to be avoided by anyone taking tricyclic antidepressants or medication for BIPOLAR DISORDER, such as lithium carbonate or Depacote. (A separate entry on antidepressants is available in this encyclopedia.)

Occasionally, drug dealers will pass dextromethorphan pills or powders off as ketamine, ecstasy (MDMA), or even heroin. (An entry on each of these drugs is available in this encyclopedia.) Unsuspecting users can suddenly find themselves with a whole series of symptoms for which they are not prepared. In the *New York Times,* Jacob Sullum reported that this substitution of dextromethorphan for other illicit drugs has led some dance clubs to test pills and powders on-site in order to protect customers from unknowingly taking overdoses of the dangerous DXM.

The combination of dextromethorphan products and alcohol can cause extreme nausea and vomiting, as well as a greater loss of motor control.

Treatment for Habitual Users

The FDA does not consider dextromethorphan an addictive substance. However, press coverage of dextromethorphan abuse has uncovered cases of psychological dependence, or an addiction created by an emotional need for the substance. A young user told *Teen People* magazine in 2003: "I thought I could just use Coricidin for fun, that it didn't matter. I never expected to get hooked." This user reported months of daily abuse that led to physical problems, including blood in her urine and a complete loss of interest in school and friendships. "I'll never be able to get that time back," she said. "If I could erase it and make it go away, I would."

decongestant: a drug that relieves nasal congestion

bipolar disorder: a psychological disorder that causes alternating periods of depression and extreme elevation of mood

In order to kick a drug habit, some people seek treatment at an inpatient rehab facility. At such centers, drug users get counseling to overcome their dependence. *© Bojan Brecelj/Corbis.*

The antidote drugs that work on opiate overdoses, such as naloxone (Narcan), do not ease the symptoms of dextromethorphan overdose. According to the *American Journal of Emergency Medicine,* the emergency medical response to dextromethorphan overdose is to administer oral medications to induce vomiting and use intravenous fluids to combat dehydration. Usually the abuser simply has to ride out the symptoms under observation at a hospital.

Those abusers motivated to end their use of dextromethorphan will find no physical symptoms of withdrawal. However, the psychological pull of the drug may be difficult to overcome. Serious abusers may have to spend time at inpatient rehab facilities, fighting depression, insomnia, and feelings of worthlessness. Counseling with a licensed addiction therapist or psychiatrist will help the recovering abuser to identify the underlying reasons for attraction to the drug. Additionally,

dextromethorphan abusers are welcome in twelve-step programs such as Narcotics Anonymous, where they can meet other recovering substance abusers and find twenty-four-hour support through meetings and telephone hotlines.

Consequences

Long-term abuse of over-the-counter products containing dextromethorphan can lead to organ damage, brain damage, and permanent damage to the central nervous system. Deaths have been reported from dextromethorphan alone, as well as in situations where the user combined dextromethorphan with alcohol, sedatives, or controlled substances. The changes in judgment that come with dextromethorphan abuse can lead to accidental injuries, automobile crashes, and "date rape" situations.

The Law

Dextromethorphan is not a controlled substance. It can be purchased legally in pharmacies, grocery stores, and convenience stores. Some national pharmacy chains have opted to sell cough and cold products only to those over the age of eighteen, or in small quantities. The ability to purchase products containing dextromethorphan varies from store to store. Powdered dextromethorphan is sold on some Internet sites. However, the quality of the product, even its chemical composition, is not regulated. The Internet auction site *eBay* voluntarily decided not to allow listings of DXM for sale.

Intoxication

Police officers have pulled over drivers under suspicion of drunk driving, only to find that the drivers were under the influence of dextromethorphan. In those cases, the drivers have been prosecuted under the same statutes that apply to drunk driving. "Driving While Intoxicated" and "Driving under the Influence" do not apply strictly to alcohol, but rather include substances such as dextromethorphan.

In a report on the *Greater Dallas Council on Alcohol & Drug Abuse* Web site, the legal aspects of DXM abuse were discussed. "Even though [DXM] is not regulated as a prescription drug, or as a controlled substance, being intoxicated on ANY drug in a public place can subject a user to prosecution for disorderly conduct, disturbing the peace, and similar violations."

Police stop drivers if they suspect the person is drinking and driving. If the driver is found to be under the influence of dextromethorphan or other drugs instead, he or she faces prosecution under the same statutes that apply to drunk driving. *© Kim Kulish/Corbis.*

Furthermore, anyone who distributes nonprescription doses of an over-the-counter drug to a minor can face prosecution under laws that protect children.

Some pharmacies have reported thefts of cold and cough products. Anyone caught trying to steal dextromethorphan products from a store can be prosecuted for shoplifting.

In 2003, the states of Texas and North Dakota refused to pass legislation that would make the purchase of certain cold products illegal for persons under the age of eighteen. A similar measure was struck down in California in 2004. As of 2005, legislation was pending in New Jersey. The state of New York passed a bill creating misdemeanor charges for anyone who gives a minor two or more products containing dextromethorphan. The mindset of most state legislators seems to be that the

benefits of proper use of over-the-counter cold and cough remedies outweigh the dangers of dextromethorphan abuse.

The tide of opinion could change, however. In a worst case scenario, a widespread epidemic of dextromethorphan abuse may lead the Drug Enforcement Administration (DEA) to add the drug to its list of controlled substances. Then the products containing dextromethorphan would require a prescription from a licensed doctor. In the meantime, the burden for preventing dextromethorphan abuse falls on parents and concerned friends who detect changes in behavior, motivation, and overall health in their loved ones.

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See also: Over-the-Counter Drugs

Diet Pills

Official Drug Name: Benzphetamine (benz-FETT-uh-meen; Didrex), diethylpropion hydrochloride (dy-eth-uhl-PROH-pee-onn high-droh-KLOR-ide; Tenuate, Tenuate Dospan), orlistat (OAR-liss-tat; Xenical), phendimetrazine (fenn-dih-MEH-trah-zeen; Bontril), phentermine (FENN-ter-meen; Adipex-P, Ionamin), sibutramine (sih-BYOO-truh-meen; Meridia)
Also Known As: None
Drug Classifications: Schedule III (benzphetamine and phendimetrazine), Schedule IV (diethylpropion, phentermine, and sibutramine); stimulants.

What Kind of Drug Is It?

Prescription diet pills are stimulants—substances that increase the activity of a living organism or one of its parts. Diet pills that can only be prescribed by physicians fall into one of two categories: 1) appetite suppressants; or 2) lipase inhibitors. Lipase is a substance that speeds up the breakdown of fats in the body.

Appetite suppressants, also known as ANORECTICS, decrease feelings of hunger. These drugs were created to replace AMPHETAMINES, which proved to be an extremely dangerous method of weight control. (A separate entry on amphetamines is included in this encyclopedia.) Lipase inhibitors work by keeping fats from being absorbed in the digestive tract.

Note to the Reader

This entry deals specifically with diet pills that were being prescribed by physicians for weight control as of 2005.

Generations of people attempting to lose weight have tried nonprescription remedies to achieve their goals. Many dieters drink cup after cup of caffeinated coffee in an effort to suppress their hunger cravings. Caffeine is an ingredient in many over-the-counter (OTC) diet pills. Some dieters use herbal remedies, which are not regulated by the U.S. Food and Drug Administration (FDA). (Entries on over-the-counter drugs, caffeine, and herbal drugs are also available in this encyclopedia.)

Overview

The obsession with thinness seen throughout Europe and North America in the twentieth and early twenty-first centuries is a trend that developed during the late 1800s. The concept of beauty prior to that time was completely different. In fact, a full figure for women was actually quite desirable. Art from the 1700s and 1800s depicts women as well-endowed, curvaceous, and quite proud of their bodies. A few extra pounds on an individual were considered a sign of good health and high economic status. Fine French chocolates were all the rage among the rich, while the less fortunate and painfully thin lower classes barely had enough food or money to sustain themselves.

anorectics: pronounced ah-nuh-RECK-ticks; diet pills that cause a loss of appetite; they were developed to replace amphetamines

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

The image of beauty has changed over the centuries. A full figure for women was actually quite desirable in the 1700s and 1800s. Art from this era depicts women as well-endowed, curvaceous, and proud of their bodies. The painting shown here was created by Franz Xavier Winterhalter in 1855 and depicts Empress Eugenie and her friends.

Early Diet Pills

By the late 1800s, however, attitudes about weight were beginning to change, especially among women. The first diet pills, referred to at that time as "fat reducers," showed up on the market in 1893. These pills were thyroid extracts.

The thyroid is an important gland in the body. It secretes chemical messengers called hormones that control metabolism. Metabolism is the process by which food is converted to energy

Diet Fads

Dieting has a long and somewhat curious history. The use of diet pills to lose weight began around the turn of the twentieth century and has carried over into the twenty-first. With the dawn of the 1920s, the ideal body type became a thin one (although not as extreme as the "model thin" type that started gaining popularity in the 1980s).

Throughout the 1920s, new weight-loss trends developed. One was the use of laxatives—medicines that relieve constipation by loosening the bowels—to clean out the lower digestive tract. This can be a very risky practice, though, since overuse of laxatives can cause dehydration and chemical imbalances in the body. Laxative abuse continues to this day.

Around the same time as the laxative boom began, other unusual weight-loss products hit the market. One of the best known was called La-Mar Reducing Soap. This product promised to "wash away fat and years of age," according to an advertisement from the London, England, soap manufacturer.

Gimmicky weight-loss products continue to be marketed to people desperate to lose weight. Illegal Internet pharmacy Web sites started popping up in the 1990s, offering controlled substances for sale without a prescription. Another fad involved remedies that promised weight loss "without diet or exercise." Doctors caution patients against falling for scams like these.

that the body uses to function. Thyroid extracts are used to correct problems with the thyroid gland. Their use causes people to lose weight, but produces dangerous side effects in people with normal thyroids. These effects include muscle weakness, chest pains, an increased heart rate, abnormal heart rhythms, high blood pressure, and even death. Despite the risks, overweight people continued to seek out the thyroid hormone as a weight-loss remedy until the 1950s.

The "New" Drug of the 1930s: Dinitrophenol

"Weight-loss pills in general have a rather alarming history," wrote Denise Grady in the *New York Times.* In 1933, a drug called dinitrophenol (DY-NY-troh-FEE-noll) went on the market. It became a popular weight-loss remedy, despite the fact that it was originally used as a PESTICIDE. "During the 1930s," noted Grady, "about 100,000 Americans took . . . dinitrophenol, which prevented food energy from being turned into fat." But the drug turned out to be poisonous for humans as well as pests. It caused damage to the taste buds, blindness, serious skin rashes, extremely high fevers, and even death.

pesticide: a chemical agent designed to kill insects, plants, or animals that threaten gardens, crops, or farm animals

Despite all the dieting fads that come and go, one method remains the most successful and healthy—regular exercise and limiting calorie intake.

Dangerous and sometimes fatal side effects associated with drugs like dinitrophenol led the U.S. Congress to enact the Food, Drug, and Cosmetics Act in 1938. The act gave the U.S. government powers to regulate substances marketed as drugs. However, some people still managed to purchase dinitrophenol through mail-order companies through the 1940s.

From Dinitrophenol to Amphetamines to "Amphetamine-Like" Diet Drugs

The use of dinitrophenol dropped as dieters discovered amphetamine, a medication developed in 1887. Historically, doctors prescribed amphetamines as an appetite suppressant. Amphetamines tend to decrease feelings of hunger in people who take them, making them an often-abused drug among dieters. Although the use of amphetamines for weight control was popular in the 1950s and again in the 1980s and part of the 1990s, this practice is no longer very common. Amphetamine

use for weight loss is dangerous because it can become addictive. Some overweight individuals may resort to illegal means to obtain prescription-only amphetamines and even methamphetamine. (An entry on methamphetamine is also available in this encyclopedia.) Most doctors agree that the best way to regulate weight is through moderate exercise and a healthy diet.

The dangers of amphetamine addiction prompted drug companies to develop "amphetamine-like" diet pills—medicines containing chemicals similar to amphetamines. Although not quite as powerful as amphetamines, these pills did reduce users' appetites and were considered safer, with less potential for misuse or abuse.

Into the Twenty-first Century

As of 2005, "in weight-obsessed America . . . two-thirds of adults are overweight or obese," wrote the authors of an *MSNBC.com* article on fitness. In the same article, Dr. JoAnn Manson, chief of preventive medicine at Boston's Brigham and Women's Hospital, stated: "A prescription for exercise may be the most important prescription a physician writes all day."

Dozens of prescription diet pills have come and gone over the years. A large number of them are no longer available for use by patients. Physicians can no longer write prescriptions for them because they have been "discontinued." As of 2005, according to the FDA, approximately twenty-five prescription diet pills had been categorized as "discontinued." A discontinued drug product is one that has been removed from the market in the United States for reasons other than safety or effectiveness. The exact reason or reasons for their removal are not stated on the *FDA* Web site.

The large number of these drugs only serves to highlight America's cultural obsession with weight. For a list of discontinued prescription drugs, see the table on this page.

Discontinued prescription diet pills, 2005

Diet pill type (listed by active ingredient)	Drug name
Diethylpropion hydrochloride	Depletite
Diethylpropion hydrochloride	Diethylpropion-HCL
Diethylpropion hydrochloride	Tepanil; Tepanil Ten-Tab
Mazindol	Mazanor
Mazindol	Sanorex
Phendimetrazine	Adphen
Phendimetrazine	Alphazine
Phendimetrazine	Cam-Metrazine
Phendimetrazine	Di-Metrex
Phendimetrazine	Melfiat; Melfiat-105
Phendimetrazine	Metra
Phendimetrazine	Phenazine; Phenazine-35
Phendimetrazine	Plegine
Phendimetrazine	SPRX-105; SPRX-3
Phendimetrazine	Statobex; Statobex-G
Phentermine	Fastin
Phentermine	Obsetin-30
Phentermine	Oby-Trim
Phentermine	Ona-Mast
Phentermine	Pre-Sate
Phentermine	Tora
Phentermine	Wyamine Sulfate

SOURCE: Compiled by Barbara C. Bigelow for Thomson Gale, from "Drugs@FDA," Center for Drug Evaluation and Research, U.S. Food and Drug Administration, Rockville, MD [Online] http://www.accessdata.fda.gov/scripts/cder/drugsatfda/ [accessed May 24, 2005]

What Is It Made Of?

Most diet pills are SYMPATHOMIMETICS, or amphetamine-like drugs. They stimulate the sympathetic nervous system in a way similar to amphetamines. The sympathetic nervous system is responsible for the body's "fight or flight" responses in the face of danger. The body releases a burst of energy that increases blood pressure, makes the heart beat faster, and slows digestion. These types of actions decrease hunger in users. Diet pills included among the sympathomimetics are benzphetamine, diethylpropion, phendimetrazine, and phentermine.

Orlistat is a lipase inhibitor. Lipase is a substance that speeds up the chemical breakdown of fats. By "inhibiting" the action of lipase, orlistat blocks fat absorption in the intestine. An estimated 30 percent of fat that would normally be absorbed by the intestines is allowed instead to pass right through the body undigested.

How Is It Taken?

The weight-loss medications described in this entry cannot be dispensed without a doctor's prescription. They are manufactured in both pill and capsule form and are taken by mouth. The patient follows a dosage schedule set by the physician. Most prescription diet pills are taken before meals to take the edge off a person's hunger.

Are There Any Medical Reasons for Taking This Substance?

Prescription diet pills are not recommended for people who are only slightly overweight. These drugs are used to treat obesity, a medical condition characterized by excess fat stored in the body. People who are considered overweight or obese weigh more—generally 20 percent or more—than is considered healthy for their heights and ages. Obese people are at risk for such medical conditions as DIABETES, STROKE, and heart disease. Obesity contributes to the deaths of about 300,000 Americans annually, according to the FDA.

Body Mass Index

A more specific standard called body mass index (BMI) is used to determine whether an overweight or obese individual is a candidate for prescription diet pill therapy. Body mass

sympathomimetics: pronounced SIMM-path-oh-muh-MEH-ticks; medications similar to amphetamines but less powerful and with less potential for addiction

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

Health Risk Re-evaluated

In an interesting spin on the over-emphasis given to obesity in the United States, the Centers for Disease Control and Prevention (CDC) announced in April of 2005 that being "modestly overweight" might not be as dangerous as once thought. According to *CNN.com*, the CDC's study revealed that "people who are modestly overweight have a lower risk of death than those of normal weight." The key term here is "modestly," meaning slightly.

CDC director Dr. Julie Gerberding cautioned that severe obesity remains a major health risk but pointed out that the definition of obesity is evolving. The CDC's new report changes obesity's ranking among "the nation's leading preventable causes of death" from number two to number seven, behind smoking, alcohol, germs, toxins and pollutants, car crashes, and guns.

It could take awhile for the CDC's new vision of a healthy weight to take hold throughout a weight-loss-obsessed culture. *MSNBC.com* reported that girls as young as nine years old are "using bodybuilding steroids—not necessarily to get an edge on the playing field, but to get the toned, sculpted look of models and movie stars." Steroids aid in this quest by helping replace fat with muscle. (A complete entry on steroids and their dangers is available in this encyclopedia.) In many cases, the girls taking steroids suffer from eating disorders such as bulimia and anorexia as well.

index is a calculation that expresses the relationship between a person's weight and height in a single number. It is used as an indicator of health risk due to excess weight. Diet drugs may be prescribed to a person with a body mass index (BMI) of at least 30 and no medical conditions related to obesity. A BMI of 30 is assigned to a 5-foot-5-inch-tall (1.65-meters tall) person weighing 180 pounds (81.65 kilograms), a 5-foot-7-inch-tall (1.7-meters tall) person weighing about 190 pounds (86.18 kilograms), and a 6-foot-tall (1.83-meters tall) person weighing about 220 pounds (99.79 kilograms).

Length of Treatment

The biggest problem with prescription diet pills is that some users develop a dependence on them. Most diet pills are prescribed for short-term use, which ranges from a few weeks to several months. The goal of this treatment is for patients to lose weight at a steady rate and keep the weight off. Diet pills are only part of the treatment that focuses on changing patients' behavior. These changes generally consist of establishing and sticking to an exercise routine as well as following a healthy diet.

New Obesity Drug

The quest for a better prescription diet pill continues. According to *MSNBC.com*, the drug company Sanofi-Aventis was seeking FDA approval in the spring of 2005 for a new obesity drug called rimonabant (RIM-oh-NAB-ant), which was likely to be marketed under the name Acomplia. After extensive testing, rimonabant was found to help severely obese individuals keep off the weight they lost for up to two years. For long-term success, though, cardiologist Dr. Sidney C. Smith was quoted by *MSNBC.com* as saying: "There have got to be some improved behavioral and diet changes going on beyond taking a pill."

Side effects of rimonabant in test users include nausea, dizziness, and increased cases of diarrhea. One unexpected effect: the drug may also help people stop smoking.

Usage Trends

CNN.com reported that in the United States, "prescription drug sales totaled $235 billion nationally in 2004, a historic high that was up 8.3 percent from 2003." Hundreds of millions of those dollars are spent on prescription diet pills each year.

Prescription diet pills are manufactured for the treatment of obesity, an increasingly common medical problem. However, overweight people are not the only ones using diet pills. Some people obtain prescription-only diet pills to lose a few pounds quickly. Others have eating disorders and develop a PSYCHOLOGICAL DEPENDENCE on the pills. People who lose weight using diet pills run the risk of regaining those pounds once they stop taking the drugs. This contributes to an endless cycle of weight loss followed by weight gain.

Effects on the Body

The diet pills developed to replace amphetamines became known as anorectics or appetite suppressants. Anorectics are sometimes referred to as sympathomimetic drugs. They are stimulants that "mimic" the body's natural energy-releasing mechanisms. The FDA has approved a variety of anorectics over the years for the short-term treatment of obesity. Phentermine was approved in 1959, fenfluramine (FENN-FLOOR-uh-meen) in 1973, and dexfenfluramine (deks-FENN-FLOOR-uh-meen) in 1996. Other anorectic diet pills include benzphetamine, diethylpropion, and phendimetrazine.

A different type of prescription diet pill received FDA approval in 1999. The lipase inhibitor orlistat (Xenical) is said to block about 30 percent of the fat absorbed by the body.

The Fen-Phen Craze

In the 1990s, doctors in the United States and other countries began prescribing low doses of fenfluramine (Pondimin) or dexfenfluramine (Redux) along with low doses of phentermine. The combination, known informally as "Fen-Phen," was never approved

psychological dependence: the belief that a person needs to take a certain substance in order to function

Dexfenfluramine (Redux) was part of the drug combination known as Fen-Phen. Never approved by the FDA, Fen-Phen use led to serious heart problems for some users. *© James Leynse/Corbis.*

by the FDA. Seven million prescriptions for Fen-Phen were written in 1996. "The rationale for using the two drugs," according to a *Seattle Times* contributor, "was that they might work more effectively together with fewer side effects."

Soon, however, the safety of Fen-Phen was called into question. The appetite-suppressant mixture was thought to be the cause of some severe health problems, including serious heart valve malfunctions. As a result, both fenfluramine and dexfenfluramine were withdrawn from the market in September of 1997. Phentermine is still sold because no cases of heart valve disease have been reported when that drug is taken alone, according to an FDA report.

There Are No Magic Cures

Prescription diet pills help with weight reduction by suppressing the user's appetite and increasing the feeling of fullness in the

FDA-approved prescription diet pills, 2005

Diet pill type (listed by active ingredient)	Drug name	Dosage
Benzphetamine hydrochloride	Didrex	50 mg tablet
Diethylpropion hydrochloride	Tenuate	25 mg tablets
Diethylpropion hydrochloride	Tenuate Dospan	75 mg extended release tablets
Orlistat	Xenical	120 mg capsule
Phendimetrazine	Bontril	105 mg extended release capsule
Phendimetrazine	Bontril PDM	35 mg tablet
Phendimetrazine	Phendimetrazine Tartrate	35 mg tablet or capsule; 105 mg extended release capsule
Phendimetrazine	X-Trozine	35 mg capsule
Phendimetrazine	X-Trozine-LA	105 mg extended release capsule
Phentermine	Adipex-P	37.5 mg tablet or capsule
Phentermine	Ionamin	Extended release capsules; multiple strengths
Sibutramine hydrochloride	Meridia	Capsules available in multiple strengths

SOURCE: Compiled by Barbara C. Bigelow for Thomson Gale, from "Drugs@FDA," Center for Drug Evaluation and Research, U.S. Food and Drug Administration, Rockville, MD [Online] http://www.accessdata.fda.gov/scripts/cder/drugsatfda/ [accessed May 24, 2005]

stomach. But diet pills alone will not make excess weight disappear. According to Patricia Dwyer Schull in the *Nursing Spectrum Drug Handbook,* prescription drugs for "obesity management" must be "used in conjunction with [a] reduced-calorie diet" in order to be effective.

Diet pills can produce symptoms that range from dizziness to an increased number of bowel movements. Possible side effects include light-headedness, dry mouth, a false feeling of well-being, nausea, irritability, INSOMNIA, trembling, blurred vision, nervousness, increased sweating and urination, and problems with the blood vessels in the lungs.

Sibutramine (Meridia), a prescription diet pill approved by the FDA in 1997, may cause an increase in heart rate and blood pressure. Long-term use of any prescription appetite suppressant can lead to addiction. Taking anorectics can impair a person's ability to drive, operate heavy equipment, or perform other potentially hazardous activities. Sympathomimetics or anorectics should not be prescribed to people with a history of drug abuse.

Taking orlistat, the lipase-inhibiting-type diet pill, can bring on an increased number of bowel movements, gas with discharge, oily or fatty stools, and the inability to control a bowel movement. Because orlistat blocks the absorption of fat in the intestines, the fat is eliminated from the body as part of a bowel movement. Orlistat users may sometimes feel an urgent need to go to the bathroom. These symptoms are often aggravated if the user eats too many high-fat foods.

Women who are pregnant or nursing their babies should consult with their physician about any diet pill use. Most prescription diet pills are not recommended for use by pregnant or nursing women. Diet pills can also affect bone development in children and young adults.

When patients stop taking anorectics, their bodies need to adapt to the lack of drugs in their systems. The amount of WITHDRAWAL time will vary, depending on the strength of the dosage taken and the length of time it was used. Withdrawal symptoms may include

insomnia: difficulty falling asleep or an inability to sleep

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

insomnia, nightmares, nausea, vomiting, and stomach cramps. The user typically experiences strong hunger pangs as well.

Possible Dopamine Connection

A study conducted by the National Institute on Drug Abuse (NIDA) suggests that the same factors that control excessive behaviors such as drug abuse and gambling may be associated with overeating. The main factor may be an abnormality in the brain involving chemical messengers called NEUROTRANSMITTERS. DOPAMINE is the neurotransmitter that acts on the part of the brain responsible for feeling pleasure, filtering incoming information, making choices, judging behavior, and deciding when and how to act.

NIDA researchers believe that obese people do not have enough receptors on their brains' nerve endings to grab on to dopamine and allow it to do its work. The decrease in dopamine receptors is apparently linked to a high BMI. The greater a person's BMI number, the fewer dopamine receptors they seem to have in their brains. *NIDA Notes* staff writer Robert Mathias quoted Dr. Nora Volkow as saying: "An individual who has low sensitivity to normal stimuli learns behaviors, such as abusing drugs or overeating, that will activate" those areas of the brain that "create a sense of well-being." The next step in this research is to determine if there are ways other than overeating or drug-taking that can stimulate the pleasure centers in the brains of these individuals.

Reactions with Other Drugs or Substances

Before taking diet pills, patients need to inform their health care providers of any other medications they are already taking. Diet pills are often taken in combination with LAXATIVES, DIURETICS, and herbal remedies, which can lead to dangerous drug reactions. Mixing diet pills with alcohol can have serious side effects. In addition, certain antidepressants can interact negatively with prescription diet pills, causing high blood pressure or an irregular heartbeat. Physicians may decide to adjust drug dosages, have patients discontinue certain medications, or counsel the patient not to use prescription diet pills at all.

Treatment for Habitual Users

Since many of the prescription diet pills available to overweight patients are amphetamine-like substances, they tend to have the same effects on users as amphetamines. TOLERANCE to diet pills can

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

dopamine: pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

laxatives: drugs that help produce bowel movements

diuretics: pronounced die-er-EH-tiks; substances that reduce bodily fluids by increasing the production of urine

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

Eating Disorder Facts

Eating disorders are more common than most people realize and lead to a variety of health risks:

- Close to 10 million women and 1 million men suffer from anorexia nervosa or bulimia nervosa.
- Another 25 million people are affected by binge eating disorder.
- Eating disorders can cause osteoporosis (the loss of bone mass).
- Changes in the mouth and teeth are often the first signs of an eating disorder. Lips may look red, cracked, and dry, and teeth often erode (become brittle and weak) due to frequent vomiting and nutritional deficiencies.
- If left untreated, eating disorders can be fatal.

occur if the user takes the drugs in a greater quantity or for a longer time than instructed.

It is very important to remember that prescription weight-loss medications are meant to be used only for a limited time. If diet drug dependence or addiction does occur, experts consider behavioral therapy—sometimes referred to as "talk" therapy—and emotional support essential for treatment and rehabilitation. Treatment must be adapted to the individual. It should include nutritional counseling and advice on lifestyle changes that will help the patient reach and maintain a healthy weight.

Consequences

In a society where "thin is in" and people are often judged by their appearance, diet pill use has skyrocketed. However, diet pills are merely a temporary solution to a long-term problem. Maintaining a healthy weight is an ongoing process that involves adopting a whole new lifestyle of eating healthy meals and exercising regularly.

Diet Pill Abuse

People who use diet pills often put the pounds they have lost right back on as soon as they stop taking the drugs. Not only do they regain the weight they first lost, they sometimes gain even more. This process is called the "yo-yo syndrome" because the affected individual's weight goes up and down like a yo-yo. Common consequences of diet pill abuse include muscle loss, psychological dependency, feelings of failure, and a generally unhealthy physical state. Overuse of pills can affect concentration and performance in school or work. In addition, there is a potential for addiction to some diet pills.

anorexia: pronounced ah-nuh-REK-see-uh; a severe eating disorder characterized by an intense fear of gaining weight, a refusal to eat, a distorted sense of self-image, and excessive weight loss

The Struggle to Be Thin

Although excessive weight and obesity are problems in the United States and other countries, there is also a concern about people who diet to an unhealthy low weight. Individuals suffering from eating disorders have an unrealistic image of themselves and their bodies. The most common eating disorders are ANOREXIA

nervosa and BULIMIA nervosa. For someone with an eating disorder, taking diet pills can aggravate an already serious condition. If left untreated, eating disorders can be fatal.

The Law

The Food and Drug Administration (FDA) oversees the regulation of prescription diet pills. The Controlled Substances Act (CSA), a portion of the 1970 Comprehensive Drug Abuse Prevention and Control Act, classified drugs into five categories, or schedules, based on the effect of the drug, its medical use, and potential for abuse. Schedule I drugs, those in the most tightly controlled category, have no medical use and an extremely high potential for abuse.

Among diet drugs, benzphetamine and phendimetrazine are considered Schedule III drugs. Abuse of these drugs may lead to physical or psychological dependence. Diethylpropion, phentermine, and sibutramine diet pills are considered Schedule IV drugs. They have a lower potential for abuse than the Schedule IIIs, but still may lead to physical or psychological dependence in some users. Federal law prohibits the use or distribution of diet pills obtained without a prescription.

People suffering from anorexia and bulimia see themselves as overweight no matter how thin they really are.

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See also: Amphetamines; Caffeine; Dextroamphetamine; Ephedra; Herbal Drugs; Methamphetamine; Steroids

Dimethyltryptamine (DMT)

Official Drug Name: N,N-dimethyltryptamine (dy-meth-ull-TRIP-tuh-meen), Nigerine, desoxybufotenine (dess-OKS-ee-byoo-foh-tenn-inn), 3-(2-dimethylaminoethyl)-indole; 5-MeO-DMT; (related compounds) 5-MeO-DIPT, alpha-methyltryptamine (AMT)
Also Known As: 45-minute psychosis, businessman's special, DET, fantasia, foxy, foxy methoxy
Drug Classifications: Schedule I, hallucinogen

What Kind of Drug Is It?

Dimethyltryptamine, most commonly known as DMT, is a fast-acting hallucinogen—a substance that brings on HALLUCINATIONS, which alter the user's perception of reality. It is related to LSD (lysergic acid diethylamide) and psilocybin. (An entry for each of these drugs is available in this encyclopedia.) DMT causes a rapid rush of mind-altering states that end fairly quickly, usually within an hour. For this reason, DMT has been nicknamed the "businessman's special."

The compound can be found in many kinds of plants. It is even found in the poisonous venom of certain toads. (Venom is a liquid poison created by an animal for defense against predators or for killing smaller prey.) DMT is also created synthetically in laboratories.

Although the hallucinations brought on by DMT use are brief in duration, they are extremely powerful. Unlike LSD, which works over a period of hours, DMT alters the brain's chemistry in a matter of minutes. Ancient cultures brewed teas from plants containing DMT for use in religious ceremonies. More modern users often find themselves bewildered by the way the drug changes perceptions. Because people under the influence of DMT often lose contact with reality, they can behave in ways dangerous to themselves or others. For this and many other reasons, the compound is classified as a Schedule I controlled substance.

Overview

The use of hallucinogenic mushrooms, snuffs, and brews dates back thousands of years and has occurred all over the world. In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger discusses early reports of drug use. He explains that the naturalist hired by explorer Christopher Columbus (1451–1506) for his second voyage (1493–1496) described a strange behavior of the Tairo Indians. The naturalist observed the native peoples using a snuff derived from seeds of the yopo tree (*Anadenatherea peregrine*).

hallucinations: visions or other perceptions of things that are not really present

Using a double-stemmed tube and coffee powder, a boy shows visitors at the Bogota Gold Museum in Colombia how his ancestors inhaled the narcotic *yopo*. Explorer Christopher Columbus and his men observed the native peoples inhaling the narcotic powder.

The Mayan, Olmec, and Cherokee Indians all left behind archeological evidence that they worshiped toads and used toad venom in their religious ceremonies. Even in modern times, native cultures in Colombia, Ecuador, Peru, and Brazil prepare a brew from jungle plants that is variously called *yagé, caapi,* and AYAHUASCA ("vine of souls"). One of the active ingredients in this brew is DMT.

Chemists began to synthesize, or manufacture, DMT in the 1930s. By the 1950s, they understood the chemical composition of *ayahuasca* tea and BUFOTENINE. In the late 1950s and early 1960s, hallucinogens were not illegal. Thus, some experimental chemists used themselves and their friends as subjects, taking various strengths of hallucinogenic compounds and recording their reactions. These scientists determined that DMT did not produce any mental effects if taken by mouth. (*Ayahuasca* tea, however, has an added ingredient that allows the body to metabolize, or break down, DMT.)

DMT, bufotenine, and other similar compounds are snorted or injected to produce hallucinations. DMT has never been as widely abused as LSD, but it is named in the U.S. Controlled Substances Act of 1970. At that time, dimethyltryptamine (DMT) was named a Schedule I hallucinogen, making its possession, distribution, and creation a crime.

What Is It Made Of?

SYNTHETIC dimethyltryptamine is a white or sometimes light brown crystalline solid, like a small, strong-smelling chunk of salt. Some people have compared its odor to mothballs. Others have said that it smells like plastic being burned. As its name suggests, its chemical composition is complicated. Once crystallized, it cannot be dissolved in water. Instead it must be dissolved either in an ORGANIC SOLVENT like alcohol or in an acid.

ayahuasca: one of several teas of South American origin, used in religious ceremonies, known to contain DMT; also a plant

bufotenine: the component of venom from the toad genus *Bufo* that contains DMT

An Inga Indian shaman in Colombia prepares a drink called *yagé,* a hallucinogenic brew said to have healing powers. *AP/ Wide World Photos.*

DMT occurs widely in nature, in the leaves, seeds, and roots of certain plants, and in the milky venom of toads in the genus *Bufo.* Its synthetic, or laboratory-made form, mimics the chemical composition of its natural form.

DMT is unique in its hallucinogenic family in two ways. First, when snorted, injected, or smoked, it acts much more quickly than LSD or psilocybin. This is because fat cells in the human body absorb LSD and psilocybin and release them more slowly to the brain. DMT is not absorbed by fat cells. The entire dose races to the brain as soon as it is taken. Second, pure DMT loses its hallucinogenic qualities if eaten. It is destroyed by monoamine oxidase in the stomach. Monoamine oxidase is a naturally occurring enzyme that detoxifies amino

synthetic: (on opposite page) made in a laboratory

organic: (on opposite page) a term used to describe chemical compounds that contain carbon

solvent: (on opposite page) a substance, usually liquid, that dissolves another substance

The tea made from the *ayahuasca* plant is one of several teas of South American origin, used in religious ceremonies, known to contain DMT.

compounds in ingested foods. The tea preparations used in South America contain ingredients that inhibit monoamine oxidase action. That is why they can be consumed orally. Still, those who have tasted *ayahuasca* and other similar herbal brews find them quite foul on the tongue.

How Is It Taken?

In some religious rituals, participants drink brews concocted from plants containing DMT and other ingredients. RECREATIONAL USERS smoke plant matter soaked in dissolved DMT, snort ground-up DMT crystals, or inject DMT that has been dissolved in a non-water solvent. Users experience nearly immediate—and sometimes very bizarre—mental effects, often including loss of touch with reality.

Even the most hard-core hallucinogen users have reported that DMT is strong, unpredictable, and can produce frightening effects. A report in the *Journal of Toxicology: Clinical Toxicology* detailed the case of a seventeen-year-old college student who nearly died of heart failure after taking DMT. The student had to be restrained at the hospital and was sent by helicopter to a regional poison center. His temperature at the time he was admitted to the hospital was 105°F.

recreational users: people who use drugs solely to achieve a high, not to treat a medical condition

Are There Any Medical Reasons for Taking This Substance?

Medical researchers have been granted limited opportunities to study the use of hallucinogens for treating anxiety in terminally ill patients, SCHIZOPHRENIA, and opiate addiction. Because DMT moves through the brain so quickly, it is not likely to be used for medical research. The substance's Schedule I classification reveals that the U.S. government sees it as having no value for the treatment of illness.

Usage Trends

DMT has never been as popular among drug abusers as LSD and other hallucinogens. Its delivery system is more complicated. Its effects usually last less than an hour, although the abuser can experience longer periods of confusion afterward.

Chemists constantly tinker with the compound, however. In October of 2002, the DEA announced the seizure of two new compounds: 5-MeO-DIPT, known on the street as "foxy" or "foxy methoxy," and alpha-methyltryptamine (AMT). Both of these compounds are closely related to DMT, but they can be used in tablet form.

Tablets or the chemicals used to create the tablets have been found in Arizona, Delaware, Florida, Idaho, Illinois, New Jersey, Oregon, Virginia, Washington, and the District of Columbia. Some of the drug seizures by law enforcement officials have occurred at all-night clubs or at raves, wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use.

People creating foxy or AMT may believe they are not breaking the law because these hallucinogens are not specifically covered by the Controlled Substances Act. However, it is against the law to manufacture or sell a "CONTROLLED SUBSTANCE ANALOG." Anyone buying, selling, or using foxy and AMT may face the same penalties as someone buying, selling, or using DMT.

About the Toads. . . .

The *Bufo marinus* toad is a native of the Americas and one of the toads that secretes DMT in its venom. When interest in hallucinogens was at its height in the 1960s and early 1970s, some people in Australia (where the toads had been imported) and America actually *licked* the toads in an effort to get high. What the toad-lickers quickly discovered was that *Bufo marinus* venom

schizophrenia: a mental disease characterized by a withdrawal from reality and other intellectual and emotional disturbances

controlled substance analog: any chemical compound that acts on the body the same way a controlled substance does

Foxy and AMT

Pure DMT is relatively rare on the illegal drug market. But a new generation of hallucinogens has been created that can be taken in tablet form. Two of these, "foxy" or "foxy methoxy" and AMT, mimic the actions of DMT. Tablets of foxy and AMT have been seized at raves and clubs in more than a half dozen states in the United States.

These two hallucinogens may at first appear to be legal because their specific chemical compounds are not listed as controlled substances. But since they act like DMT in the body, they are known as "controlled substance analogs," and they are indeed illegal. Anyone caught selling or making foxy and AMT faces prosecution under state and federal laws.

contains many ingredients *besides* DMT. People became violently ill with heart palpitations, drooling, and intense, long-lasting headaches.

Others tried drying and smoking the venom of *Bufo alvarius,* a desert toad found in California, Arizona, and parts of Mexico. To quote Paul M. Gahlinger in *Illegal Drugs:* "Smoking toad . . . proved to be too powerful an experience for most people. Besides the obvious difficulty of getting and handling the toad, the intoxication was too intense, with too many physical side effects, to achieve any real popularity." Nevertheless, the U.S. government added bufotenine, the hallucinogenic ingredient in toad venom, to the list of illegal drugs.

Effects on the Body

Dimethyltryptamine is called a "serotonin agonist." When the chemical enters the brain, it interferes with the normally occurring NEUROTRANSMITTER called SEROTONIN. Serotonin serves many functions in the brain, from regulating moods to assisting the brain in the way it processes information. According to David Porush in *Omni* magazine, serotonin plays a role in how people sense reality.

Altering Reality

DMT has been shown to alter the way the brain perceives reality. Users experience visual hallucinations, both with eyes closed and open. They may feel detached from themselves or have an "out of body" experience. And because serotonin affects reasoning, DMT may cause an abuser to think that he or she is having a moment of religious ecstasy, of communion with the divine. Repeat users of hallucinogens have reported "seeing" fairies, elves, and angels. Some users have had the feeling of being in the presence of God. It is this aspect of the drug's behavior that has tied it to certain religious practices.

Some DMT abusers also experience intense fear, anxiety, and paranoia—the feeling that other people and ordinary, inanimate objects have become agents of evil. Human faces become like masks. Furniture can seem to have human characteristics. Once the drug has produced this kind of anxiety, no antidote exists to stop it.

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

DMT occurs in the milky venom of toads in the genus *Bufo marinus*. People have actually licked toads trying to get high.

The user must "ride out" the experience until the DMT exits the brain and the normal levels of serotonin return. In the case of DMT, the "TRIP" is of short duration, but users report that the drug alters one's sense of time. Minutes may seem like hours, and the user may have a difficult time communicating during those minutes.

Other side effects of DMT include dizziness, nausea, sweating, runny nose, and drooling. In certain extreme cases, users may experience a racing heartbeat, elevated body temperature, and convulsions. Heavy users risk brain damage and a condition called "serotonin syndrome" that can cause muscle tremors or rigidity, confusion, and changes in blood pressure.

People with mental illness who experiment with DMT run significantly greater risks of having "bad trips" or other lasting emotional side effects. As with other hallucinogens, DMT tends to magnify the levels of emotion in the brain. Thus, if depression or anxiety already

trip: an intense and usually very visual experience produced by an hallucinogenic drug

Historical Accounts

Use of hallucinogens has been documented in many ancient cultures. DMT use has been more common in the Americas because the toads and plants containing it are widespread in North and South America. Here is a look at some examples from the historical record, both long ago and recent.

- The skeletons of 10,000 toads were found in an ancient Cherokee Indian burial site in North America.
- During Christopher Columbus's second voyage to the New World (1493–1496), his naturalist, Friar Ramón Paul, wrote about the Tairo Indians of Haiti. As noted in Paul M. Gahlinger's book *Illegal Drugs,* the friar observed: "This powder they draw up through the nose and it intoxicates them to such an extent that when they are under its influence, they know not what they do."
- In 2000, members of the O Centro Espirita Beneficiente Uniao do Vegetal religious sect claimed that the seizure of thirty gallons of *hoasca* tea by the U.S. Drug Enforcement Administration (DEA) violated their right to freedom of religion. As reported by Scott Sandlin in the *Albuquerque Journal,* their case reached the Tenth Circuit Court of Appeals late in 2004, where judges ruled in favor of the church. The tea is considered a sacrament, but its use will be closely monitored by church members and the DEA so that it does not invite abuse by outsiders.

exist, the drug will make these conditions worse. Depression is a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts. Anxiety is a feeling of being extremely overwhelmed, restless, fearful, and worried.

Reactions with Other Drugs or Substances

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

sedatives: drugs used to treat anxiety and calm people down

antihistamines: drugs that block *histamine,* a chemical that causes nasal congestion related to allergies

analgesics: pain relievers or the qualities of pain relief

DMT is extremely dangerous when combined with some drugs prescribed for depression. DMT also reacts badly with AMPHETAMINES, SEDATIVES, ANTIHISTAMINES, and strong ANALGESICS. (An entry on amphetamines is available in this encyclopedia.) It can increase or intensify the side effects of any of these substances. Mixing DMT with drugs from poisonous plants (strychnine or belladonna alkaloids, for example) can be fatal.

On its own, DMT renders the user unable to judge ordinary situations. For instance, a person high on DMT runs a much greater risk of being involved in an automobile crash (either by driving or walking into traffic) or other injury. The combination of alcohol and DMT further increases the risk of accident or injury.

DMT use has been linked to hyperthermia, or an elevated body temperature. It is dangerous to use the drug in rave situations where a great number of people are crowded into a small space, dancing or milling about. The use of a strong, quick-acting hallucinogen like DMT might also lead to panic or paranoia in a dance club environment. Those who use the drug as part of religious rituals take extreme care to create the most soothing surrounding environment.

The Other DMT

DMT the *hallucinogen* should not be confused with desoxy-methyl-testosterone, or DMT, a *"designer steroid."* This latter DMT was developed in the twenty-first century to fool drug testers at athletic events. It is in the steroid family and is related to testosterone, a hormone found in greater quantities in males than in females. According to Lynn Zinser in a 2005 article for the *International Herald Tribune,* scientists working for the World Anti-Doping Agency vowed to develop urine tests that show the presence of desoxy-methyl-testosterone, the "other" DMT.

Treatment for Habitual Users

Over time the human body develops a tolerance to DMT. Users must take higher and higher doses to achieve the same effect. Although the drug is not habit-forming, it can encourage risk-taking behavior, including the use of other drugs. Long-term use can lead to brain damage.

Self-help groups such as Narcotics Anonymous (NA) welcome anyone who wishes to quit using any kind of mind-altering substance, including hallucinogens. Most communities have at least one chapter of Narcotics Anonymous, an international organization that connects drug abusers with others who have experienced the same difficulties. NA meetings encourage drug abusers to share their stories, and they offer the support of group acceptance.

Abusers of hallucinogens should also seek the guidance of a licensed professional psychiatrist or psychologist who can help determine the root feelings that led to drug experimentation. Licensed doctors treating hallucinogen abusers may prescribe anti-anxiety medications or anti-psychotic drugs if the abuser has a history of mental problems related to drug use. There are no specific WITHDRAWAL symptoms associated with DMT, although users will experience fatigue and occasionally confusion that lasts several hours after a dose.

Consequences

As with other hallucinogens, DMT can cause "flashbacks." Days, weeks, or months after use, an abuser can suddenly relive an entire hallucinogenic experience, or parts of it. The loss of judgment that occurs with DMT use sometimes causes abusers to become violent, to strike out at those trying to help, or to behave in

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

other self-destructive ways. The *Journal of Toxicology: Clinical Toxicology* cited a case of a young man who fought with paramedics as they tried to save his life. The patient ended up with "multiple abrasions on his arms and chest" from his struggle with health care providers.

In a federal court case that ended in 2004, the O Centro Espirita Beneficiente Uniao do Vegetal religious sect won the right to use an hallucinogenic tea in its religious services. The sect cited the U.S. Constitution's right to freedom of religion in its winning court case. It is important to note that religious use of hallucinogenic teas differs greatly from recreational drug use. Religious rites featuring DMT-laced teas are presided over by experienced leaders who create a proper atmosphere for use. They help their followers to understand the experience. Abuse or overdose of the substance is not tolerated. In contrast, street DMT users often encounter preparations that might contain other ingredients, or higher doses, than expected. The resulting hallucinatory experience, while lasting only a short time, may be terrifying or life-threatening.

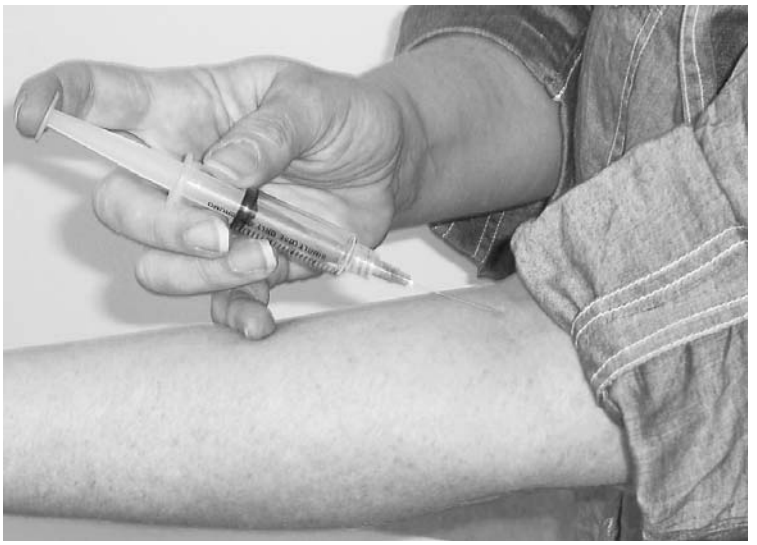
The Risks Are High

In an effort to bypass laws against DMT, certain companies have been selling "research chemicals" through the Internet. The legality of these chemicals is open to debate. However, these substances have not been tested for safety even through illegal experimentation. The United Kingdom's *Guardian* newspaper reported on two deaths, both young men under the age of twenty-one, both from a "research chemical" called 2-CT-7 they had bought over the Internet. Responding to the deaths, the DEA scheduled 2-CT-7 as a controlled substance, and its sale on the Internet ceased. Ingesting "research chemicals" bought online is as risky as any other form of drug abuse.

Anyone who shares a needle to inject street drugs runs the risk of contracting the human immunodeficiency virus (HIV). This virus leads to acquired immunodeficiency syndrome (AIDS), an as-yet-incurable disease that destroys the human immune system. So while DMT may not be habit-forming, it can lead to deadly complications when delivered by injection.

The Law

The Controlled Substances Act of 1970 created five schedules based on a drug's value as a medicine, its chances of causing addiction, and its possibilities for abuse. DMT is a Schedule



One of the ways that DMT is taken is by injection. Anyone who shares a needle to inject street drugs runs the risk of contracting the human immunodeficiency virus (HIV), hepatitis, and other diseases. *Photograph by Leitha Etheridge-Sims.*

I drug, meaning that U.S. government authorities consider it one of the most dangerous drugs. Possession of DMT is illegal in the United States, Canada, and the United Kingdom, among other countries. It cannot be prescribed by a doctor for any illness. As a Schedule I drug, DMT possession carries stiff fines and imprisonment. The penalties increase significantly for repeat offenders.

DMT-Like Substances

DMT can be extracted from plants that are legal to buy. However, people can be arrested for creating DMT from those plants, even if they only plan to use it themselves.

Any substance that behaves like DMT—for instance, the hallucinogens foxy and AMT—are considered "controlled substance analogs." Although their names and chemical compositions may not be specifically listed in controlled substance legislation, they are still illegal because they mimic the behavior of other illegal drugs. The same holds true for many of the "research chemicals" sold over the Internet. If the effects of the chemicals mimic DMT—or if the chemicals are used to create DMT—the user/creator violates the law.

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See also: LSD (Lysergic Acid Diethylamide); Psilocybin

Diuretics

Official Drug Name: The three main groups of diuretics (die-er-EH-tiks) discussed in this entry are: 1) the loop diuretics, 2) the potassium-sparing diuretics, and 3) the thiazide (THY-uh-zide) diuretics. Loop diuretics include bumetanide (byoo-MEH-tuh-nide; Bumex), furosemide (fur-OH-seh-mide; Lasix), and torsemide (TORE-seh-mide; Demadex). Potassium-sparing diuretics include amiloride hydrochloride (am-ILL-ohr-ide high-droh-KLOR-ide; Midamor), spironolactone (speer-oh-noh-LACK-tone; Aldactone), and triamterene (try-AM-tuh-reen; Dyrenium). Thiazide (and thiazide-like) diuretics include chlorothiazide (KLOR-oh-THY-uh-zide; Diurigen, Diuril), chlorthalidone (klor-THAL-ih-doan; Hygroton, Thalitone), hydrochlorothiazide (HIGH-droh-KLOR-oh-THY-uh-zide; Dichlotride, Esidrix, Ezide, Hydrochlor, Hydro-D, Hydro-DIURIL, Hydro-Par, and Microzide), indapamide (inn-DAH-puh-mide; Lozol), and metolazone (meh-TOE-luh-zone; Diulo, Mykrox, Zaroxolyn).
Also Known As: Water pills
Drug Classifications: Not scheduled

What Kind of Drug Is It?

The main goal of diuretic therapy is to get rid of extra fluids in the body. Diuretics reduce bodily fluids by increasing the production of urine. Diuretic drugs are used to treat high blood pressure, congestive heart failure (CHF), and various other conditions that cause the body to retain, or hold in, water. CHF occurs when the heart is unable to circulate, or pump, the blood throughout the body with sufficient force.

Overview

Diuretics are a class of drugs that increase urine output. That means that users not only urinate more often, they urinate in greater amounts than usual. The main medical uses for diuretics are the treatment of high blood pressure and congestive heart failure.

Because diuretics cause an overall water weight loss, they are often abused by individuals with eating disorders such as anorexia (pronounced ah-nuh-REK-see-uh) and bulimia (pronounced bull-EEM-eeh-yuh). Anorexia is a severe disorder characterized by an intense fear of gaining weight, a refusal to eat, a distorted sense of self-image, and excessive weight loss. Bulimia is a disorder that involves long periods of bingeing on food, followed by self-induced vomiting and abuse of laxatives. The words anorexia and bulimia are both taken from the Greek language. Anorexia means "no appetite" and bulimia means "great hunger."

Diuretics are also abused by athletes who are trying to "make weight" for certain classes of competition. Oftentimes, the use of diuretics can help athletes, such as weightlifters, lose just enough—perhaps an extra pound or so—to remain in their chosen weight class. This practice is illegal in sporting competition, however. Diuretics are considered banned substances according to the International Olympic Committee (IOC), the United States Anti-Doping Agency (USADA), the World Anti-Doping Agency (WADA), the National Collegiate Athletic Association (NCAA), and a number of other national and international sporting authorities.

Digitalis is derived from the dried leaves of the foxglove plant. The drug gives the heart muscle a boost, making its contractions stronger and faster. © *Eric Crichton/Corbis.*

William Withering's Work on Diuretics

The name *diuretic* comes from a Greek term meaning "to urinate." This type of drug first gained acceptance in the medical community when eighteenth-century British physician William Withering (1741–1799) created digitalis (dij-ih-TAL-us) from the dried leaves of the foxglove plant (*Digitalis purpurea*). Digitalis gives the heart muscle a boost, making its contractions stronger and faster.

Digitalis also acts as a diuretic. In Withering's time, it became a popular treatment for dropsy (DROP-see), an old-fashioned term for EDEMA. People with edema often have swollen feet, ankles, and lower legs due to water buildup in their tissues. Fluid retention in the tissues of the body can be very dangerous. It is frequently related to congestive heart failure, which can be deadly. As of 2005, digitalis-type drugs were still being used in the treatment of heart failure. By strengthening the contractions of the heart muscle, digitalis helps pump excess fluids throughout the body. When the heart works more efficiently, fluids are less likely to pool, or accumulate, in the feet and legs.

Breakthroughs in Diuretic Research

In 1957, researchers John Baer, Karl Beyer, James Sprague, and Frederick Novello formulated the drug chlorothiazide (KLOR-oh-THY-uh-zide), the first of the thiazide diuretics. It was a pioneering achievement in medicine. Chlorothiazide was the first safe and effective long-term treatment for patients with high blood pressure and heart failure. All four scientists received the Albert and Mary Lasker Foundation Special Public Health Award for 1975 for their work on diuretic drug compounds. According to the *Lasker Foundation* Web site, "Such compounds are now universally accepted as a primary treatment for these conditions."

The next class of diuretic drugs to be developed were the so-called "loop diuretics." They take their name from the fact that they work on a specific part of the KIDNEY known as the LOOP OF HENLE. Loop diuretics are the most powerful of all

edema: pronounced ih-DEEM-uh; water buildup in the body's tissues that causes swelling

kidney: the body's urine-producing organ

loop of Henle: the U-shaped part of the nephron (tiny filtering unit of the kidney) where reabsorption processes take place

diuretics. The first one to appear on the market was furosemide (Lasix) in 1965. Loop diuretics were hailed as a major advance in the treatment of congestive heart failure.

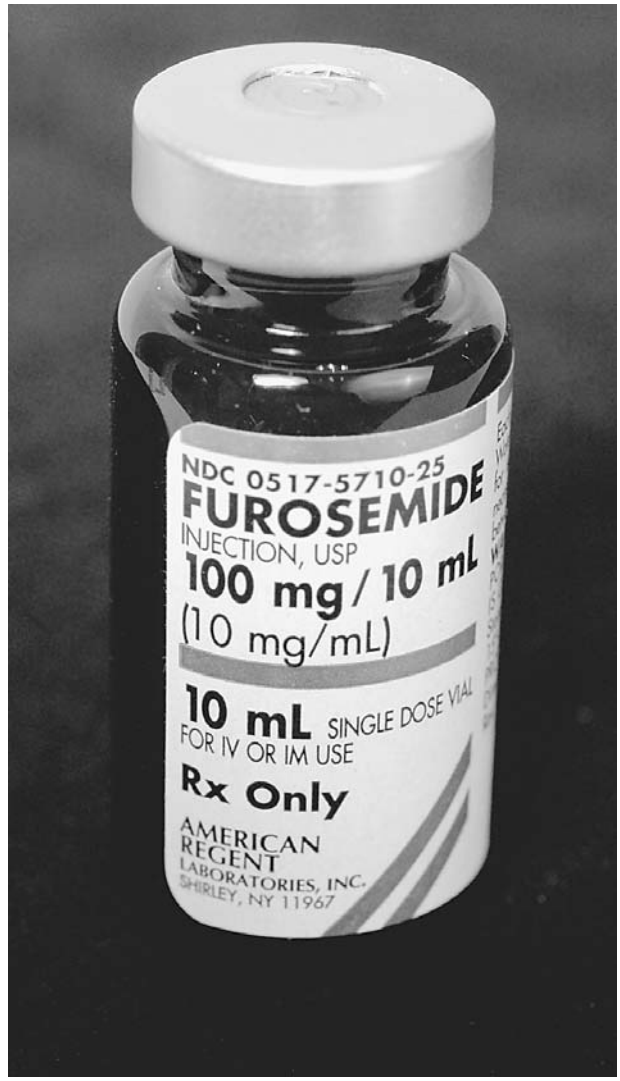
It was around this time that over-the-counter diuretics first became available. Pamabrom (Pamprin), a medication that relieves the fluid retention and bloating associated with a woman's MENSTRUAL CYCLE, is still available without a prescription. There are also certain dietary supplements that may have diuretic action as a side effect, but have a different primary purpose. For example, the supplement creatine promotes fluid loss with regular use. (A separate entry on creatine is available in this encyclopedia.)

What Is It Made Of?

Diuretics are medicines with complex chemical structures. For example, the chemical formula for chlorothiazide, the best known of the thiazide diuretics, is $C_7H_6ClN_3O_4S_2$.

How Is It Taken?

Diuretics are most commonly available in pill form. In a hospital setting, they may be injected directly into a patient's veins. Certain diuretics used to control pressure on the eyeball may be administered in eye drop form. Some diuretics are consumed naturally in foods, including various fruits, vegetables, and herbs.



Loop diuretics are the most powerful of all diuretics. The first to appear on the market was furosemide, which is used to treat congestive heart failure. *Scott Camazine/Photo Researchers, Inc.*

Are There Any Medical Reasons for Taking This Substance?

Diuretics are typically used to treat high blood pressure, congestive heart failure, edema, and other conditions that cause the body to retain excess fluids. In addition to their traditional uses, diuretics show promise in the treatment of several other

menstrual cycle: commonly referred to as a woman's "period"; the monthly discharge of blood and other secretions from the uterus of nonpregnant females

One of the medical uses of diuretics is in the treatment of edema. People suffering from edema retain excess fluids in their bodies, often in their feet.

medical conditions, including OSTEOPOROSIS, heart attack, and STROKE.

Usage Trends

The 2004 edition of *The Pill Book* and the 2005 edition of the *Nursing Spectrum Drug Handbook* list the loop diuretic furosemide (Lasix) among the top ten most commonly prescribed drugs in the United States. Not far behind were the thiazide diuretic hydrochlorothiazide and the potassium-sparing diuretic triamterene, both of which landed in the top twenty.

Cheap but Effective Prescription Drugs

Lawrence K. Altman reported in the *New York Times* that "traditional water pills, or diuretics, are superior to newer, more expensive drugs in lowering high blood pressure and preventing its serious and often fatal complications." In 2002, a New Jersey-based study was conducted involving more than 42,000 men and women of varied ethnic backgrounds age fifty-five and older. The results showed that diuretics were found more effective in lowering the participants' blood pressure than the trendier—and extremely costly—new classes of blood pressure drugs. In follow-up reports published in 2005, researchers suggested that thiazide diuretics, in particular, are also helpful in preventing heart attacks and strokes.

osteoporosis: a loss in bone density resulting in thinned and fragile bones

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

In addition, several sources, including the 2003 Rotterdam Study, have shown that thiazide diuretics "may reduce bone loss by reducing the amount of calcium excreted in the urine," reported Eric Nagourney in the *New York Times*. Thiazide diuretics seem to protect the elderly against hip fractures, a common and potentially life-threatening ailment among older people. "The benefit was most pronounced in people over eighty," noted Nagourney.

Blood Pressure Facts

The following statistics were cited in reports on a study of diuretics funded by the National Heart, Lung and Blood Institute, the National Institute on Aging, and the Robert Wood Johnson Foundation.

- High blood pressure affects about 50 million people in the United States, and the risk increases with age.
- Half of all Americans over the age of sixty have high blood pressure.
- One-third of Americans over the age of sixty have both high blood pressure and diabetes, a serious disorder affecting the level of sugars in the blood.

Abusing Diuretics to Lose Weight

Although diuretics have legitimate uses, some people abuse the drugs. The most widespread abuses of diuretics appear among: 1) individuals suffering from eating disorders; and 2) athletes attempting to keep their weight down for sporting competitions.

According to the National Institute of Mental Health (NIMH), up to 3.7 percent of females suffer from anorexia, and up to 4.2 percent of females suffer from bulimia at some point in their lives. Anorexia involves self-starvation in an effort to keep off weight. Bulimia involves a cycle of bingeing and purging, meaning people eat massive amounts of food in a single sitting and then attempt to rid themselves of the huge caloric intake before it can be digested. Bulimics purge the food through self-induced vomiting, laxative use, and diuretics.

Males generally develop eating disorders less frequently than females. However, as of 2005, the percentage of males with eating disorders was on the rise. In addition, the National Eating Disorders Association (NEDA) reported that patients with either anorexia or bulimia frequently "develop the other eating disorder" within five to fifteen years of developing the first. In other words, a person with anorexia may end up with bulimia and a person with bulimia may end up with anorexia. This shift in disorders, according to NEDA president Doug Bunnell, helps "remind clinicians, patients, and families that these disorders are complicated."

The Sports Connection

Diuretic use and eating disorders in sports and professional athletics are growing concerns both in the United States and abroad. Jockeys, swimmers, and gymnasts, for instance, compete under

Many sporting organizations test athletes for diuretic use. Some athletes use diuretics to lose weight or cover up steroid use. In 2003 Australian cricket player Shane Warne received a one-year suspension after testing positive for a banned diuretic. *AP/Wide World Photos.*

conditions where "smaller" is considered "better." Weight loss among these and other athletes may be encouraged by coaches. Female athletes, in particular, often develop eating disorders and unhealthy weight-loss practices, including diuretic abuse. This puts them at a higher risk for osteoporosis and interrupting their menstrual cycle.

Sports such as weightlifting, wrestling, and boxing require regular weigh-ins. Diuretics are sometimes used by athletes to lose weight quickly in order to compete in lower-weight classes. The pressure to keep their weight down may extend beyond the use of diuretics, leading to starvation diets and attempts to sweat off pounds in rubber suits or saunas. These and other unsafe practices can put athletes at risk for severe DEHYDRATION, seizures, and even death.

Diuretics in the sports world have another documented use. Called "masking," it is when diuretics are used to speed the elimination of banned performance-enhancing substances from the body. This practice increases the users' chances of passing mandatory drug tests. Athletes using steroids, for instance, might attempt to rid their bodies of trace amounts of the banned drug by taking diuretics.

Many sports organizations have added diuretics and other masking agents to their list of banned substances. For example, the National Football League Players Association (NFLPA) mentions diuretic use in its steroid policy. The organization notes that "masking agents or diuretics used to hide [the presence of steroids and other performance-enhancing substances]" are considered "Prohibited Substances." Steroids, masking agents, diuretics, and other banned substances "have no legitimate place in professional football."

Effects on the Body

There are three main classes of diuretics: loop diuretics, potassium-sparing diuretics, and thiazide diuretics. The main function of diuretics is to increase the amount of sodium and fluids excreted by the kidneys.

dehydration: an abnormally low amount of fluid in the body

Kidneys and Electrolytes

The kidneys are the urine-producing organs of the body. They act as filters for body fluids, sifting out waste products and keeping important body chemicals called ELECTROLYTES at steady levels. As the *Kidney Learning System* Web site points out, another key function of these "powerful chemical factories" is to "remove drugs from the body."

Sodium, potassium, chloride, calcium, and magnesium are all examples of electrolytes. These chemicals are present in the body's fluids and help move nutrients into cells and wastes out of them. Nerve, muscle, and heart functions depend on proper levels of electrolytes in the body. The use of diuretics, however, can trigger electrolyte imbalances. This occurs because diuretics increase the amount of urine the body releases. Sodium, potassium, and other electrolytes can be removed from the body along with the urine.

The kidneys work to keep electrolyte concentrations in the blood at an even level. However, swings in body fluid chemicals do occur. Improper levels of electrolytes can cause a variety of symptoms, including confusion, fainting, dizziness, and headache.

Reducing Fluid Levels

In general, diuretics work by encouraging the loss of sodium and fluid from the body. This is the key to their effectiveness in treating high blood pressure and congestive heart failure.

People who suffer from long-term high blood pressure are said to have hypertension. Hypertension occurs when the force of blood against the blood vessel walls increases. This condition may be treated with diuretics from all three classes. Those used most often include thiazides such as chlorothiazide and hydrochlorothiazide; the potassium-sparing diuretic spironolactone; and the loop diuretic furosemide. Diuretics relieve hypertension by flushing excess water and sodium from the body. Lower fluid levels decrease the pressure on blood vessels and help improve blood circulation, resulting in lower blood pressure.

Congestive heart failure occurs when the pumping ability of the heart is impaired. Loop diuretics such as furosemide are most frequently prescribed to reduce the edema that results from congestive heart failure. Thiazide and potassium-sparing diuretics may also be prescribed.

Doctors also prescribe diuretics for other conditions that cause fluid retention, including certain types of DIABETES and various

electrolytes: charged atoms such as sodium, potassium, chloride, calcium, and magnesium that conduct electrical impulses in the body, and therefore are essential in nerve, muscle, and heart function

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

The All-Important Kidney

Just how important are the kidneys? The National Kidney Foundation's *Kidney Learning System* Web site reveals some interesting facts about the kidneys and their function.

- Humans have two kidneys, one on either side of the spinal column near the middle of the back.
- The kidneys are shaped like beans. They get their name from the "kidney bean."
- On average, each kidney weighs about 5 ounces.
- The kidneys filter about 200 quarts of fluid in a 24-hour period.
- Of those 200 quarts of fluid, about 2 quarts are made into urine and excreted from the body.
- The other 198 quarts of fluid are "cleaned up" and returned to the bloodstream.
- Urine is usually stored in the bladder anywhere from one hour to eight hours before it is excreted.
- Diabetes and high blood pressure are the most common causes of kidney disease.
- Over-the-counter pain relievers taken in large doses or for more than several weeks at a time can cause serious damage to the kidneys.

diseases of the kidneys and the liver. Water retention related to menstruation is usually relieved with over-the-counter diuretics containing Pamabrom (Pamprin).

Among the more common side effects of diuretic use are nausea, dizziness, skin rashes, sensitivity to sunlight, high blood sugar levels, and an inability to control urination. Less common side effects associated with diuretic use include hearing loss, lowered red blood cell or white blood cell levels, and inflammation of the pancreas, a gland vital to digestion.

The Loop Diuretics and Their Action on the Kidneys

Each kidney consists of about 1 million NEPHRONS held in place by supporting tissue. Nephrons are the tiny filtering units of the kidney. These structures are responsible for moving fluids and waste out of the bloodstream, resulting in urine formation. Loop diuretics take their name from the part of the kidney upon which they work—the loop of Henle. The loop of Henle is a branch within each nephron where sodium and potassium are reabsorbed back into the bloodstream instead of being filtered into the urine. Loop diuretics inhibit this action and promote excretion of the sodium and potassium instead, along with calcium, magnesium, and, of course, water. Loop diuretics are considered the most powerful of all diuretics. Bumetanide (Bumex), furosemide (Lasix), and torsemide (Demadex) are all loop diuretics.

nephrons: tiny working units of the kidney; each kidney has more than a million nephrons

The Potassium Balancing Act and Other Things to Know about Diuretics

Two other classes of diuretics are the thiazides and the potassium-sparing diuretics. Thiazide diuretics such as chlorothiazide and hydrochlorothiazide work by blocking sodium reabsorption by the kidneys. They are "potassium-depleting" diuretics, meaning that they cause a loss of potassium from the body. This condition is known as HYPOKALEMIA. This loss may be reversed by eating potassium-rich foods, such as bananas, or by taking potassium supplements. Signs of hypokalemia include a rapid or irregular heartbeat, fatigue, weakness, mood swings, muscle cramps, nausea, vomiting, a dry mouth, and persistent thirst.

The diuretics amiloride, spironolactone, and triamterene are known as "potassium-sparing" diuretics. This type of diuretic is used commonly in the treatment of congestive heart failure. Their use may cause HYPERKALEMIA, a condition where there is too much potassium in the body. Signs of hyperkalemia include an irregular heartbeat, tiredness, weakness, difficulty breathing, numbness, a tingling sensation in the hands or feet, anxiety, and difficulty concentrating.

Sometimes, potassium-sparing diuretics are used in conjunction with thiazide diuretics to keep potassium levels in the user's body stable. One drug known by the brand name Dyazide is a good example of a combination-type diuretic. It contains hydrochlorothiazide (a thiazide diuretic that causes a loss of potassium in the body) *and* triamterene (a diuretic that helps the body retain potassium).

Other Risks: The use of diuretics can be especially risky among pregnant women, people with compromised immune systems, and individuals with certain drug allergies. Physicians must be made aware of a patient's complete medical history before they can prescribe diuretics safely. Individuals who take diuretics for more than six months at a time run the risk of developing chemical imbalances that can result in serious side effects.

Magnesium deficiency may occur with long-term use of the loop and thiazide diuretics. Symptoms include nausea and vomiting, muscle cramps, weakness (especially when exercising), INSOMNIA, an irregular heartbeat, and difficulty sleeping. Calcium deficiency is a possible side effect of both loop and potassium-sparing diuretics.

Natural Diuretics

In his book *The Healing Power of Foods,* nutritional expert Michael T. Murray details the natural medicinal properties of common foods. The following foods and spices are considered natural diuretics:

- watermelon
- horseradish
- pepper
- celery
- herbal salads that include ingredients such as dandelion leaves

hypokalemia: a loss of potassium in the body

hyperkalemia: a dangerous build-up of excess potassium in the body

insomnia: difficulty falling asleep or an inability to sleep

Signs of insufficient calcium in the body include a rapid heartbeat, muscle cramps, bone thinning, tooth decay, and difficulty sleeping.

Dehydration

Diuretic use in sports is usually prompted by the belief that a lower weight will improve athletic performance. However, the side effects experienced from long-term diuretic abuse typically offset any temporary gains in ability.

The main risk of diuretic abuse is severe dehydration. This is of special concern to athletes who might take the drug to "make weight" for sporting events or to improve performance. People exercising or participating in athletic competition are already at risk for dehydration because they are losing large amounts of fluids and electrolytes in their sweat. Diuretics can speed up this process.

Patients on doctor-prescribed diuretics must take extra precautions when exercising. These include: 1) drinking adequate amounts of water, sports drinks, or other non-caffeinated fluids; 2) wearing loose and comfortable clothing; 3) setting aside time for regular rest periods; and 4) watching for signs of HEAT EXHAUSTION.

It is absolutely essential that a patient remain in regular touch with the prescribing doctor throughout the course of diuretic therapy.

Reactions with Other Drugs or Substances

Over-the-counter diuretic preparations are available in any drug store. Even though some diuretics are available without a prescription, the risk for serious side effects remains. Diuretics should always be taken under the recommendation and guidance of a trained healthcare professional.

Diuretics affect potassium levels. Drugs that are known to decrease potassium levels (certain anti-inflammatory steroids and heart drugs, for instance) should be avoided by anyone taking potassium-depleting diuretics. Potassium deficiencies can cause potentially dangerous side effects. In contrast, patients taking potassium-sparing diuretics such as amiloride, spironolactone, or triamterene should not eat foods high in potassium. The action of these diuretics raises the amount of potassium in their bodies. Thus, food rich in potassium—bananas, tomatoes, sweet potatoes, and oranges, to name a few—would only add to the problem and should be avoided.

heat exhaustion: a condition that results from physical exertion in extreme heat; symptoms range from clammy and cool skin, tiredness, nausea, weakness, confusion, and vision problems to a possible loss of consciousness

Individuals taking prescription diuretics should always check with their doctors before adding herbal supplements

St. John's wort, available as an herbal remedy, acts as a natural diuretic.

to their drug regimen. Herbal diuretics can actually increase the effect of prescription diuretics, so the two should not be combined. Some of the more well-known diuretic herbs include bilberry, celery seed, dandelion leaf, goldenrod, horse chestnut seeds, juniper, parsley, and St. John's wort. Foods and beverages rich in caffeine—such as chocolate, coffee, and tea—can also have a diuretic effect at high doses. They should not be consumed in excess with prescription diuretics. Alcohol has a diuretic effect as well and should be avoided by patients taking doctor-prescribed diuretics.

Treatment for Habitual Users

Treatment for diuretic abuse starts with examining an individual's reasons for taking the drugs. People mainly abuse diuretics in order to lose weight. These individuals include

What is an eating disorder? Some basic facts

Eating Disorders—such as anorexia, bulimia, and binge eating disorder—include extreme emotions, attitudes, and behaviors surrounding weight and food issues. Eating disorders are serious emotional and physical problems that can have life-threatening consequences for females and males.

Anorexia nervosa is characterized by self-starvation and excessive weight loss.

Symptoms include:

- Refusal to maintain body weight at or above a minimally normal weight for height, body type, age, and activity level
- Intense fear of weight gain or being "fat"
- Feeling "fat" or overweight despite dramatic weight loss
- Loss of menstrual periods
- Extreme concern with body weight and shape

Bulimia nervosa is characterized by a secretive cycle of binge eating followed by purging. Bulimia includes eating large amounts of food—more than most people would eat in one meal—in short periods of time, then getting rid of the food and calories through vomiting, laxative abuse, or over-exercising.

Symptoms include:

- Repeated episodes of bingeing and purging
- Feeling out of control during a binge and eating beyond the point of comfortable fullness
- Purging after a binge (typically by self-induced vomiting, abuse of laxatives, diet pills and/or diuretics, excessive exercise, or fasting)
- Frequent dieting
- Extreme concern with body weight and shape

Binge eating disorder (also known as **compulsive overeating)** is characterized primarily by periods of uncontrolled, impulsive, or continuous eating beyond the point of feeling comfortably full. While there is no purging, there may be sporadic fasts or repetitive diets and often feelings of shame or self-hatred after a binge. People who overeat compulsively may struggle with anxiety, depression, and loneliness, which can contribute to their unhealthy episodes of binge eating. Body weight may vary from normal to mild, moderate, or severe obesity.

Other eating disorders can include some combination of the signs and symptoms of anorexia, bulimia, and/or binge eating disorder. While these behaviors may not be clinically considered a full syndrome eating disorder, they can still be physically dangerous and emotionally draining. All eating disorders require professional help.

SOURCE: " hat Is an Eating Disorder Some Basic Facts," National Eating Disorders Association, Seattle, A, 2003. www.NationalEatingDisorders.org

people with eating disorders as well as athletes trying to make a certain weight class.

Help for Disordered Eaters and Athletic Abusers

The *National Eating Disorders Association* Web site suggests that "the most effective and long-lasting treatment for an eating disorder is some form of psychotherapy or counseling, coupled with careful attention to medical and nutritional needs." Experts consider emotional support and behavioral therapy—sometimes referred to as "talk" therapy—essential for treatment and rehabilitation. It is vital to address the emotional motives and distorted thinking behind the behavior of a patient with an eating disorder.

The main goals of treatment are: 1) to stabilize the patient's weight; 2) to put an end to self-destructive behaviors, such as diuretic abuse, binge eating, and self-starvation; and 3) to help the patient relearn healthy nutritional practices. Patients with anorexia may be so severely malnourished that they require intravenous feeding in a hospital setting. Nutritional counseling and advice on lifestyle changes can help the patient reach and maintain a healthy weight.

Athletes who abuse or misuse diuretics for purposes of performance enhancement or "making weight" face special treatment challenges. Coaches, trainers, and teammates may praise weight loss and an excessively low percentage of body fat, making it harder to change one's behavior. In addition, obsessive exercise and workout routines are often rewarded in sports and competition rather than questioned. In these cases, a treatment strategy must include educational training for the coaching and training staff as well as the athlete.

Consequences

Diuretics are not a PSYCHOACTIVE DRUG and have no direct mental effects on the user. However, abuse and misuse of this medication can lead to severe dehydration, which may bring on headaches, mental confusion, and even seizures.

Patients using diuretics for a specific medical reason under a doctor's supervision rarely experience problems. The misuse of diuretics, however, can result in serious consequences for the user. Diuretic use among people suffering from eating disorders can cause their health to worsen even further. Competitive athletes who misuse diuretics, either due to an eating disorder or for performance-enhancing purposes, usually find that their athletic performance suffers in the long run.

The Law

Diuretics are not controlled substances. Federal law does not regulate their possession and use. Some diuretic drugs are even available without a prescription. For those that do require a doctor's prescription, several rules apply to their use. The U.S. Food and Drug Administration (FDA) oversees the regulation of non-controlled drugs such as diuretics. Illegally selling or distributing prescription diuretics is against the law.

Professional athletes who test positive for diuretics in Olympic competition are suspended from participation in the games. They may also be stripped of any medals they have won. At the Summer Olympic Games in Athens, Greece, in 2004, Sanamachu Chanu of India was disqualified from competition after she tested positive for a banned diuretic. Her fourth-place finish in the weightlifting competition was tossed out.

Another incident occurred at the 2000 Olympics, when three Bulgarian weightlifters tested positive for the diuretic furosemide. The athletes involved were Izabela Dragneva, winner of the gold medal; Ivan Ivanov, winner of the silver medal; and Sevdalin Minchev, winner of the bronze medal. The International Olympic Committee took back the athletes' medals after they failed their mandatory drug tests. Alan Tsagaev, another Bulgarian weightlifter whose drug test was clean, went on to win the silver in his weight class. The coach of the Bulgarian team later took responsibility for the disqualification of his players. He claimed that he did not realize furosemide was one of the ingredients in a Bulgarian medicine named Orotsetam, which he had distributed to his team.

psychoactive drug: a drug that alters the user's mental state or changes behavior

Sanamacha Chanu of India tested positive for a banned diuretic at the Olympic Games in 2004. She was disqualified from the competition.

AP/Wide World Photos.

Diuretics appear on the World Anti-Doping Agency's "2005 Prohibited List" of drugs. Since 2000, the United States has stepped up its own investigation of performance-enhancing drugs in sports by forming the U.S. Anti-Doping Agency (USADA). The agency's main goal is "to provide clean athletes with a level playing field." According to the USADA's 2004 Testing and Results Management Numbers, the diuretic hydrochlorothiazide was one of nearly twenty "adverse findings" connected with doping violations for the year.

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See also: Caffeine; Creatine; Diet Pills; Herbal Drugs; Over-the-Counter Drugs

Ecstasy (MDMA)

Official Drug Name: 3, 4-methylenedioxymethamphetamine (METH-uhl-een-die-OCK-sy-meth-am-FETT-uh-meen); almost always referred to by shortened names MDMA or ecstasy
Also Known As: ADAM, booty juice, disco biscuits, E, essence, hug drug, rave, roll, Scooby snacks, X, XTC
Drug Classifications: Schedule I, stimulant with hallucinogenic properties

What Kind of Drug Is It?

MDMA, best known as ecstasy, is a drug usually taken in pill form, often in social settings such as parties, clubs, or raves. (A rave is a wild overnight dance party that typically involves huge crowds of people, loud techno music, and illegal drug use.) By 2004, however, ecstasy use had spread beyond the party scene. According to the Office of National Drug Control Policy of the Executive Office of the President: "[R]esearch indicates that the use of MDMA is moving to settings other than nightclubs, such as private homes, high schools, college dorms, and shopping malls."

The illegal substance produces a variety of effects on behavior and basic metabolism (bodily function). Some of these effects are temporarily pleasant. The user may feel happy, more in tune with others, and more energetic. Other effects are not so welcome. These include clenched jaws, DEHYDRATION, and dangerous fever.

Although some drugs have a long history of use and abuse, ecstasy is a relatively new arrival on the illegal drug scene. The earliest studies in people and animals do indicate that ecstasy has a lasting effect on its users in terms of depression, memory loss, and impulsive behavior. Depression is a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts.

Ecstasy was named a Schedule I substance by the U.S. government in 1985. Basically, that means that scientists have not found any safe medical use for the drug. Its production, sale, and consumption are illegal, and this affects the quality of each individual pill. Ecstasy is a synthetic drug, meaning that it is made in a laboratory—it does not occur in nature. It is created from chemicals. These laboratories operate in secret, with no official medical or government agency regulating or checking on the quality, dosage, or even the composition of the pills. Sold on the street, the ecstasy pills might also contain such substances as caffeine, dextromethorphan (deks-troh-meth-ORR-fan), or a dangerous HALLUCINOGEN called PMA. (Entries for caffeine, dextromethorphan, and PMA are also available in this encyclopedia.)

dehydration: an abnormally low amount of fluid in the body

hallucinogen: a substance that brings on hallucinations, which alter the user's perception of reality

A young rave dancer is shown swirling lightsticks and sucking on a pacifier. Some rave dancers use pacifiers to keep them from grinding their teeth after taking ecstasy. *© Scott Houston/Corbis.*

Ecstasy behaves differently than other controlled substances. Some scientists call it an "entactogen" (ent-AK-tuh-jenn), meaning that it enhances feelings of kindness, well-being, and empathy or understanding. Others call it a stimulant—a substance that increases the activity of a living organism or one of its parts. In the body, ecstasy works like a combination of AMPHETAMINES and hallucinogens. Like amphetamines, it stimulates users, making them more likely to dance for long periods and interact with others in a most outgoing way. Like hallucinogens, ecstasy heightens sensations, particularly those having to do with happiness and intimacy.

In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger quoted a frequent ecstasy user who said: "E makes shirtless, disgusting men, a club with broken bathrooms, a deejay that plays crap, and vomiting into a trash can the best night of your life."

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

Ecstasy use increased every year between 1990 and 2001. With that increase came a better understanding of the drug's pitfalls and how it affected human beings over time. Current statistics indicate that ecstasy use is declining as those experimenting with it have become aware of its dangers. Deaths among ecstasy users have been reported in the United States, Australia, Canada, and the United Kingdom.

Overview

Ecstasy, or MDMA, was first created in 1910 by German scientists studying amphetamines. Merck, a German pharmaceutical company, took out a patent on the chemical in 1914. Some sources say the company thought MDMA might be useful to suppress appetite. Whether it was studied for this purpose or not, it showed little usefulness and was nearly forgotten for half a century.

The drug resurfaced in the 1950s during the Cold War (1945–1991), an era that saw extreme tension between the United States and the former Soviet Union as the two competed for world dominance. Throughout the 1950s, scientists in the United States studied a number of amphetamines and hallucinogens for use in chemical warfare. MDMA, then known as EA-1475, was one of the drugs tested by the U.S. Army Office of Strategic Services (a precursor to the Central Intelligence Agency, or CIA). Since the army was searching for drugs that would produce psychotic or violent behavior, MDMA proved useless. Again it drifted into disuse.

The compound surfaced again in the laboratory of American chemist Dr. Alexander T. "Sasha" Shulgin (1925–) in the 1960s. Shulgin, according to the London-based *Guardian Unlimited* news service, has tested and synthesized some 200 PSYCHOACTIVE SUBSTANCES during his lifetime. Reporter Dan Glaister noted: "Shulgin seems destined to be remembered for one small episode in 1965 when, tipped off by a student about an interesting but forgotten compound, he synthesised MDMA." Shulgin created his own batch of MDMA and experimented on himself and others in his inner circle of friends and colleagues who were willing to try unknown drugs. His belief, after using MDMA, was that it might have some value as a drug for mental disorders. He especially thought that MDMA might help people to "open up" about troubling events in their lives that they did not want to discuss otherwise.

In the 1960s and 1970s, MDMA was not an illegal substance, but it also was not being manufactured by any drug company. Some chemists made small batches that were used by psychiatrists,

psychoactive substances: substances that alter the user's mental state or change behavior

A young drug dealer is shown counting ecstasy pills. Ecstasy use has spread beyond the party scene, finding its way into private homes, high schools, college dorms, and shopping malls. *© Scott Houston/Corbis.*

especially in California. At first the medical community in California was excited about the drug that seemed to heighten feelings of closeness and connectedness in patients. But as the drug drifted into RECREATIONAL USE, animal testing indicated that it destroyed brain cells. The doctors backed away, but the drug had found a following among college students. In those days it was commonly known as ADAM, a scrambling of MDMA.

recreational use: using a drug solely to achieve a high, not to treat a medical condition

Ecstasy's Popularity Soars

The identity of the person who first called the drug "ecstasy" has been lost to history. However, it is commonly believed that a drug pusher coined the term. Various sources

note that MDMA was once called "empathy," which described the drug's effects on some users. But the name was later changed to "ecstasy" to make it sound more appealing. The word ecstasy comes from the Greek word *ekstasis,* meaning to be outside of oneself or outside of one's body. The name caught on as the drug became ever more popular on college campuses.

Gahlinger estimates that in 1976, private laboratories produced about 10,000 doses per month. By 1985, that number had risen to 50,000 doses per month. And then demand simply skyrocketed. *Time* magazine reported that in December of 1999, drug agents seized 1.2 million tablets of ecstasy in a single bust in Los Angeles. U.S. customs agents confiscated 9.3 million tablets in 2000, a small fraction of the total sold and consumed that year. In April 2005, as reported by *ABC News Online,* "Australian . . . authorities found 5 million ecstasy tablets, with a street value of more than $250 million, in a shipment of tiles." That was the biggest single bust of ecstasy on record as of that date.

Ecstasy Found at Raves: The popularity of ecstasy coincided with a new type of all-night dance party called a "rave." Beginning in 1987 on the Spanish island of Ibiza, British vacationers staged all-night parties, complete with loud, beat-driven dance music in crowded conditions. Raves spread first to the United Kingdom and then to the United States. By the mid-1990s they were widespread, particularly in big cities. The use of "club drugs" to enhance the enjoyment of the party experience was already established in America, where certain discos catered to cocaine and amphetamine users. Ecstasy fit the rave scene better than cocaine, however. Under its influence, otherwise shy or cautious people became wild dancers, open and friendly to strangers, and able to stay awake all night.

By the time raves became established in the United States, ecstasy had already been added to the Schedule I list of controlled substances by the U.S. Food and Drug Administration (FDA). Ecstasy's placement on the list in 1985 was under an "emergency" clause. As animal testing continued, even the psychiatrists who had used it for patient therapy began to agree that the drug was unsafe. When illegal ecstasy became the drug of choice at raves, the government's position was strengthened. Emergency room visits sparked by bad reactions to ecstasy spiked from 253 in 1994 to 5,542 in 2001, according to the Drug Abuse Warning Network (DAWN) report. In 2002, ecstasy-related ER visits dropped to 4,026. In 2000, the *Christian Science Monitor* reported 72 deaths related to ecstasy in the state of Florida alone.

Is It Really Ecstasy?

Since it is illegal, an ecstasy pill is not regulated for purity. Authorities have found pills being sold as ecstasy that have contained:

- 4-bromo-2, 5-dimethoxyamphetamine (2C-B), a hallucinogen
- caffeine, a stimulant
- dextromethorphan, an active ingredient in cough syrup
- lysergic acid diethylamide (LSD), a hallucinogen
- paramethoxyamphetamine (PMA), a hallucinogen
- pseudoephedrine, an antihistamine (a drug that blocks the creation of "histamines," chemicals released in allergy attacks)

The dosage levels of ecstasy also vary from pill to pill. In March 2005, a healthy 24-year-old man in Glastonbury, United Kingdom, died of an ecstasy overdose. The local coroner blamed the death on "rogue tablets" containing high doses of the drug.

What Is It Made Of?

Ecstasy's long, complicated scientific name refers to the various parts of its molecule. A particular group of atoms, in a specific arrangement, make up the ecstasy molecule. The drug begins with an N-methyl group of carbon and hydrogen atoms, attached to a nitrogen-containing compound. A methylene bridge attaches more carbon, with "dioxy," or two oxygen atoms as part of the bridge. The molecule becomes more complex with attachments of benzene, propane, another chain of carbon and hydrogen atoms, and an amino group. Drawn out on a blackboard, the molecule looks like an answer on an advanced chemistry test. In its pure form, ecstasy is a white powder. If the powder is light brown in color, it is impure.

The MDMA molecule does not occur in any living organism. It must be created in a laboratory by a process known as "synthesis." The process of creating ecstasy is fairly simple for chemists, and it is inexpensive to make. Pills that are manufactured for pennies apiece can sell in the illegal drug market for $15 to $40 per dose. A vast underground network of laboratories, most of them in Europe, supply a cunning army of smugglers who bring the pills to the United Kingdom and the United States.

Pills bought on the street might not contain pure ecstasy, however. Dosages vary widely. So do the ingredients in the illegal pills. Some might contain caffeine or dextromethorphan, others might have powerful hallucinogens. Occasionally the pills have nothing in them at all but sugar or aspirin. The old phrase "buyer beware" applies to any illegal drug purchased on the street.

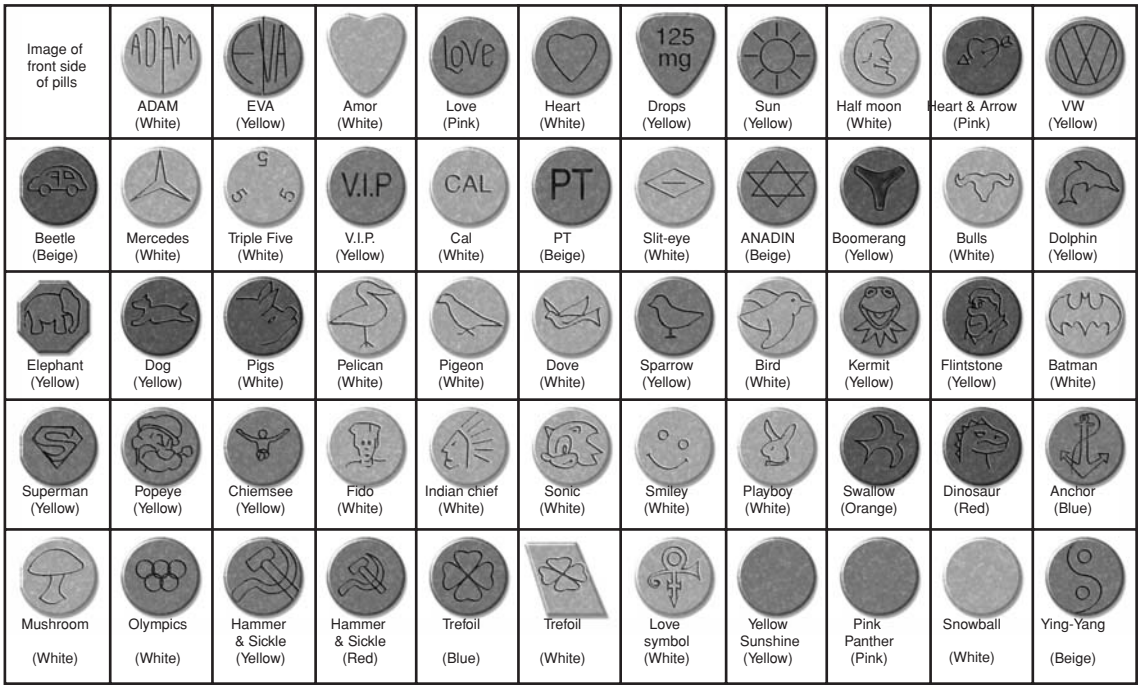
How Is It Taken?

At least part of ecstasy's popularity is based on how easy it is to take. It is sold primarily in pill form. Users swallow the small pills with water or alcohol. Some users have been known to crush ecstasy and snort it. The average dose per pill is 50 milligrams, but the dosages can range up to 300 milligrams.

When sold on the street, ecstasy pills might also contain such substances as caffeine, dextromethorphan, or a dangerous hallucinogen called PMA. Some club drug users unknowingly take PMA thinking it is ecstasy. PMA is nicknamed "death" because people tend to overdose on it easily.

Sometimes ecstasy is taken deliberately with other controlled substances. A combination of ecstasy and LSD is called a "candy flip." The DAWN report indicates that ecstasy users who are admitted to hospital emergency rooms sometimes also test positive for marijuana, hallucinogens, or stimulants such as cocaine.

Ecstasy pills come in various colors and designs. According to the White House Office of National Drug Control Policy's *Pulse Check: Trends in Drug Abuse* from November 2002: "In order to market their product, 'cooks' [drug makers] in many areas produce ecstasy pills in a variety of colors and shapes, with numerous logos, labels, and stamps. Corporate names, fashion designers, and cartoon characters are often featured, with constant changes in some



Ecstasy pills come in various shapes and colors with many different symbols, characters, or words stamped on them. *By Argosy for Thomson Gale.*

cities as different fads come and go." Popular designs include the letter "e," hearts, shamrocks, animals, smiley faces, car logos, the Nike symbol, Pokemon characters, Batman, Superman, Popeye, Mickey Mouse, Buddha, and the Statue of Liberty. Patterns and colors often vary by region of the country.

Are There Any Medical Reasons for Taking This Substance?

The FDA puts all prescription medications through thorough tests to make sure the substances are safe, that they work on the condition for which they are prescribed, and that they have no long-term negative side effects. The scientific research done on ecstasy to date indicates that it does cause brain damage, memory loss, and long-lasting mood disorders. Currently ecstasy cannot be prescribed by doctors, and it is not produced by legitimate pharmaceutical companies.

That being said, the FDA has approved small studies of ecstasy use. One involves people suffering from post-traumatic stress

Ecstasy Chronology

Ecstasy was created in the early 1900s, but it is one of the newer drugs of abuse in the United States. Here is a brief look at ecstasy's history.

1910 German scientists first synthesize MDMA while studying amphetamines. The Merck company patents the drug in 1914.

1953 The U.S. Army Office of Strategic Services (OSS) experiments with MDMA for possible use in chemical warfare.

1965 Alexander T. "Sasha" Shulgin (1925—) synthesizes MDMA and experiments with it himself. Shulgin feels the drug could have uses in the mental health field.

1985 Faced with growing recreational use and tests indicating that the drug causes brain damage in animals, the U.S. government adds ecstasy to the Schedule I list of controlled substances.

2000 U.S. customs agents seize 9.3 million doses of ecstasy from smugglers and dealers.

2004 Monitoring the Future researchers note a decline in ecstasy use among eighth, tenth, and twelfth graders in the United States.

2005 Australian authorities seize approximately 5 million ecstasy tablets in the biggest MDMA drug bust to that date.

disorder (PTSD), which is a mental illness that can occur after one experiences or witnesses life-threatening events, such as serious accidents, violent assaults, or terrorist attacks. Symptoms of PTSD include reliving the experience through nightmares and flashbacks, having problems sleeping, and feeling detached from reality. Those who suffer from PTSD tend to repress memories of the dangerous incident that provoked the disease. It is thought that ecstasy might help patients relive the trauma to reduce anxiety about it. The study of ecstasy for use in PTSD patients was in preliminary stages in 2005.

The FDA has also approved a trial study of ecstasy use in terminally ill cancer patients who have been given only a short time to live. In this case, it is thought that the drug will ease the patient's anxiety about death, while also increasing the patient's ability to talk openly with grieving family members. This study highlights the dangers of casual ecstasy use at parties. Since those being given ecstasy in the study are going to die within weeks or months, the worries of long-term brain damage do not exist.

Neither of these studies have resulted in the classification of ecstasy as a drug with medical benefits.

Government Steps In

The Ecstasy Prevention Act of 2001, Senate Bill S1208 IS, offered government grants to communities that put a high priority on curbing the sale of ecstasy at clubs and raves. The bill also provided $7 million in federal funding for a national media campaign on the dangers of ecstasy and other club drugs. The same bill instituted a drug test for ecstasy use among government employees.

Usage Trends

By the mid-1980s, when it was declared illegal, ecstasy had already found users among college students. However, the drug found its most visible place in the rave and club scene of the 1990s. Even though it is illegal, ecstasy use increased dramatically among partygoers and rave attendees. Taking a small pill seems far less extreme than snorting, smoking, or injecting a drug, so many young people thought ecstasy was not dangerous. Peer pressure added to the drug's popularity. In a crowded club, friends could easily persuade other friends to try it.

With increased ecstasy use came increased information on how the drug behaves, its side effects, and its dangers. This information seems to have filtered into the population of ecstasy users—and those who might consider using it. According to the 2004 Monitoring the Future (MTF) study, ecstasy use peaked among eighth, tenth, and twelfth graders around the year 2000 and has since sharply declined for all of those age groups. The 2003 National Survey on Drug Use and Health (NSDUH) likewise reported a decrease in repeat use between 2002 and 2003, as well as a decrease in the number of first-time users, from 1.8 million in 2002 to 1.1 million in 2003. Young people also reported that the drug became harder to find than it was in the past. M. J. Ellenhorn, in *Ellenhorn's Medical Toxicology: Diagnosis and Treatment of Human Poisoning,* wrote: "Desirable effects begin to change with each successive dose: freshmen love it, sophomores like it, juniors are ambivalent, and seniors are afraid of it."

Whatever the cause, from legal crackdowns on raves to word of mouth, ecstasy use began to decline in 2003.

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

dopamine: pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

norepinephrine: pronounced nor-epp-ih-NEFF-run; a natural stimulant produced by the human body

Effects on the Body

Medical doctors say that ecstasy increases the levels of several neurotransmitters in the brain. Neurotransmitters are substances that help spread nerve impulses from one nerve cell to another. Specifically, ecstasy increases SEROTONIN, which regulates mood and blood vessel behavior; DOPAMINE, which regulates movement and mood; and NOREPINEPHRINE, which regulates blood pressure.

The neurotransmitters flood the brain's synapses, which are junctions between two nerve cells where signals pass, and are not taken in again by the brain's nerve terminals. An excess of serotonin

in the brain affects emotions and perception. An excess of dopamine alters muscle movements and the ability to feel pleasure and pain.

Basically, the ecstasy user's brain chemistry is altered. About twenty minutes after ingestion, ecstasy causes a "rush" that leads to a high, lasting about three to six hours. During that high, a user often experiences high levels of happiness, contentment, affection for friends and strangers, self-confidence, and increased energy. The drug lowers INHIBITIONS and encourages people to act on their impulses. Its use has been linked to casual sexual encounters.

In a club or rave setting, an ecstasy user might dance nonstop for hours, "feeling" the music with a heightened sense of awareness. However, repeated incidents have shown that crowded clubs prove a bad setting for ecstasy use. The drug's side effects can be intensified by heat, exercise, and dehydration.

Ecstasy affects many functions of the body beyond mere emotion. It causes uncomfortable clenching of the jaw, muscle tension, nausea and vomiting, excessive sweating, tremors, chills, and blurred vision. In certain people it can lead to death through elevated body temperature, heart attack, stroke, or seizure. Some ecstasy deaths have occurred when users drank too much water, leading to fatal swelling of the brain. A condition called RHABDOMYOLYSIS has also been linked to ecstasy use. Medical literature also warns that ecstasy use can lead to kidney failure through alteration of the salt level in the bloodstream.

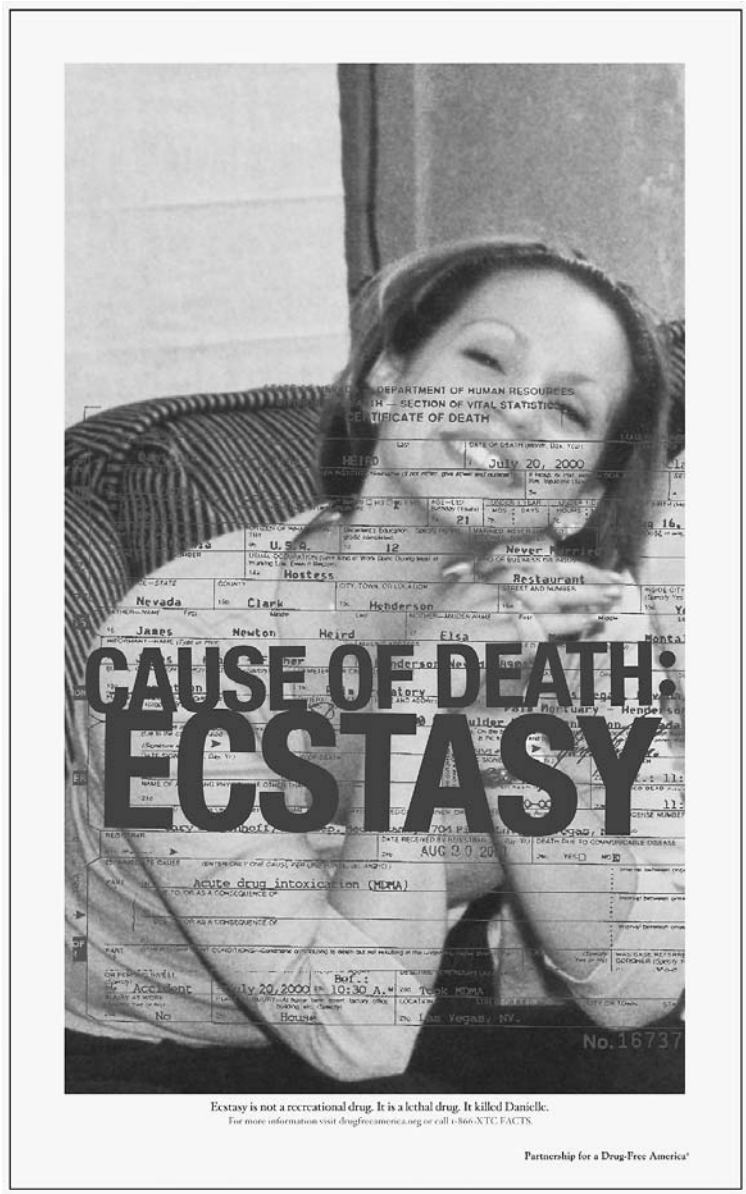
The most difficult side effects of ecstasy use begin as the drug wears off. These effects can last for weeks or months. In his book, Gahlinger observed: "Coming down off a weekend rave, the aftermath of MDMA can feel like a bad hangover that some users refer to as the Terrible Tuesdays." The user feels stressed, anxious, tired, and depressed. Ecstasy differs from other drugs in that users do not get relief from their hangovers from taking another dose of the substance. Sometimes the extra dose of ecstasy makes the bad symptoms worse. Even in those who get some rebound relief from another dose, ecstasy users build up a TOLERANCE level. After awhile, the desired high does not come, no matter how much ecstasy the user takes.

Gahlinger noted: "Monkeys show abnormal patterns of serotonin-producing neurons up to seven years after treatment with MDMA. In people who have taken MDMA 20 times or more, analysis of the spinal fluid shows a depletion of serotonin metabolites, indicating a long-term disruption in normal brain functioning." Ecstasy abuse has been linked to long-term depression, panic attacks, impulsive behavior, and memory loss—all symptoms of a serotonin imbalance in the brain. Studies show that ecstasy is neurotoxic in animals. In other words, it can damage their brains.

inhibitions: inner thoughts that keep people from engaging in certain activities

rhabdomyolysis: pronounced rabb-doh-my-OLL-uh-sis; destruction of muscle tissue leading to paralysis

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced



As part of its campaign against drug use, the Partnership for a Drug-Free America told the story of Danielle, a young woman who died after using ecstasy. Here, her picture is superimposed with her death certificate. According to the coroner, the cause of death was ecstasy. *Public Service Announcement provided courtesy of the Partnership for a Drug-Free America®.*

About one in twelve people lack an enzyme called *cytochrome P450-246* that metabolizes ecstasy. One dose of the drug can be fatal to this group of users.

Reactions with Other Drugs or Substances

Sometimes people intend to mix ecstasy with other drugs or alcohol. Sometimes the "ecstasy" pill actually contains other substances. Either way, ecstasy does not react well with any drug or with alcohol. Taking ecstasy while drinking alcohol can greatly increase the possibility of fever and dehydration. Combining ecstasy with hallucinogens such as ketamine, LSD, or 2C-B can magnify the level of HALLUCINATIONS. Mixing ecstasy with stimulants such as cocaine or methamphetamine can increase blood pressure and heart rate.

Certain prescription drugs known as monoamine oxidase inhibitors (MAOIs) should never be combined with MDMA. The reaction between the two substances can be fatal. MAOIs are prescribed for depression and for the symptoms of acquired immunodeficiency syndrome (AIDS).

Some other drugs prescribed for depression and anxiety may actually block the brain's reaction to ecstasy. This group of drugs is called selective serotonin reuptake inhibitors, or SSRIs, and includes Prozac, Zoloft, and Paxil.

People suffering from anxiety, depression, PHOBIAS, or other mental disorders should avoid taking ecstasy at all. Even one dose can cause mental problems to become worse, or to last longer, or to be resistant to treatment.

Ecstasy and Mental Health

Late in 2004, the Food and Drug Administration approved two pilot studies of ecstasy for use in the mental health field. In one study, terminally ill cancer patients were given ecstasy in hopes that the drug would ease their anxiety as they faced death. In another, the drug was given to victims of post-traumatic stress disorder (PTSD), a condition brought on in response to a frightening or life-threatening event. The government did not fund either of these studies. They were paid for by a private, nonprofit foundation called the Multidisciplinary Association for Psychedelic Studies.

Treatment for Habitual Users

While not physically addictive, ecstasy is dangerous because repeated use—even weeks or months apart—can damage neurons in the brain. Today's habitual users are tomorrow's research subjects, because scientists do not know how repeat use of ecstasy will affect brain function as people age. Animal studies show that brain damage after heavy MDMA use may last a lifetime. Effects on humans are highly debated. Some research indicates long-term memory problems.

hallucinations: visions or other perceptions of things that are not really present

phobias: extreme and often unexplainable fears of certain objects or situations

Test your knowledge: How much do you know about Ecstasy?

The National Institute on Drug Abuse of the National Institutes of Health has created this quiz for teens about the club drug ecstasy and its effects. The answers follow the quiz, but don't peek. See how much you know!

1. Ecstasy is also known as _____.

   a) MDMA
   b) PCP
   c) LSD

2. Ecstasy is known as a "club drug" because _____.

   a) Teens take ecstasy at a clubhouse
   b) Teens take ecstasy in a big sandwich
   c) Teens use ecstasy at all-night dance clubs

3. Ecstasy is part _____.

   a) Opiate and inhalant
   b) Stimulant and hallucinogen
   c) Marijuana and prescription drug

4. A slang word for ecstasy is _____.

   a) Dumbo
   b) Adam
   c) Noodles

5. Ecstasy is usually taken in a _____.

   a) Needle or syringe
   b) Patch on the skin
   c) Pill or tablet

6. In 2002 teens were using ecstasy _____ than in 2001.

   a) Less
   b) More
   c) About the same

7. One of the dangers of ecstasy is hyperthermia or _____.

   a) Overheating
   b) Freezing
   c) Losing an arm or leg

8. MDMA is _____ in animals.

   a) Neurotoxic
   b) Hypertoxic
   c) Not toxic

9. Ecstasy use can effect _____.

   a) Sight and hearing
   b) Thought and memory
   c) Speech and language

10. Ecstasy is often made with _____.

    a) Other drugs
    b) Added vitamins
    c) Extra care

11. A dose of ecstasy lasts _____.

    a) All night
    b) 30 minutes
    c) 3 to 6 hours

Answers:

1. **A**: Ecstasy is known in science as methylenedioxymethamphetamine or MDMA.
2. **C**: Ecstasy is known as a "club drug" because teens and young adults take the drug at a nightclub, rave, or trance scene.
3. **B**: Ecstasy is part stimulant (amphetamine-like) and part hallucinogen (LSD-like).
4. **B**: Ecstasy is sometimes called "Adam."
5. **C**: Ecstasy is usually taken by mouth as a pill, tablet, or capsule.
6. **A**: According to a recent Monitoring the Future study of teens in 8th, 10th, and 12th grades, use of ecstasy is less than in previous years.
7. **A**: Ecstasy causes the body to overheat because of dehydration or loss of fluids through excessive sweating.
8. **A**: MDMA is neurotoxic in animals, which means it can damage their brains.
9. **B**: Ecstasy use affects thought and memory.
10. **A**: Other chemicals or substances are often added to or substituted for MDMA, such as caffeine, dextromethorphan (cough syrup) and amphetamine. Makers of ecstasy can add anything they want to the drug. So the purity of ecstasy is always questionable.
11. **C**: For most users, a "hit" of ecstasy lasts for 3 to 6 hours

SOURCE: Adapted from "Quiz: Ecstasy," in *The Science Behind Drug Abuse: NIDA for Teens,* National Institute on Drug Abuse, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MA [Online] http://teens.drugabuse.gov/parents/documents/ecstasy_quiz.doc [accessed May 24, 2005]

Anyone wishing to quit an ecstasy habit should consult a doctor or psychiatrist. The emotional and mental problems brought on by ecstasy may be eased by prescription medication. Users are advised to talk about the reasons why they began using illegal drugs—and stay away from situations where such drugs might be available. The nonprofit organization Narcotics Anonymous (NA) has chapters in most towns and cities where drug abusers can share experiences and help each other to stay straight. NA also operates a telephone hotline and can give referrals to doctors and hospitals where drug abusers can receive attention.

Consequences

Ecstasy use can lead to death through several paths. An overdose can occur from a pill containing too much of the drug. In this case, the user collapses, becomes unconscious, and stops breathing. Cases have been reported of heart attack due to ecstasy overdose.

Sweating and HYPERTHERMIA or overheating brought on by ecstasy use in crowded settings, combined with exercise such as dancing, can lead to death in two ways. In the first case, the user simply dies of organ damage, similar to a HEAT STROKE. In the second case, the user drinks so much water that the body falls into a condition called HYPONATREMIA, literally, water poisoning. Drinking too much water too quickly flushes important sodium from the body and causes the brain to swell. A sixteen-year-old girl in Boulder, Colorado, died of this condition in 2001 after taking ecstasy at a party.

The rebound "low" after taking ecstasy has been linked to suicidal depression. A teenager named Dayna Moore is quoted on the *Monitoring the Future* Web site on the pitfalls of ecstasy rebound: "When I came down, I fell into a deep, dark hole. It was a depression I couldn't stand." Anyone with a history of mental problems would be more likely to experience this difficulty.

Ecstasy might not always kill, but it does damage the brain—sometimes after even one use. Repeat users face a host of rebound symptoms, including panic attacks, phobias, depression, loss of appetite, and memory problems.

hyperthermia: a dangerous rise in body temperature

heat stroke: a condition resulting from longtime exposure to high temperatures; symptoms include an inability to sweat, a very high body temperature, and, eventually, passing out

hyponatremia: pronounced HY-poh-nuh-TREE-mee-uh; a potentially fatal condition brought on by drinking too much water; can cause swelling of the brain or sodium imbalance in the blood and kidneys

The Law

Ecstasy is a Schedule I substance, carrying the highest degree of illegality for possession and distribution. It is illegal in the United States, Canada, and the United Kingdom, and it cannot be obtained by prescription. Anyone caught with ecstasy can face stiff fines, possible

To help users be sure that ecstasy pills contained no other ingredients, some clubs offered purity testing stands, like this one in the Netherlands. However, in 2003 the U.S. government implemented the Reducing Americans' Vulnerability to Ecstasy act, which made it illegal to run purity tests in clubs. *© The Cover Story/Corbis.*

prison time, and other penalties. These penalties vary from state to state and can differ depending on the amount of the substance seized.

In 2003 the federal government passed the Reducing Americans' Vulnerability to Ecstasy bill. It is a law that places a great deal of responsibility on organizers of raves or large get-togethers. The bill makes these club owners or promoters responsible if ecstasy is found at their events. Prior to the passage of this bill, some clubs had purity testing facilities on their premises so that ecstasy users could be sure their pills had no other ingredients. In this regard, the bill further increases the dangers of ecstasy use because it is now illegal to run purity tests in clubs.

Given the scientifically proven dangers of ecstasy use, it is unlikely that the substance will be removed from Schedule I status, except perhaps for the use of hospice patients who are about to die. As of late

2004 and early 2005, there was some renewed interest in using MDMA to treat the mentally ill. However, studies need to be conducted to determine how this could best be achieved.

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See also: 2C-B (Nexus); Amphetamines; Caffeine; Dextromethorphan; GHB; Ketamine; LSD (Lysergic Acid Diethylamide); PMA and PMMA

Ephedra

Official Drug Name: Ephedra (ih-FEH-druh) *Ephedra sinica,* ephedrine (ih-FEH-drinn), ephedrine alkaloids
Also Known As: *Ma huang, mahuang,* Mormon tea
Drug Classifications: Not scheduled; dietary supplement

What Kind of Drug Is It?

Ephedra plants are yellow cone-bearing bushes that grow in desert areas. The Chinese herbal remedy *ma huang* (ma-HWANG) is made from the twigs of the ephedra bush. It has been used to treat asthma (AZ-muh), a lung disorder, for thousands of years. Asthma is a disease that involves swelling and congestion in the lungs, which makes it difficult to breathe.

Ephedra is a natural source of ephedrine, just as coffee beans are a natural source of caffeine. For nearly a decade prior to its ban by the U.S. government in 2004, ephedra was associated with very serious side effects, including strokes, heart attacks, and even death in some users.

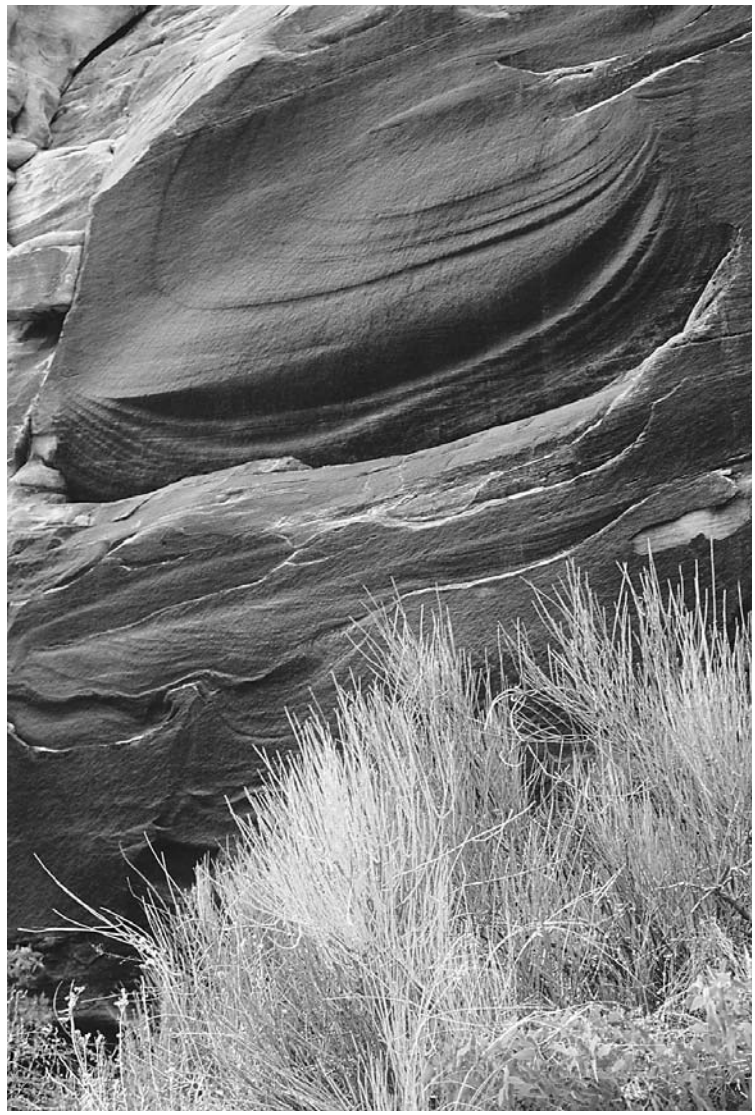
Overview

The Chinese herbal remedy ephedra, also called *ma huang,* has generated a whirlwind of debate since the mid-1990s, when some of its users became seriously ill. Reports of adverse events, or negative side effects, related to ephedra use raised considerable concern among physicians and legislators. Until it was banned by the U.S. Food and Drug Administration (FDA) in 2004, ephedra was most often taken by young and middle-aged adults for weight loss, increased energy, and bodybuilding. Chinese herbalists argue that ephedra should not be used for these purposes.

The earliest known use of ephedra was in ancient China, where it was used as an herbal remedy to treat a variety of ailments. In the 1920s, Dr. K. K. Chen studied ephedra and isolated its active ingredient—ephedrine. An active ingredient is the chemical or substance in a compound known or believed to have a therapeutic, or healing, effect.

Ephedrine ALKALOIDS act as powerful stimulants on the heart, causing an increase in heart rate and a rise in blood pressure. (Stimulants are substances that increase the activity of a living organism or one of its parts.) Ephedrine also helps dilate, or open up, the breathing passages in the lungs.

alkaloids: nitrogen-containing substances found in plants



Wild ephedra is shown growing in a canyon in Utah. According to folk tradition, ephedra received the nickname "Mormon tea" because of its popularity among pioneers of the Mormon faith. Religious restrictions kept Mormons from consuming coffee and black tea, so they drank herbal tea brewed from the ephedra bush as a substitute.

Soon after the discovery of ephedrine alkaloids, physicians in the United States began prescribing ephedra as a decongestant for stuffy noses. It was also used as a bronchodilator—a drug that relaxes

Ephedra is one of the medicinal and ceremonial plants used by Native Americans in the desert and canyon areas of the American West.

breathing muscles, allowing air to flow more easily through the tubes that lead to the lungs.

Serious side effects associated with ephedra include high blood pressure, irregular heart rate, seizures, heart attacks, and strokes. Extensive research and analysis have linked the use of this herbal stimulant to 155 deaths. One tragedy involved a healthy sixteen-year-old high school student from Lincoln, Illinois. In September of 2002, Lincoln Community High School football player Sean Riggins died of HEAT STROKE after taking a strength-boosting ephedra supplement he had purchased at a gas station. As of early 2005, the controversy surrounding ephedra—and its ban—raged on.

heat stroke: a condition resulting from longtime exposure to high temperatures; symptoms include an inability to sweat, a very high body temperature, and, eventually, passing out

Bulking Up and Slimming Down

Before ephedra was banned by the FDA in 2004, products containing the herb were used primarily for weight reduction. Health

food stores, supermarkets, drugstores, convenience stores, and even gas stations sold products containing ephedrine alkaloids. These included products with names such as Easy Trim, Diet Max, Xtreme Lean, Metabolife 356, Xenadrine RFA-1, Ultimate Orange, Yellow Jacket, Quick Shot, Stacker 2, and Ripped Fuel. The products' labels promised they would fight fat, build lean muscle mass, curb the appetite, boost energy, and help users lose weight.

Under the U.S. Dietary Supplement Health and Education Act (DSHEA), which was passed in 1994, herbs are treated as foods rather than drugs. The act allowed dozens of brands of supplements containing ephedrine alkaloids to flood the market without being tested for safety. As a rule, herbal supplements do not have to undergo the extensive testing required for over-the-counter (OTC) medications and prescription drugs. In fact, it is up to the FDA to show that an herbal supplement is unsafe. As Snigdha Prakash explained in a National Public Radio (NPR) story on ephedra, "the FDA must prove that problems associated with ephedra supplements are caused by them."

As far back as April of 1996, the FDA issued a consumer warning about ephedra. The government agency noted that ephedra *may* have been connected with a dozen deaths and several hundred complaints of adverse reactions. From that point on, the reports of complications linked to ephedra use kept climbing. In an article published in the *Virginian Pilot* in 2000, Dr. Neal L. Benowitz of the University of California at San Francisco noted that heart attacks, strokes, seizures, and deaths were occurring in "otherwise healthy young people" who had taken the herbal stimulant. He and fellow researcher Dr. Christine Haller concluded: "Dietary supplements that contain ephedra alkaloids pose a serious health risk to some users."

The Ephedra Education Council, a group backed and supported by the herbal products industry and supplement manufacturers, has always insisted that ephedra is completely safe when taken as directed. They blame adverse reactions to ephedra on: 1) improper dosing; 2) preexisting health problems among users; and 3) the combined effects of caffeine or other drugs taken along with the herbal supplement.

Tragedy on the Ball Field

On February 16, 2003, the ephedra controversy became front-page news when twenty-three-year-old Steve Bechler, a pitcher with the Baltimore Orioles, collapsed during a preseason workout in Florida. He died the next day.

Members of the Baltimore Orioles observe a moment of silence in honor of their teammate Steve Bechler, who died after collapsing from heat stroke during spring training in Florida. Bechler's death was reportedly linked to a supplement containing ephedra and caffeine. *AP/Wide World Photos.*

Bechler was trying to lose about ten pounds that he had put on between seasons. He had not eaten regular meals for several days and was reportedly taking a weight-loss supplement that contained ephedra and caffeine. By speeding up body processes, ephedra and ephedrine alkaloids create more heat within the body. The substances also act to constrict, or narrow, the blood vessels, making it harder for the body to release the pent-up heat through the skin in the form of sweat. In addition, experts note that the energy-enhancing effect of ephedra may prompt users to exercise longer and harder than they normally would or should.

Drugs and Baseball

The controversy surrounding the death of Steve Bechler in 2003 prompted Major League Baseball (MLB) to take a good look at its drug-testing policy. Ephedra and ephedrine alkaloids had already been banned in minor league baseball, as well as by the International Olympic Committee (IOC), the National Collegiate Athletic Association (NCAA), and the National Football League (NFL). Suspected steroid use among professional baseball players had sparked arguments about the prevalence of drugs in the league as well. "Both ownership and the players have been widely criticized for not facing up to the use of legal muscle-building drugs that gave new muscles to Mark McGwire and many other sluggers," noted George Vecsey in the *New York Times*.

Aside from being overweight, Bechler had other health problems, including an enlarged heart, higher blood pressure than he should have had, and trouble with his liver. On the day of his fatal spring training workout, he is said to have taken three ephedra-containing supplement pills—one pill more than the recommended dosage. Bechler later collapsed on the field from severe heat stroke. His organs simply stopped working. According to a *New York Times* article by George Vecsey, "conditions in Florida on Sunday were 81 degrees" with "74 percent humidity, far below the danger level" for heat stroke. Still, Bechler's body temperature rose to 108.4 degrees Fahrenheit before his death.

In March of 2003, reports from the medical examiner in Broward County, Florida, stated that ephedra "played a significant role" in Bechler's death. This tragedy followed earlier reports of ephedra-related fatalities among young athletes. One and a half years earlier, twenty-two-year-old Northwestern University cornerback Rashidi Wheeler died during a workout. The cause of death was listed as an asthma attack, but Wheeler had been taking a powdered performance-enhancing dietary supplement containing ephedra and caffeine. The company that manufactured the supplement had discontinued the product and all other ephedra supplements shortly before Wheeler died.

Athletic Associations Take Action

In September 2001, just one month after Wheeler's death, the National Football League (NFL) joined the National Collegiate Athletic Association (NCAA) and the International Olympic Committee (IOC) in banning its players from using ephedrine. The ephedrine ban allows for the random testing of NFL players for ephedrine use.

Mounting Evidence of Health Risks

Authorities in Canada were equally concerned about the safety of ephedra. Health Canada, the agency that regulates Canadian health care, requested a voluntary recall of products containing

ephedra or ephedrine in 2002. The agency's Web site posted an advisory stating: "A risk assessment concluded that these products pose a serious risk to health." Health Canada received sixty reports of adverse events and a report of one death related to ephedra use. The agency noted that it would "continue to monitor reports of adverse events" and "take further action if necessary."

By January of 2003, 7-Eleven stores announced that they would stop selling ephedra-containing products such as Metabolife. The General Nutrition Centers (GNC) retail chain followed suit in May. Meanwhile, the makers of Metabolife announced the release of a new formula of their supplement—one that did not contain ephedra. At the time, Metabolife International, the San Diego-based maker of Metabolife, was being investigated by the U.S. government following claims that the company had lied about the safety of its ephedra product.

At the end of 2003—six years after the safety of the herbal supplement was first called into question by the U.S. government—the administration of President George W. Bush took steps to ban ephedra. This decision was based on an in-depth investigation of the situation by RAND, a nonprofit research institute. An expert panel of researchers from RAND was hired by the government to analyze the data surrounding the ephedra controversy. The group examined the results of 20 clinical trials and 284 case reports of adverse events. RAND researchers admitted that they did not have much data to work with but stated they were able to compile "enough evidence to reach fairly confident conclusions." The results of the study were released in March of 2003. Highlights include findings that:

- Ephedrine-containing supplements increased the average weight loss of dieters in the short term by 0.4 to 2.2 pounds per month
- The athletic benefit from supplements containing ephedrine and caffeine was limited to a "20-30 percent increase in short-term performance" only
- "There *may* be a causal relationship between taking the substances and suffering rare serious adverse events. Catastrophic effects of ephedra, including death, cannot be ruled out."

Research from the University of California at San Francisco supports these findings. Dr. Stephen Bent and his colleagues set out to compare the health risks of ephedra with the dangers of other herbal products. The results of their study were published in the *Annals of Internal Medicine* in March of 2003. The researchers found that even though ephedra products amounted

Due to all the controversy surrounding ephedra, some companies opted to create similar nutritional supplements in an ephedra-free formula.
AP/Wide World Photos.

to less than 1 percent of herbal supplement sales in the United States, more than 64 percent of all adverse reactions to herbal supplements were linked to their use. Bent and his colleagues concluded: "Ephedra use is associated with a greatly increased risk for adverse reactions compared with other herbs, and its use should be restricted."

FDA Bans Ephedra in 2004

In February of 2004, the FDA prohibited the sale of ephedra supplements. The agency issued a consumer advisory that stated, in part: "After a careful review of the available evidence about the risks and benefits of ephedra in supplements, the FDA found that these supplements present an unreasonable risk of illness or injury to consumers." The ban went into effect on April 12, 2004. During the weeks leading up to that date, diehard users were "reportedly stocking up" on their favorite ephedra supplements, commented

Mary Duenwald in the *New York Times.* In some cases, users bought a large enough supply to last one to two years.

With ephedra gone from the shelves, dieters and athletes began looking for a product to take its place. "Critics . . . remained concerned because so little was known about the other herbal ingredients being used as substitutes," reported Christopher Drew and Ford Fessenden in the *New York Times.* One such substance is an ephedrine-like stimulant called synephrine (sih-NEH-frinn), also known as the bitter Seville orange (*Citrus aurantium*) or simply bitter orange. The substance is supposed to be safer than ephedra but has not undergone studies to prove that claim. According to the *New York Daily News,* bitter orange "has been linked to seven deaths."

Back in the News in 2005

The Utah-based supplement company Nutraceutical International was the first in the industry to be successful in challenging the FDA's ban on ephedra. In the spring of 2005, federal judge Tena Campbell ruled in favor of Nutraceutical, saying the FDA had failed to prove that the company's product "posed a significant health risk," wrote Penni Crabtree. The judge's ruling applies only to so-called "low-dose" supplements such as the one produced by Nutraceutical. A "low dose" supplement contains 10 or fewer milligrams of ephedrine alkaloids per daily dose.

The Utah ruling made it hard to predict the future legal status of ephedra. Under Judge Campbell's order, the FDA cannot stop Nutraceutical from selling its ephedra supplement. In addition, the FDA must determine what constitutes a "safe level" of ephedrine.

Metabolife Lawsuits

In June of 2004, just two months after ephedra supplement products were banned in the United States, Metabolife International lost a major court case that centered on the health risks connected with its product Metabolife 356. Rhea McAllister, a thirty-five-year-old Texas woman who took Metabolife 356 for about a month, suffered a stroke in 2002. She was trying to lose some weight and thought the product would help her burn off a few pounds. A jury awarded her $7.46 million in damages. The award would have been larger if McAllister had not been found partly to blame for the extent of the damage. "Jurors found McAllister 30 percent liable for failing to tell her doctors she was using Metabolife when she first complained of symptoms," noted Beth Gallaspy in an article for the *Beaumont Enterprise*.

This was not the first time Metabolife International had been taken to court over Metabolife 356. "In November 2002," wrote Penni Crabtree in the *San Diego Union-Tribune,* "a federal jury in Alabama awarded $4.1 million in damages to four people who suffered heart attacks or strokes" after taking the product.

What Is It Made Of?

The ephedra bush grows in the desert regions of Asia, North America, and other parts of the world. Not all ephedra plants contain

ephedrine alkaloids. It is the alkaloid content of the plant that gives it a medicinal effect. The Asian ephedra plant typically has the highest concentration of ephedrine alkaloids.

The chemical formula for ephedrine is $C_{10}H_{15}NO$, which is very similar to the structure of AMPHETAMINE or "speed," a widely abused stimulant that gives people a lot of energy. (A separate entry on amphetamines is available in this encyclopedia.) Like amphetamine, ephedrine alkaloids can have a powerfully stimulating effect on the heart. Former FDA commissioner David A. Kessler told the *New York Times* in 2003 that substances like ephedra are really drugs "masquerading as nutritional supplements."

How Is It Taken?

Ephedra has been sold in the form of tablets, capsules, a powder that can be combined with water to make a shake, and as a key ingredient in energy boosting bars. Asthma treatments include sprayable mists and injectable liquids containing ephedrine.

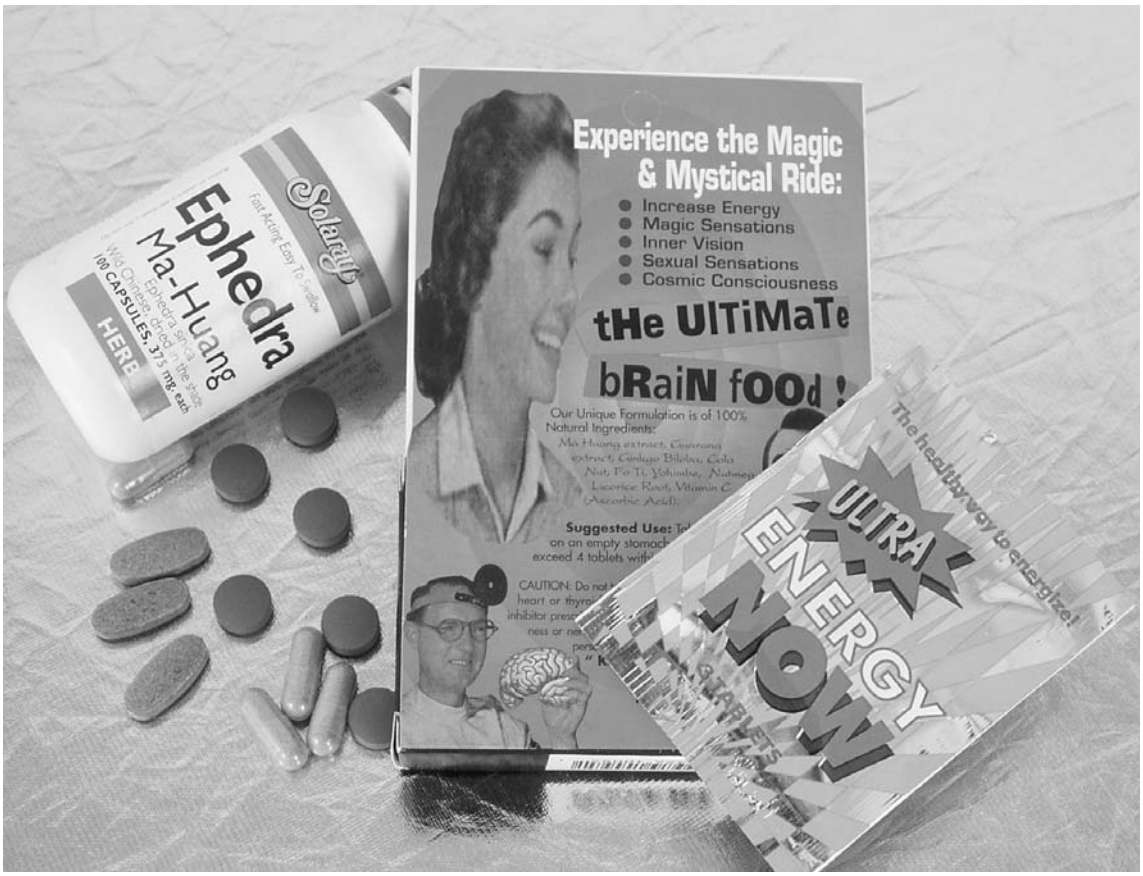
The twigs of the *ma huang* plant are dispensed by traditional Chinese herbalists. Tea made from the twigs is used to treat asthma, coughs, and the common cold. Herbalists caution that ephedra is a strong herb and that it should not be used for more than a week at a time.

Ephedrine starts to take effect about an hour after ingestion and, after kicking in, lasts about three to four hours. The recommended dosage of ephedrine is a maximum of 8 milligrams in 6 hours, or 32 milligrams per day. In *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy,* Cynthia Kuhn and her coauthors caution that it is hard to regulate the dosage of herbal remedies because "the amount and purity of what you buy is unknown."

Are There Any Medical Reasons for Taking This Substance?

Ephedra has been used to treat a variety of ailments for thousands of years. Because it can dilate breathing tubes and ease congestion in the nasal passages, it has been used as an ingredient in some over-the-counter decongestants and cough and cold products. Until it was banned in 2004, ephedra was used in the United States mainly as a weight-loss aid, a body-building product, and a booster for improved athletic performance.

amphetamine: pronounced am-FETT-uh-meen; a stimulant drug that increases mental alertness, reduces appetite, and helps keep users awake



Many ephedra supplements claimed that they could boost one's energy and feed one's brain. © *Laura Dwight /Corbis.*

In a report on Chinese herbal medicine published in the *Dallas Morning News,* Esther Wu interviewed experts in the field of herbal remedies. One of these experts, Dr. Richard Tao of the Dallas College of Oriental Medicine, commented: "In the United States, the herb has been abused. Ma huang is not traditionally used for losing weight."

Usage Trends

The *Knight Ridder/Tribune Business News* estimated that 12 million Americans used ephedra products at the height of their popularity. Ephedra sales fell from $1.3 billion in 2002 to $510 million in 2003, according to the *New York Times.*

Ephedrine and Meth

The U.S. Drug Enforcement Administration (DEA) has been monitoring ephedrine powder and tablet production because these substances can be used to make methamphetamine, an illicit drug more commonly known as "meth" or "speed." Methamphetamine is highly addictive, often abused, and extremely dangerous. Illegal labs can produce about 1.5 pounds (0.68 kilograms) of meth from 2.2 pounds (1 kilogram) of ephedrine. Pseudoephedrine, a substance found in cold medicines, can be used for the same purpose.

Before the ban on ephedra and ephedrine alkaloid supplements, manufacturers claimed that the products enhanced athletic performance and helped build lean muscle mass. That made ephedra supplements especially appealing to both male and female athletes. Frank Uryasz of the NCAA told *Houston Chronicle* reporter Janny Hu that young athletes run the greatest risk of suffering ephedra-related problems. "The age group we work with thinks they're going to live forever. . . . When we educate athletes about banned drugs, we say, 'Stimulant, plus exercise, plus heat and humidity, equals death.'"

Government studies reveal that most drug use, including ephedrine use, begins in high school. In fact, 62 percent of student athletes in a 2001 NCAA survey reported that they had started using nutritional supplements in high school.

Effects on the Body

Ephedra supplements have amphetamine-like effects on the user. Side effects may include dizziness, headache, tiredness, shaking, nausea, and trouble sleeping. Higher dosages can cause an unusually fast heartbeat, chest pain, extremely high blood pressure, and even seizures. Health officials point out that ephedra can be dangerous even at recommended doses because the potency, or strength, of each dose varies so much from one manufacturer to another and from one batch to another. Users have been known to double or triple the recommended dosage in an attempt to lose weight faster or perform better in athletic events.

Opponents of ephedra claim that the product is legal methamphetamine, or speed. (An entry on methamphetamine is available in this encyclopedia.) Mental side effects of ephedrine such as EUPHORIA, agitation, irritability, and ANXIETY were noted in the RAND report. Personality changes, DEPRESSION, and paranoid psychosis (a severe mental disorder that can lead to a total loss of touch with reality) could not be ruled out. These types of side effects commonly occur with the use of illicit, or illegal, stimulant drugs, including amphetamines and methamphetamine.

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

anxiety: a feeling of being extremely overwhelmed, restless, fearful, and worried

depression: a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts

Ephedra users also face an increased chance of seizures, heart attack, stroke, and possibly death. The use of ephedra by pregnant women and people with high blood pressure is especially risky.

Reactions with Other Drugs or Substances

Ephedra supplements typically contain caffeine. Users may already be consuming caffeine in carbonated beverages, coffee, or tea. Mixing caffeine with ephedrine increases the stimulant effects on the heart, making the user more anxious and edgy. "Ephedrine/caffeine/aspirin combinations are often 'stacked' by weight lifters, and used for weight loss," noted Kuhn prior to the substance's ban. Ephedra is especially dangerous when used in combination with over-the-counter or prescription decongestants, any other stimulants, and certain drugs used to treat depression.

Products such as Ultimate Xphoria, which contain ephedra, have been the subject of controversy. In 1996 a college student allegedly took eight pills while on spring break in Florida, then died of cardiac arrest. © *James Leynse /Corbis.*

Treatment for Habitual Users

Although the FDA recognizes that ephedra and ephedrine alkaloids may cause adverse health events or serious side effects, they are not considered addictive, habit-forming drugs. "Quitting abruptly is safe and does not bring on WITHDRAWAL symptoms," wrote Duenwald in the *New York Times*. "But people who have used the supplement to lose weight may see the pounds return."

Consequences

Healthy individuals have been known to suffer serious consequences following ephedra use. As of early 2005, ephedra was the only dietary supplement banned by the FDA. Possession and use of a banned substance can lead to trouble with the authorities. According to *MSNBC.com*, ephedra consumption can actually "result in a false-positive for amphetamines in urine tests." Athletes will incur a doping suspension if they test positive for ephedra.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

The Law

The FDA's ban on ephedra went into effect on April 12, 2004. The ban "specifically excludes uses of the herb in traditional Asian medicine," explained Duenwald. It is aimed instead at supplements marketed for weight loss, muscle building, and enhanced athletic performance. The sale and distribution of ephedra and ephedrine-containing supplements is against the law. It is illegal for users in the United States to obtain ephedrine supplements from countries that have not banned it. As of mid-2005, federal authorities were cracking down on Internet sites that continued to sell ephedra in the United States. It is hard to predict whether the federal ban on ephedra will remain in place.

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See also: Amphetamines; Caffeine; Dextroamphetamine; Diet Pills; Diuretics; Herbal Drugs; Methamphetamine; Over-the-Counter Drugs; Steroids

Fentanyl

Official Drug Name: Fentanyl N (1-phenethyl-4-piperidyl) propionanilide (FENN-tuh-nill proh-pee-uh-NANN-ull-ide); brand names include Actiq, Alfenta, Duragesic, Oralet, Sublimaze, and Sufenta
Also Known As: Apache, China girl, China town, China white, dance fever, friend, goodfellas, great bear, He-man, jackpot, king ivory, Mexican brown, murder 8, P-dope, perc-o-pop, Persian white, P-funk, poison, synthetic heroin, Tango & Cash, TNT, tombstone
Drug Classifications: Schedule I, analogs; Schedule II, pharmaceuticals; opioid analgesic

What Kind of Drug Is It?

Fentanyl, when used legally by doctors and ANESTHESIOLOGISTS, is a powerful, quick-acting painkiller. Its effects begin more quickly than injected drugs, such as heroin or morphine, but the effects do not last as long as either drug. (Entries for heroin and morphine are available in this encyclopedia.) Fentanyl is also the active ingredient in some transdermal patches. Such patches, available by prescription, attach to the skin and transmit the painkiller slowly over a period of hours through the skin cells. Since the mid-1990s the drug has also been available in an oral lozenge, or lollipop, to ease the most extreme forms of cancer pain.

Fentanyl is a synthetic drug, meaning that it is created in the laboratory from chemicals. It is not taken from a plant or an animal. It was created to mimic the effects of organic substances like heroin and morphine. Fentanyl works like those drugs, but it is far more powerful than either—sometimes as much as 80 to 100 times stronger than morphine. Surgeons, anesthesiologists, and oncologists (cancer doctors) are highly trained in the proper uses and the potential dangers of fentanyl, which in its legal form is a Schedule II controlled substance. This means that fentanyl is carefully monitored in hospitals and available only by prescription.

However, fentanyl and its ANALOGS can be produced in illegal labs. Since such drugs create a high for the user, fentanyl has also become an abused drug available unlawfully. Sold on the street, sometimes as "synthetic heroin," it is one of the most unpredictable, addictive, and deadly of illegal drugs.

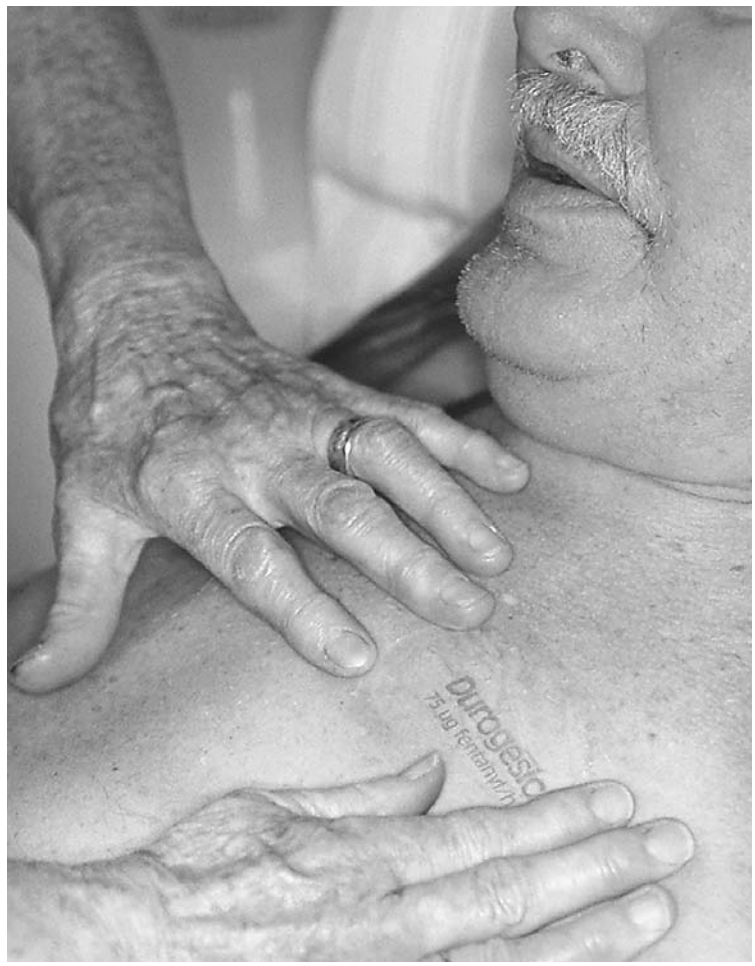
Overview

Fentanyl is an extremely powerful OPIOID that relieves pain like the various drugs created from the opium poppy plant. Opiate use extends back to ancient times, when people in the Middle East and northern Africa learned that certain poppies produce a fluid that causes euphoria, or a state of extreme happiness and well-being; drowsiness; and pain relief.

anesthesiologists: medical doctors trained to used medications to sedate a surgery patient

analogs: drugs created in a laboratory, having a slightly different chemical composition than a pharmaceutical, yet having the same effects on the brain as the pharmaceutical

opioid: a substance created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine



Transdermal patches containing fentanyl are applied directly to the patient's skin. The medication is released through the skin at a rate of about 75 micrograms per hour. *Samuel Ashfield/Photo Researchers, Inc.*

A document dated to 1552 BCE in the ancient Egyptian city of Thebes lists more than 700 uses for opium gum. Abuse of opium and its derivatives heroin, codeine, and morphine, has occurred throughout recorded history. But the drugs have also been recognized for their ability to ease pain. After the hypodermic needle was invented in 1848, injected morphine made surgery far less traumatic to a patient and eased the suffering during recovery.

Opiates, such as heroin and morphine, could not be used without difficulties, however. The substances cause addiction and

problems with the stomach and intestines. In the twentieth century, scientists began to experiment with chemical compounds that would carry the ANALGESIC benefits of morphine without the side effects such as addiction and constipation. Fentanyl was developed in the 1950s in Belgium. Its use as a quick-acting painkiller and relaxant attracted the interest of the medical community. First marketed under the brand name Sublimaze, the compound went into widespread use in the 1960s.

Fast Fentanyl Facts

Fentanyl is a human-made (synthetic) substance that mimics the behavior of opiates in the brain and central nervous system. It is 80 to 100 times more powerful than morphine.

Doctors have found many uses for such a powerful painkiller. Fentanyl is one of the ingredients given to women during childbirth to ease the pain of contractions. Oral surgeons use it during tooth extraction. Heart surgeons use it in the most delicate operations, because even patients who have been "put to sleep" with NITROUS OXIDE or some other agent can react to surgical tools. A vast majority of people facing any kind of surgery receives at least one shot of fentanyl at the beginning stages of a procedure, to ease the tension of general anesthesia (being "put to sleep"). The drug's effectiveness against the most extreme pain in terminal cancer is well established.

The Dangers of Fentanyl

Despite its effective use as a painkiller, synthetic fentanyl carries with it some of the worst side effects of its natural cousins, heroin and morphine. It is highly addictive, and its WITHDRAWAL symptoms are even worse than those of heroin. Like its cousins as well, fentanyl affects the part of the brain that controls breathing. Doctors use it in surgery with great care, closely monitoring patients for suffocation. Some people who have abused fentanyl have stopped breathing with the needles still in their arms. The drug works that fast.

Faced with these dangerous side effects, the federal government and the medical community have tried to balance fentanyl's beneficial uses against its potential for addiction and death. Pharmaceutical fentanyl—such medications as Sublimaze, Duragesic, and Actiq—are Schedule II controlled substances. Even this level of care has not eliminated the abuse of legal fentanyl, however.

Beginning in the late 1970s, illegally synthesized fentanyl analogs (using slightly different molecules) began appearing as "club drugs" that could be snorted, injected, or taken as tablets. Drug dealers

analgesic: pain reliever or the qualities of pain relief

nitrous oxide: a gas given to surgical patients to induce sleep

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

After Chechen rebels took an entire theater of people hostage in Moscow in 2002, they released eight children. The fate of some of the other child hostages was not the same, however. To end the standoff, the Russian government flooded the theater with gas containing fentanyl, killing many hostages (men, women, and children) as well as the terrorists.

AP/Wide World Photos.

touted fentanyl as a "safer" heroin. The substance is also harder to detect in urine drug tests. Various people tried the drug, and deaths and emergency room visits from fentanyl analog abuse began immediately. In 1984, the Food and Drug Administration (FDA) declared all fentanyl analogs to be Schedule I substances (completely illegal and useless for medical purposes). According to the *Journal of Toxicology: Clinical Toxicology,* by 1995 over 100 deaths had been attributed to illegal fentanyl analogs. The vast majority of these deaths occurred because the analogs were so powerful that users just stopped breathing.

The 1990s also saw the invention of a berry-flavored lollipop containing fentanyl. This Schedule II product was introduced to ease "breakthrough pain" in cancer patients already on strong painkillers. Breakthrough pain is defined as a bout of intense pain that occurs rapidly and lasts several hours, despite the patient's use of longer-acting pain medicine. Despite the tight controls on the lollipops, they have been found for sale on the BLACK MARKET in Pennsylvania, Connecticut, and other states.

In 2002, fentanyl was again the subject of news stories and debate. In October of that year the Russian government used a fentanyl gas to end a hostage crisis at a theater in Moscow. As many as 117 people died from the gas; many others were hospitalized.

Fentanyl's Analogs

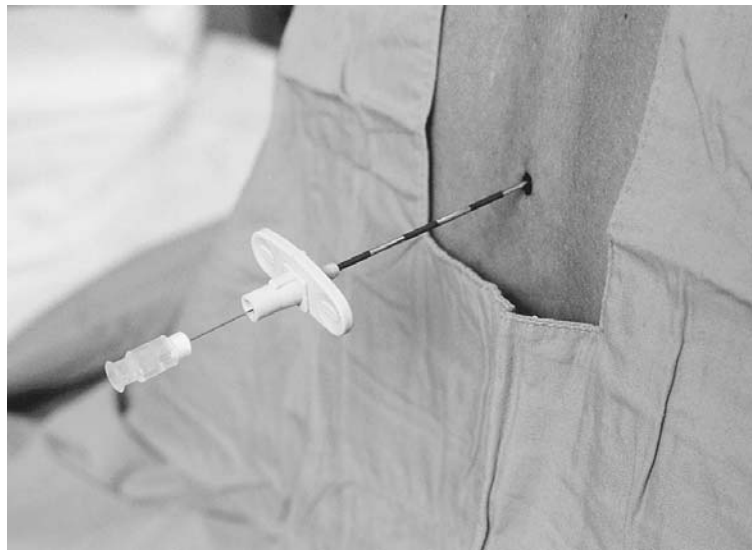
Chemists tinker with the fentanyl compound to create "analogs" with similar characteristics but greater strength. Some of these fentanyl analogs have names such as: acetyl-alpha-methylfentanyl; beta-hydroxyfentanyl; and Remifentanil. All of these analogs are produced illegally and are Schedule I controlled substances, which means that they have no recognized medical use. Because the strengths and chemical by-products vary so much, a single use of any of these analogs can prove deadly.

On July 15, 2005, the FDA issued a public health advisory about the use of fentanyl skin patches. The warning appeared on the FDA's Web site as follows: "FDA is investigating reports of death and other serious side effects from overdoses of fentanyl in patients using fentanyl transdermal (skin) patches for pain control. . . . The directions for using the fentanyl skin patch must be followed exactly to prevent death or other serious side effects from overdosing with fentanyl." The agency also noted: "The FDA is conducting an investigation into the deaths associated with these patches. The Agency has been examining the circumstances of product use to determine if the reported adverse events may be related to inappropriate use of the patch or factors related to the quality of the product. It is possible that some patients and their health care providers may not be completely aware of the dangers of these potent narcotic drug products and the important recommendations regarding their safe use."

What Is It Made Of?

The chemical structure of fentanyl is $C_{22}H_{28}N_2O$. As its scientific name suggests, it is a complicated compound made of carbon, hydrogen, nitrogen, and oxygen atoms. Because fentanyl is not derived from the opium plant, it is called an opioid. This designation means that it works like morphine but is not one of the organic opiates. The drug tests used to find opiates in humans or animals do not work for fentanyl.

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"



A patient is shown getting an epidural, which is a shot of painkiller injected into the body's spinal fluid. Fentanyl is used in epidurals.

A synthetic painkiller and relaxant, fentanyl is one of the strongest opioids. It is water soluble, meaning that it dissolves in plain water and does not need to be boiled. Medicinal fentanyl is diluted in liquids for injection, in gels for patches, and in hard sugar candy for lozenges. Illegal fentanyl analogs are sold as powders or pills.

How Is It Taken?

Doctors administer fentanyl to patients in several ways. The drug can be injected into spinal fluid (an "epidural"). For most surgical procedures, it is injected directly into the bloodstream. Since the effects wear off fairly quickly, a longer medical procedure might require several injections. In long-acting skin patches, the fentanyl, dissolved in a gel, slowly seeps into the skin over a period of about seventy-two hours. Fentanyl-laced lollipops or lozenges are sucked and swirled around the inside of the mouth. The drug enters the bloodstream through the mucous membranes of the mouth. Fentanyl can also be dissolved into a mist or a gas and breathed into the lungs.

Illegal forms of fentanyl are generally injected or snorted into the nose. Medical literature describes some deaths that have occurred

from abusers cutting up patches, extracting the gel, cooking it at high temperatures, and smoking it. The *Journal of Toxicology: Clinical Toxicology* also reported a fatality of a fentanyl abuser who cut a patch into pieces, then sucked and swallowed it. Other abusers have been known to wear multiple patches at the same time and to put the patches in places where the absorption of the fentanyl will occur more quickly.

Fentanyl lollipops, sometimes called "perc-o-pops," are also sold on the black market. These lollipops become highly dangerous when abusers chew them quickly instead of sucking on them slowly, the way they were intended to be used by cancer patients. As with the patches, the oral lollipops are designed to release the drug into the system slowly. Eating them exposes the abuser to a maximum dose, and possibly to suffocation.

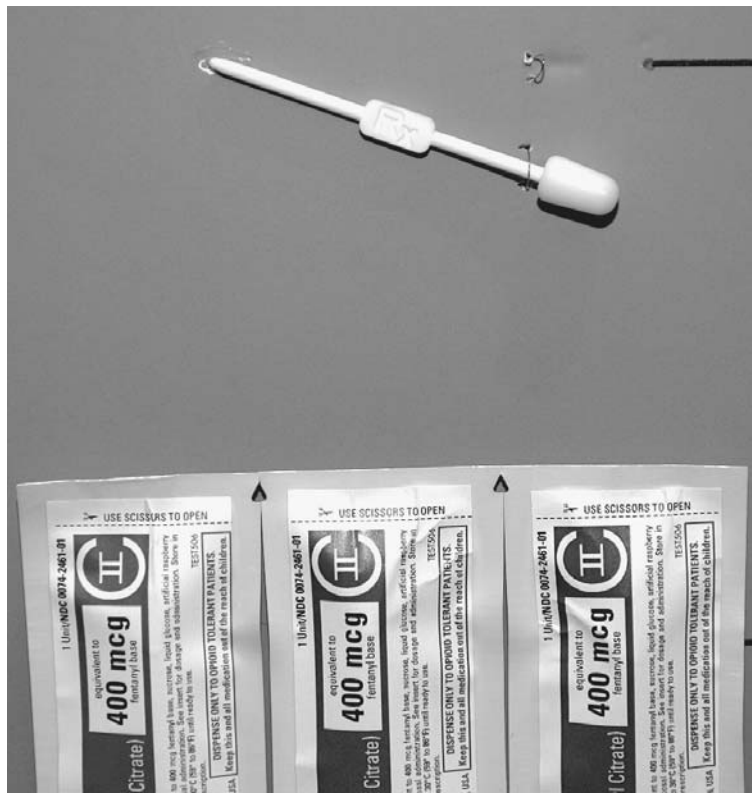
Making fentanyl available in lollipop form was a controversial issue. Some people were concerned that young patients might regard the lollipops as candy, rather than the powerful painkiller that they are. Drug makers took steps to package the lollipop carefully so that it does not resemble candy.

Are There Any Medical Reasons for Taking This Substance?

Anyone who has ever faced surgery knows that it is a traumatic experience. Most humans will resist being "put to sleep" by drugs. Anesthesiologists, the doctors who are trained in the procedure of putting people to sleep, often begin with a dose of fentanyl. The drug acts very quickly to relax patients and prepare them for drugs such as SODIUM PENTATHOL or nitrous oxide. Fentanyl also dulls pain. Even patients who are under complete sedation can experience rapid heartbeat and changes in blood pressure as they are cut. Fentanyl prevents this pain response and is thus the drug of choice for heart surgery and other delicate operations.

When an anesthesiologist gives a patient fentanyl, he or she will carefully monitor the patient for breathing problems. This monitoring continues throughout the operation. For more minor procedures, such as tooth extractions, surgeons may administer fentanyl to sedate a patient and relieve pain without ever putting the patient entirely to sleep. The patient might dimly recall events during the operation but will feel no pain. Again the doctor monitors the patient very closely for any signs of breathing problems.

sodium pentathol: a drug given to surgical patients to induce sleep, usually administered by injection



Actiq, a lollipop containing fentanyl, is designed to help cancer patients in severe pain. The drug company took care to design the product so that children would not mistake it for candy. *AP/Wide World Photos.*

Relief for Cancer Patients

Cancer is one of the deadliest diseases that modern people face. It strikes children, adults in the prime of their lives, and the elderly. Sometimes the tumors produced by cancerous cells cause great pain in patients—so much pain that people can no longer sleep, eat, or function at all. Fentanyl patches allow cancer patients a degree of freedom. Sufferers do not have to be confined to a hospital bed, taking painkillers through a needle. As terminal patients near the end of their lives, fentanyl patches ease the pain so that they can interact with their caregivers and their families with less emotional trauma.

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

The fentanyl lollipops were developed for patients with advanced cases of cancer who have already taken some other strong form of pain medicine. Sometimes cancer patients develop a TOLERANCE to their pain medications. Other times they suffer

"breakthrough pain," or sudden bursts of extra pain, that last several hours. The lollipops ease this pain. Patients are warned to suck the lollipops only until the pain ceases—not until the whole lollipop is gone. That way the lollipops will be more effective in the next round of breakthrough pain.

The legal uses for fentanyl provide the strongest case for avoiding the drug on the street. Doctors, dentists, and anesthesiologists use it only in extreme situations on patients who would otherwise suffer great agony, stress, or surgical complications. Many of the patients who receive patches or lollipops are dying. Others face total loss of function without the medicine. Fentanyl is a very powerful substance, often used as the last course of action.

Usage Trends

The abuse of fentanyl is still relatively rare in the general public, but it is on the rise. In 2000, the Substance Abuse and Mental Health Services Administration (SAMHSA) reported 576 emergency room visits for fentanyl abuse. By 2002 that number had climbed to more than 1,500 cases. The numbers may be deceiving, however. Since it is difficult to test for fentanyl—and since fentanyl deaths resemble heroin deaths—the number of fentanyl fatalities may be higher.

In November of 2004, the *Salt Lake Tribune* in Utah reported a trend that was occurring in some larger cities. The fentanyl lollipops were being sold illegally on the street. Authorities worked to find out how the legal drugs had fallen into the hands of drug dealers. Law enforcement officers believed that some of the street lollipops were being obtained through fake prescriptions, theft from pharmacies or hospitals, or from dishonest doctors.

The *Philadelphia Inquirer* reported that sales of fentanyl lollipops increased from $51 million in 2001 to $237.5 million in 2003. At the beginning of 2003, pharmacies were recording 2,500 prescriptions for the lollipops per month. By the end of the same year, the number of prescriptions had risen to 4,000 per month. Between 1999 and 2004, 44 million units of fentanyl lollipops had been sold in the United States. The *Philadelphia Inquirer* noted that some of those sales were generated by doctors prescribing the medication "off label" for non-cancer pain.

One of the largest groups of fentanyl abusers is in the medical community itself. The *Houston Chronicle* reported in 2003 that nearly 2 in 100 anesthesiologists have abused fentanyl. Nurses and other health care professionals also use the drug at higher rates than the general public. Part of the reason for this trend is availability.

Tragedy in Moscow

On October 23, 2002, terrorists from Chechnya broke into a crowded theater in Moscow, Russia, and took all 700 theater-goers (men, women, and children) hostage. A tense drama unfolded as Chechen rebels began shooting hostages and making demands. On October 26, the Russian government ended the terrorist siege by pumping gas into the theater. The gas put everyone inside into a stupor, a state of unconsciousness. Russian soldiers stormed the building and rescued the surviving hostages.

However, 117 people died from the effects of the gas. Many others had to be hospitalized. Several days later, under pressure from the international community, the Russian government issued a statement about the gas used in the attack. The active ingredient was fentanyl. Those who died from the gas succumbed to one of fentanyl's common side effects: They were unable to breathe.

Hospital staff members have easier access to fentanyl than ordinary citizens. Doctors, nurses, and support staff see the pleasant effects fentanyl has on their patients, and some caregivers become tempted to abuse it. In response to this crisis, hospitals and chronic care facilities are taking greater measures to monitor the stocks of fentanyl in its various forms and to assure that patches and other sources of the drug are properly disposed of so they will not be stolen.

Effects on the Body

The human body produces its own pleasure-enhancing NEUROTRANSMITTERS called ENDORPHINS. The brain releases endorphins during times of happiness or peaceful meditation, during strenuous exercise, and also during trauma to help the body deal with stress and pain. Receptors in the brain receive the endorphins, enhancing pleasure and suppressing pain.

Opioids target the same receptors that take in endorphins. A shot of fentanyl acts quickly to produce an intense feeling of euphoria and relaxation. In the *New Statesman,* Victoria Moore recalled her dose of fentanyl just prior to kidney surgery. "The effect is virtually instantaneous. I feel wonderful. I float. The room quivers and moves in slices about me, and yet I do not feel dizzy. All doubts and cowardly misgivings are washed clean away. . . . Bring on the knives, I don't mind anymore. That's the last thing I remember."

The main brain receptor affected by opioids is the *mu* receptor. In addition to promoting euphoria, the *mu* receptor regulates pain and breathing. When fentanyl is received by the *mu* receptor, pain disappears—but the user may also experience a reduction in breathing. Sometimes the user just stops breathing and suffocates within three minutes of taking the drug.

Anesthesiologists who administer fentanyl during surgery are equipped with technology to save patients who stop breathing. This technology includes machines that measure heart rate and pulse, breathing tubes and oxygen, and an ANTAGONIST called Narcan that clears fentanyl from the brain.

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

antagonist: pronounced ann-TAG-uh-nist; a drug that opposes the action of another drug

Fentanyl's side effects closely resemble morphine's. Habitual users can suffer from abdominal pain and constipation, indigestion, nausea, drowsiness and dizziness, vomiting, and difficulty with urination. The drug causes the pupils in the eyes to become very small. This "pinpoint pupil" side effect can help emergency room doctors detect fentanyl abuse.

A toxicologist with the San Diego County Medical Examiner's Office, Kristin Rossum was convicted of murdering her husband. Large amounts of fentanyl were found in the body of the deceased man. Prosecutors claimed Rossum stole the fentanyl from the office. *AP/Wide World Photos.*

Reactions with Other Drugs or Substances

The list of substances that react poorly with fentanyl is very long. Users run a higher risk of suffocation if they combine the drug with alcohol, any other narcotic painkiller, sleeping pills, over-the-counter ANTIHISTAMINES such as Benadryl, tranquilizers such as Valium or Xanax, muscle relaxers, or antipsychotic drugs such as Mellaril or Thorazine. The drug should not be used with antifungal medicines like Diflucan, or the protease inhibitors prescribed for human immunodeficiency virus (HIV). Fentanyl also reacts badly with certain antibiotics.

Despite the claims of drug dealers, fentanyl is not safer than heroin. Users of any opiate drug, from heroin and morphine to prescription painkillers, run a great risk of deadly overdose if they switch to fentanyl or take fentanyl while using any of the opiates. Symptoms of fentanyl overdose include slow breathing or suffocation; cold, clammy skin; slowed heartbeat; low blood pressure; and pinpoint pupils.

Treatment for Habitual Users

If fentanyl is so dangerous, why is it used so commonly in medical procedures? The answer is simple. Surgical patients do not crave the drug because they sleep through its effects. Dental patients and new mothers only recall that their experiences were pain-free. End-term cancer patients need the drug for pain relief. A single dose of fentanyl administered properly by doctors does not cause addiction or withdrawal.

antihistamines: drugs that block *histamine,* a chemical that causes nasal congestion related to allergies

RECREATIONAL USE of fentanyl is different. A physical addiction can begin almost immediately. If the user does not become physically addicted, the psychological draw of the drug will eventually become too strong to resist. Once a user has a fentanyl habit, his or her entire lifestyle becomes affected by attempts to find the drug and use it.

In the *Journal of Toxicology: Clinical Toxicology,* a case was described in which a thirty-six-year-old man was brought to the hospital unconscious and hardly breathing after smoking the contents of a fentanyl patch. The man was revived and discharged from the hospital. He went home, smoked another fentanyl patch, and died. This story shows how the effects of fentanyl can override common sense and encourage users to self-destruct.

Withdrawal from fentanyl is difficult. It is best accomplished in a rehabilitation clinic or under a doctor's care. The withdrawing user will experience severe anxiety; body aches; diarrhea; rapid heartbeat; flu-like symptoms including runny nose, sneezing, chills, and sweating; nausea; trembling; INSOMNIA; and stomach pain. Most habitual fentanyl users have developed a tolerance to the "high" produced by the drug and no longer feel the rush of euphoria when they take it. The withdrawal symptoms become stronger as the body grows accustomed to the drug. The user eventually takes fentanyl not for the high, but to keep the withdrawal symptoms under control.

Self-help groups such as Narcotics Anonymous (NA) can aid the abuser through a "buddy system," which pairs new members with established members who can give advice and support. The group offers telephone hotlines and meetings where former users discuss strategies on how to stay away from drugs. Sometimes this support can be sufficient to a recovering fentanyl addict. Other addicts may need medications such as methadone or antidepressants as well as therapy with an addictions specialist. Methadone is a substitute painkiller that is used when people are trying to overcome addiction to opiates such as heroin.

recreational use: using a drug solely to achieve a high, not to treat a medical condition

insomnia: difficulty falling asleep or an inability to sleep

dysphoria: pronounced diss-FOR-ee-yuh; an abnormal feeling of anxiety, discontent, or discomfort; the opposite of euphoria

Even if the addict endures a complete physical withdrawal from the drug, emotional withdrawal may take much longer. During this time, the former user may experience anxiety and DYSPHORIA while remembering how good he or she felt while taking fentanyl. Some addicts have trouble dealing with these feelings and return to taking the drug, despite its many dangers and its addictive nature. Many recovering addicts will need to change their lifestyles completely to avoid the situations, locations, and people associated with taking the drug.

Consequences

Fentanyl is a highly addictive substance that is illegal and difficult to obtain without a prescription. Street users face the possibility of arrest and the potential of overdosing, especially on poorly produced analogs. They are also confronted with the ever-present reality of unpleasant withdrawal symptoms. Users who inject fentanyl run the risk of contracting acquired immunodeficiency syndrome (AIDS) if they share dirty needles with other addicts. The short span of fentanyl's high in the body causes some users to take as many as four doses a day. Medical staff caught using fentanyl illegally often lose their jobs after many years of study and hard work.

Despite withdrawal symptoms and the higher possibility of suffocation, fentanyl users experience little organ damage when using the drug. But the need for the substance alters lifestyles and can lead to health problems. Users might engage in risky sexual behavior in exchange for money or drugs. They may resort to burglary or theft to support a habit. They may neglect such basic bodily needs as eating and sleeping. Eventually their health suffers.

With so many valid medical uses, it is unlikely that fentanyl will be withdrawn from the legal medical market. The federal government and the private medical community will continue to work together to try to keep the drug out of the hands of those who do not need it for treatment of serious pain.

Legal Notes

Fentanyl substances can be either Schedule I controlled substances (fentanyl analogs, manufactured illegally), or Schedule II controlled substances (pharmaceuticals carefully controlled by doctors and the Drug Enforcement Administration). The harsher penalties are associated with the analogs because pharmaceutical companies do not manufacture them. However, anyone caught trying to sell or distribute either pharmaceutical fentanyl or fentanyl analogs can be prosecuted for a criminal offense. Any doctor who writes a prescription for fentanyl and gives it to someone who does not need it for severe pain can face criminal prosecution.

The Law

Fentanyl falls under two categories in the Controlled Substances Act (CSA). The CSA places all federally regulated drug substances into five schedules based on a substance's medical benefits and risks for bodily harm, abuse, and addiction. The fentanyl products used in surgery, in patches for pain management, and in oral lollipops, are all Schedule II controlled substances. In hospital settings the drug is monitored carefully for proper use and disposal, in order to cut down on staff abuse and theft. Prescriptions are overseen by the Drug Enforcement Administration to ensure that doctors do not prescribe the drug to recreational users, or to people who could be treated with other less addictive painkillers. Selling prescription

narcotics on the street—or even giving them to someone other than the person on the prescription label—is against the law.

The fentanyl analogs created in underground laboratories fall into Schedule I of the Controlled Substances Act. Schedule I is reserved for the most dangerous drugs—ones that are not considered to have any medical benefits. Anyone caught manufacturing, selling, or distributing fentanyl analogs faces stiff criminal penalties, including jail time and fines. The sentences become much more severe for second and third offenses.

In the case of fentanyl, the federal government works closely with the medical community, pharmaceutical companies, and pharmacists. The goal is to ensure that those who need the drug will get it, and those who do not need it will not find it.

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See also: Codeine; Heroin; Morphine

GBL

Official Drug Name: Gamma butyrolactone (GAMM-uh byoo-tear-oh-LAK-tone; GBL), 2(3H)-furanone dihydro
Also Known As: Blue Nitro, Firewater, G3, Gamma G, Gamma X, GH Revitalizer, Invigorate, Jolt, ReActive, REMForce, RenewTrient, Rest-eze, Revivarant, Verve, V35
Drug Classifications: Schedule I, depressant

What Kind of Drug Is It?

Gamma butyrolactone (GBL) is a very strong chemical used in the production of floor strippers, glue removers, paint thinners, pesticides, herbicides, inks, dyes, and other industrial products. When swallowed, it acts as a DEPRESSANT on the body, lowering heart and breathing rates. During the 1990s, however, GBL became popular at nightclubs and RAVES, where its effects are said to intensify the party experience. GBL is also considered a "date rape" drug because it can render a victim unconscious and produce memory loss.

Overview

GBL is a toxic, or poisonous, chemical that is powerful enough to dissolve glue and kill weeds. Sold as a clear liquid or a light-colored powder, it can be very irritating to the skin and mucous membranes when handled improperly. It is a synthetic chemical, meaning that it is made in a laboratory. GBL acts as a depressant in humans and is not meant to be swallowed. During the 1990s, however, GBL became a popular club drug.

The GBL-GHB Connection

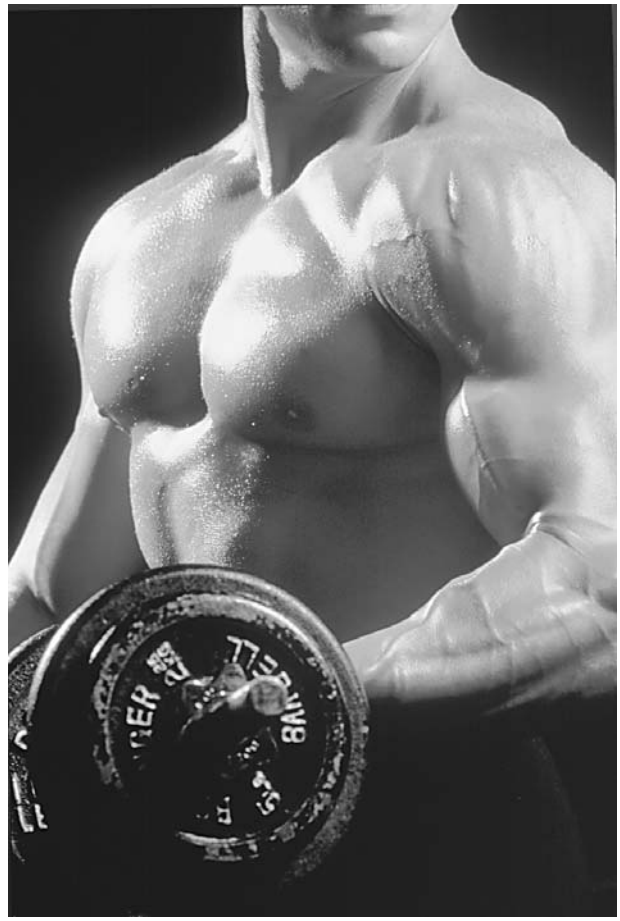
The story of GBL's rise as a drug of abuse is tied to the history of another compound called gamma hydroxybutyrate (GAMM-uh hy-DROK-see-BYOO-tuh-rate) or GHB. (A separate entry on GHB is available in this encyclopedia.) GHB is found in very small amounts in the human body and is thought to act as a NEUROTRANSMITTER in the brain. In the 1960s, it was first synthesized in a laboratory for use as an anesthetic, which is a substance used to deaden pain. In the 1980s, GHB became popular among bodybuilders, who believed it could release a hormone that would stimulate muscle growth. In November 1990, after investigating nearly sixty reports of GHB-linked illnesses, the U.S. Food and Drug Administration (FDA) ordered an end to sales of GHB-containing products. The agency declared that GHB was unsafe and illegal except for carefully controlled FDA-approved drug research.

depressant: a substance that slows down the activity of an organism or one of its parts

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

When products containing GHB became unavailable, users looked for a replacement. They found it in GBL supplements. Once GBL is ingested, the body rapidly converts it into GHB. "[T]he effects become identical to that of taking regular GHB," explained M. Foster Olive in *Designer Drugs.* GBL was sold in fitness centers and health food stores as a dietary supplement. Dietary supplements do not have to undergo the kind of rigorous testing required for over-the-counter medications and prescription drugs. That is because the Dietary Supplement Health and Education Act (DSHEA) of 1994 treats supplements as foods rather than drugs.



Throughout the 1990s, advertisements for GBL supplements appeared in bodybuilding magazines. Manufacturers of GBL supplements claimed their products would help to build muscles © *David Woods / Corbis.*

From Dietary Supplement to Party Drug to Date Rape Drug

Throughout the 1990s, advertisements for GBL supplements appeared in bodybuilding magazines under names such as Blue Nitro, Firewater, GH Revitalizer, Invigorate, Jolt, ReActive, REMForce, RenewTrient, Revivarant, and Verve. (Note that all of these supplements have since been removed from the market.) Manufacturers of GBL supplements claimed their products would build muscles, improve physical and sexual performance, combat depression, reduce stress, and relieve insomnia, a sleeping disorder.

In time, word got around that GBL was a great "party drug" because it helped release the INHIBITIONS of the user. Soon, people were taking it just to get high. Along with that high, however, came the risk of harmful and life-threatening side effects, including breathing difficulties, vomiting, and seizures. Use could lead to coma—a state of unconsciousness from which a person cannot be aroused by noise or other stimuli—and even death.

By the late 1990s, reports started appearing about GBL and GHB being used as "date rape" drugs. Because they are odorless and colorless, it is hard to tell when these substances have been added to a drink. Both drugs are strong enough to knock someone out, even in small doses. They also cause memory loss in the victim, often preventing identification of the attacker.

inhibitions: inner thoughts that keep people from engaging in certain activities

Another Dangerous Substance

1,4 butanediol (BD), pronounced BYOO-TANE-dee-ahl, is another hazardous substance that converts to GHB in the body. Some supplement makers substituted BD for GBL in an effort to bypass restrictions on both GBL and GHB. The FDA has categorized BD as a Class I Health Hazard, meaning it is a life-threatening substance.

On January 21, 1999, the FDA asked manufacturers to recall their GBL-containing products and issued press releases warning consumers not to take them. The warning was issued in response to more than fifty-five reports of GBL-related illnesses and a report of one death. The Trimfast Group, Inc. agreed to recall its products, Revivarant and Revivarant G, and most other companies followed suit. It took years before the FDA was able to classify dietary supplements containing GBL as unapproved drugs. As of 2005, it was illegal to sell anything for human consumption that contained GBL or GHB.

Because of the deadly effects associated with GBL and GHB consumption, "FORENSIC scientists are being called upon to determine the role of these compounds in overdose and sexual assault cases with increasing frequency," wrote Carl S. Hornfeldt and his coauthors in a 2002 article in *Forensic Science Communications.* To help people know if their drinks are free of "date rape" substances, various companies have created testing kits that can be used quickly before the beverage is consumed.

What Is It Made Of?

Gamma butyrolactone (GBL) is a colorless liquid that mixes easily with water and alcohol. Its chemical formula is $C_4H_6O_2$. GBL is not intended for human consumption.

How Is It Taken?

Generally, GBL is sold as a clear liquid or light-colored powder. A typical dose is a capful of liquid or a teaspoon or two of powder, depending on the purity, which can vary considerably. In either form, GBL mixes easily with water, soft drinks, and alcohol. Because it is colorless and odorless, it often goes undetected when added to a drink. Drug officials warn partygoers to keep a careful eye on their drinks to ensure that no one slips them an ILLICIT drug.

At nightclubs and raves, some users carry GBL or GHB in eye-drop bottles, water bottles, or disguised as mouthwash with added food coloring and flavorings. According to U.S. Drug Enforcement Administration (DEA) investigators, some people looking for a high will drink small amounts of GBL straight because they know that it will turn to GHB when swallowed. This method of consumption usually results in violent episodes of vomiting.

forensic: the scientific analysis of physical evidence

illicit: unlawful

At nightclubs and raves, some users carry GBL in eye-drop bottles. Some people looking to get high will drink small amounts of GBL straight because they know that it will turn to GHB when swallowed. Taking the drug in this manner usually leads to negative side effects, including violent episodes of vomiting. *© Koopman / Corbis.*

Are There Any Medical Reasons for Taking This Substance?

As of 2005, GBL had no approved medical uses in the United States.

Usage Trends

GBL and related drugs became popular on the club scene in the 1990s, especially among college-aged partygoers. There are two main reasons for the drugs' popularity among this age group: 1) they are relatively inexpensive when compared with alcohol

Alcohol and GBL

In 2004, researchers in Ireland published an article in the *Journal of Forensic Sciences* on how GBL reacts with alcohol. They found that, under the right conditions, GBL begins changing to GHB in the presence of alcohol alone—without even being swallowed. Prior to this discovery, it was believed that the conversion process occurred within the body after the GBL had been consumed. GBL mixed with a nonalcoholic beverage will convert to GHB after it is swallowed. Research continues on the effects of GBL and GHB on the human body.

and other drugs; and 2) they have no calories. However, the DEA warns that "drug quality may vary significantly" from one batch to another. For this reason, users who have taken either substance without any ADVERSE REACTION may experience life-threatening side effects the next time they use the drug.

Internet Sales

The U.S. government's "Pulse Check" report tracks information on how drugs get from the seller to the buyer. Research from a 2004 report revealed that buyers of GBL or GHB typically purchase the drug at a club, a rave, a college campus, or over the Internet. Several Internet sites have been known to sell kits containing all the ingredients necessary to cook up a batch of GHB from GBL. A DEA "Drug Intelligence Brief" stated that "GHB is easily produced by combining GBL with either sodium hydroxide or potassium hydroxide in a cooking pot or bucket." As of 2005, GBL was still available for purchase via the Internet.

Peak Use in the 1990s Includes Reports of Date Rape

At the height of its popularity in the late 1990s, GBL and GHB use accounted for a large share of club drug overdoses. Most of these occurred in users age eighteen to twenty-five. Throughout the decade, the DEA documented nearly 16,000 overdoses and more than 70 deaths related to the drugs.

Reports of GBL- and GHB-related "date rapes" began to emerge in the 1990s as well. Because the substances are hard to detect when dissolved in a drink, various individuals have become unknowing victims of GBL and GHB poisoning. Both substances are extremely effective at bringing on sleep. Rape victims who have consumed a GBL- or GHB-laced drink are unable to offer any resistance to the rapist. Furthermore, after waking up, victims often have no clear memories of the attack.

In 1996, the Drug-Induced Rape Prevention and Punishment Act made it a felony to give an unsuspecting person a date rape drug with the intent of committing violence, including rape. Penalties of large fines and up to twenty years in prison were set for importing or distributing these drugs. Regardless of the law, GBL and GHB continued to be used

adverse reaction: side effect, or negative health consequence, reported after taking a certain substance

To help people know if their drinks are free of date rape drugs, a company in California created this detection coaster. To test a beverage, one places drops of the drink on the test circles. If the circles turn dark blue in 30 seconds, the drink contains a date-rape drug. Whether the tests are truly effective is highly debated. *AP/ Wide World Photos.*

as date rape drugs. In the early twenty-first century, various companies created drink coasters and other testing kits so that people can check their drinks for potentially harmful substances. However, whether such kits are truly effective is highly debated.

Close Call for Gugliotta

Veteran NBA player Tom "Googs" Gugliotta began playing professional basketball in 1992, but his career—and his life—nearly ended in 1999, at age twenty-nine. At the time, Gugliotta was a forward for the Phoenix Suns. After a game in Portland, Oregon, on December 17, 1999, he suffered a near-fatal seizure on the team bus and was hospitalized in serious condition. Gugliotta had been taking "a supplement recommended by a friend to aid muscle recovery," explained Shira Springer in the *Boston Globe*. The supplement contained GBL. Gugliotta ingested a dose on an empty stomach prior to his seizure. His breathing stopped, and he almost died before reaching the hospital.

Gugliotta's brush with death coincided with a government crackdown on GBL. The FDA's Office of Criminal Investigations had already recorded 116 arrests related to GBL sales.

Three months after the GBL incident, Gugliotta sustained a serious knee injury that cut his playing time for four seasons. He bounced from Phoenix to the Utah Jazz to the Boston Celtics before being traded to the Atlanta Hawks in 2005. Despite his career setbacks, Googs said he was happy to be alive—and still playing basketball. It is important to check any dietary supplements to make sure what ingredients are in the product.

Usage Tapering Off in the United States

The Drug Abuse Warning Network (DAWN) is a division of the U.S. Department of Health and Human Services. DAWN monitors drug-related visits to hospital emergency departments (EDs). In the last two quarters of 2003, the DAWN "Interim National Estimates of Drug-Related Emergency Department Visits" report estimated that the use of GBL/GHB resulted in 990 ED visits out of approximately 630,000 total drug-related ED visits in 260 hospitals across the United States. A little more than half of the patients were male. Although the DAWN figures for 2003 represent only half the year, the figures remain encouraging to law enforcement and medical staff. GHB-related emergency room visits during the entire year of 2000 reached nearly 5,000, according to an earlier DAWN report.

The Monitoring the Future (MTF) study is a well-known survey of drug use and attitudes toward drugs among middle school and high school students. Although MTF does not ask about GBL use specifically on its survey, it has included questions about GHB since 2000. However, no MTF information on GHB use is available for the 1990s—the decade in which it was most highly abused.

The MTF results for 2004 indicate that 0.7 percent of eighth graders, 0.8 percent of tenth graders, and 2.0 percent of twelfth graders reported using GHB at least once in the twelve months leading up

Basketball star Tom Gugliotta (right) nearly died in 1999 after taking a dietary supplement that contained GBL. *AP/Wide World Photos.*

to the survey. Both eighth- and tenth-grade use was down slightly from 2003. A small increase in use among twelfth graders was noted. Because of the decrease in use in the other two grades, MTF investigators "interpret this pattern as showing no systematic change."

Effects on the Body

GBL and GHB are powerful depressants on their own. They are often used in conjunction with alcohol, which increases their effects. Both GBL and GHB enter the brain rapidly, but the body absorbs GBL better than it does GHB. Therefore, any given amount of GBL is more powerful than the same amount of GHB.

The physical effects of GBL poisoning begin within fifteen to thirty minutes of taking the drug and last from three to six hours. The sometimes deadly effects of GBL and related drugs appear to be dose-related. Greater-sized doses produce more severe effects.

In the Emergency Room: Doctors and Nurses Report What They See

Low doses of GBL reportedly produce feelings of pleasure, sleepiness, and a loss of inhibitions. With larger doses, users may become dizzy, confused, depressed, and aggressive. In cases of overdose, "wide swings in patients' levels of consciousness" may occur, ranging "from wildly combative to comatose," remarked Andrew H. Arneson and Janine Goetze in the *Journal of Emergency Nursing.* "Health care workers have been injured by patients' extreme and violent behavior," they added. Very few users remember their experience because of the associated memory loss.

Three separate studies of GBL-related overdoses revealed strikingly similar results. The first study was published in a 1999 issue of *MMWR: Morbidity and Mortality Weekly Report,* a publication of the U.S. Centers for Disease Control and Prevention (CDC). The second report appeared in the *Journal of Emergency Nursing* in October of 2000. These two studies concerned GBL-related hospitalizations in the United States.

The third study, published in the April 9, 2004 issue of *Swiss Medical Weekly,* dealt with 141 cases of GBL/GHB overdose reported to the Swiss Toxicological Information Centre between 1995 and 2003. At a time when GBL and GHB use appeared to be declining in the United States, the authors of the Swiss report noted that the drugs were "emerging as substances of abuse in Europe." It is important to note that GHB use was prohibited in Switzerland in 2001, and that "from 2002 onwards, reports of GBL intoxication began to replace GHB cases." Intoxication is the loss of physical or mental control due to the use of a drug.

The findings of the three studies present a consistent picture of what happens to a person who has overdosed on GBL. Symptoms include a slowed heart rate; a slowed rate of breathing (sometimes down to just eight breaths per minute); pupils that do not react to light; jerking movements; seizures; and vomiting. (Vomiting occurs most often when alcohol is consumed along with GBL.) In some cases, breathing is quite shallow and INTUBATION is required to keep the patient's airway open. Intubation may also be necessary to keep the airway free of vomit.

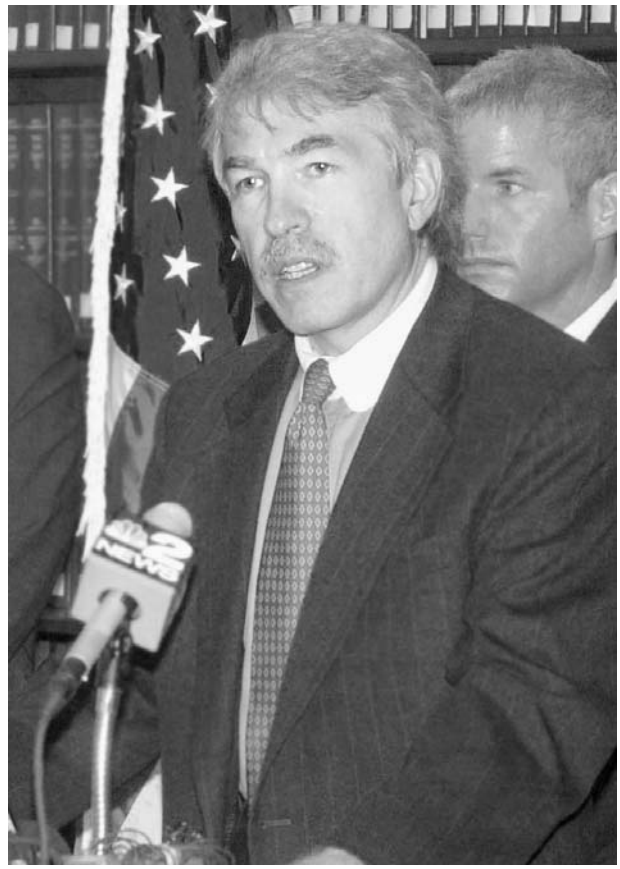
The person comes in and out of a coma. Patients react with fear and combative behavior because they are unaware of what is happening to them. Often, they need to be restrained until the effects of the drug have worn off. Typically, within twelve to twenty-four hours of the incident, patients who overdose can be discharged from the hospital. They have no memory of the events that have occurred.

intubation: putting a plastic tube into the lungs through the nose and throat, thus opening the airway of a person unable to breathe independently

Addiction and Withdrawal

GBL and related drugs can cause physical and psychological dependence and addiction when used every day for more than a month. Psychological dependence is the belief that a person needs to take a certain substance in order to be able to function. Withdrawal from the drug can cause various problems. Withdrawal is the process of gradually cutting back on the amount of drug being taken until use can be stopped entirely.

According to doctors James Reeves and Roger Duda in an article for *Addictive Disorders and Their Treatment,* GBL and GHB withdrawal symptoms may not show up until a day or two after the drug's effects have worn off. Symptoms of abrupt withdrawal can be quite severe and include rapid heart rate, high blood pressure, sleeplessness, muscle cramping, tremors, extreme anxiety, paranoia (abnormal feelings of suspicion and fear), and even HALLUCINATIONS. These symptoms can last from forty-eight hours to nearly two weeks.



Many illegal sales of date rape drugs such as GBL and GHB are made over the Internet. In 2002, DEA special agent John Bryfonski (left) talked with reporters about the arrest of three Canadians who used the Internet to sell large quantities of the drugs. The arrests were part of an international drug investigation called Operation Web Slinger. More than 104 people were arrested in 84 cities in the United States and Canada. *AP/Wide World Photos.*

Reactions with Other Drugs or Substances

GBL and related drugs are powerful depressants that slow brain function and respiration. They are especially dangerous when mixed with alcohol or other drugs with similar effects. On the club and rave scene, multiple drug use remains a common practice.

Treatment for Habitual Users

Patients usually recover from a GBL overdose within a day, provided they get emergency treatment before life-threatening complications develop. If emergency treatment is not available, RESPIRATORY DEPRESSION, or dangerous slowing of the heart rate,

hallucinations: visions or other perceptions of things that are not really present

respiratory depression: a slowed breathing rate; severe cases can cause a person to slip into a coma or even stop breathing entirely

can cause death. There is no ANTIDOTE for GBL or GHB poisoning.

Frequent use of GBL can result in physical and psychological addiction. Addicted users need increasing amounts of the drug to satisfy their habit. Withdrawal symptoms can be quite severe, and the process can take ten days to two weeks. Counseling is recommended for GBL abusers to help them deal with the anxiety and depression that often accompanies quitting a drug habit.

Consequences

Users of GBL or related drugs may experience confusion, anxiety, memory loss, aggressive outbursts, and depression. All of these symptoms can lead to unusual behavior on the part of the user. Users who suffer from paranoia or hallucinations may be perceived as being mentally ill.

Depressants like GBL cause users to lose their inhibitions. This greatly increases the likelihood of users taking unnecessary risks, becoming involved in accidents, and engaging in unsafe sex or violent behavior.

The Law

On February 18, 2000, GHB became a Schedule I drug under the Controlled Substances Act (CSA) of 1970. Schedule I drugs are among the most dangerous drugs known. At the same time, GBL became a List I chemical. This GBL/GHB legislation was called the Hillory J. Farias and Samantha Reid Date-Rape Drug Prohibition Act of 2000. It was named for two young women who were fatally poisoned with GHB. (For more information on the Farias and Reid cases, see the entry on GHB in this encyclopedia.) Giving GBL or GHB to others with or without their knowledge or consent may result in criminal charges of sexual assault, rape, MANSLAUGHTER, or poisoning. These crimes are punishable by fines and imprisonment.

Being a "List I" chemical, GBL cannot be sold to any individual in huge quantities. The substance is subject to certain additional restrictions, some of which are extremely hard to enforce. For instance, GBL cannot be sold to anyone intending to use it as a drug. It is available for purchase only as a cleaning product. GBL has not been banned by the U.S. government because it has many legitimate industrial uses. As of 2005, it was still available for sale on the Internet.

antidote: a remedy to reverse the effects of a poison

manslaughter: unintentional killing of a human being

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See also: Alcohol; Designer Drugs; GHB

GHB

Official Drug Name: Gamma hydroxybutyrate (GAMM-uh hy-DROK-see-BYOO-tuh-rate), gamma hydroxybutyric acid (GAMM-uh hy-DROK-see-byoo-TEER-ic AH-sid), sodium oxybate, Xyrem (Zy-rum)
Also Known As: Cherry meth, easy lay, G, Georgia home boy, grievous bodily harm, G-riffick, liquid ecstasy (not the same as the drug ecstasy), liquid E, liquid X, salty dog, salty water, scoop, soap, zonked
Drug Classifications: Schedule I, depressant

What Kind of Drug Is It?

GHB is an acronym for gamma hydroxybutyrate, also known as gamma hydroxybutyric acid. The "acid" in its name indicates just how dangerous the substance is. GHB acts as a depressant, which is a substance that slows down the activity of an organism or one of its parts. It slows both breathing and heart rates in the people who take it.

The drug occurs naturally in very tiny amounts in the human body. However, it is also created in a laboratory to be used illicitly, or illegally. The street version of the drug is made from harsh chemicals. This makes it one of the many so-called "designer drugs" of the 1990s. (A separate entry on designer drugs is available in this encyclopedia.) GHB is especially hazardous to humans because of its ability to cause addiction in users and because of its potential deadly effects.

Although GHB was developed for use as an ANESTHETIC in the 1960s, its makers "later withdrew it from consideration for approval by the U.S. Food and Drug Administration because of severe side effects reported by patients," explained M. Foster Olive in *Designer Drugs.* Decades later, GHB gained popularity among three different groups of users: 1) bodybuilders looking for greater muscle mass; 2) partiers at nightclubs and RAVES seeking a new kind of high; and 3) sexual predators searching for their next victim.

Overview

GHB is an odorless, colorless substance. Its slightly salty taste is said to disappear when mixed with alcohol or soft drinks. (A separate entry on alcohol is available in this encyclopedia.) The effects of GHB make it a perfect "knock out" drug for surgeries. It acts very quickly, bringing on a deep sleep and erasing all memory of what occurred while the user was under its influence. In fact, it was developed with this purpose in mind. In the 1960s, GHB showed promise as a new type of anesthetic for use in medical settings. However, its effects were unpredictable, and the substance had the potential to depress breathing and heart rates to dangerously low levels. This made it too risky to use on patients being readied for surgery.

anesthetic: a substance used to deaden pain

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

A young woman in Amsterdam, The Netherlands, openly displays a vial of GHB, a popular club drug. GHB is one of several drugs that began dominating the club scene in the 1990s. *© The Cover Story/Corbis.*

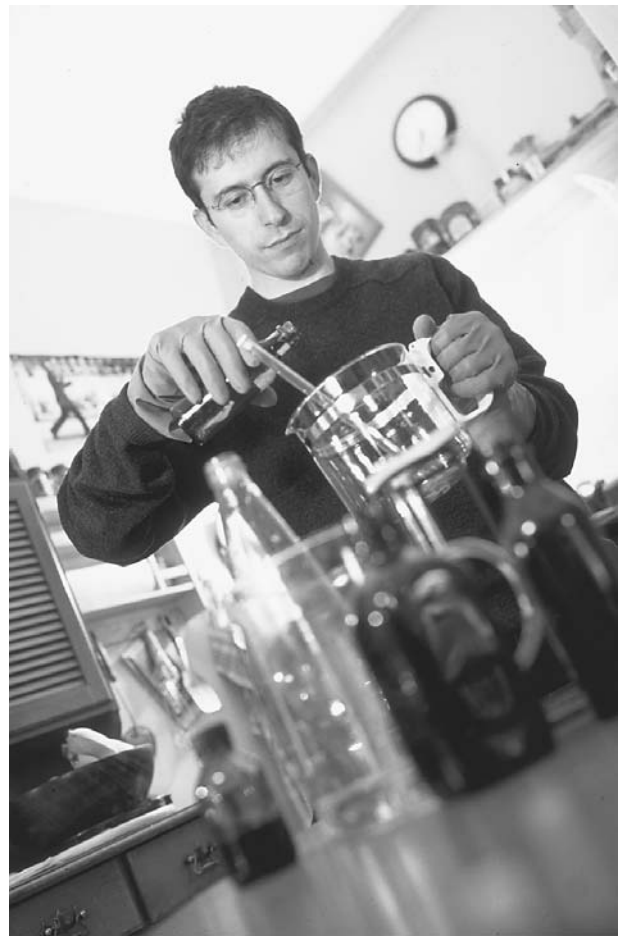
In the 1980s, GHB was sold legally in health food stores and gyms as a dietary supplement designed to stimulate growth hormones. At that time, no one knew that even small doses of the substance could cause dangerous and addictive effects. Mass marketing campaigns hailed it as a safe and effective way to increase muscle mass and maintain weight. GHB became a huge seller among bodybuilders and dieters.

But over the course of the decade, reports of life-threatening reactions to GHB began to surface. GHB produced a wide range of effects, depending on the dosage. These effects included: intoxication (the loss of physical or mental control due to the use of any drug), relaxation, vomiting, seizures, COMA, and even death. H. Joseph

coma: a state of unconsciousness from which a person cannot be aroused by noise or other stimuli

Pittman explained in *Nursing* that "even small increases in the amount of GHB ingested can lead to significant intensification of effects."

After investigating sixty reports of life-threatening reactions to GHB, the Food and Drug Administration (FDA) declared in 1990 that GHB was unsafe and illegal for use by the general public. Its only accepted use would be for drug research carried out under strict, agency-controlled conditions.



GHB is often brewed in an illegal drug maker's kitchen from an Internet recipe. One batch is never the same as the next, so contents and strengths may vary considerably. © *Schifres Lucas/Corbis Sygma.*

Getting around the Ban

After GHB became more difficult to buy, two other substances quickly took its place. These substances are gamma butyrolactone (GAMM-uh byoo-tear-oh-LAK-tone; GBL) and 1,4-butanediol (BD). (A separate entry on GBL is available in this encyclopedia.) Both GBL and BD actually turn into GHB as they are broken down in the body, producing the same effects as a dose of GHB. Manufacturers of GBL and BD supplements claimed that their products could enhance users' muscle mass, sexual performance, mood, and sleep.

Like all dietary supplements, GBL and BD were regarded by law as foods rather than drugs. For years, this legal loophole kept the FDA from being able to ban them. But reports of fifty ADVERSE REACTIONS and one death linked to GBL led the FDA to reclassify GBL as an unapproved drug. As a result, GBL- and BD-containing supplements were removed from store shelves and are no longer legally available for purchase. However, GBL has many industrial uses, which have kept it on the market as a cleaning agent. But it is illegal to market it for human consumption. BD is now considered a Class I Health Hazard, meaning that it is a life-threatening substance.

In 2000, GHB became a Schedule I substance under the guidelines set forth in the Controlled Substances Act (CSA) of 1970. This designation means that GHB is extremely dangerous and has a high potential for abuse and addiction.

adverse reactions: side effects, or negative health consequences, reported after taking a certain substance

Despite these actions, GBL, BD, and GHB continue to be manufactured and sold illegally. GBL is sold on the Internet in 55-gallon drums. Some Web sites provide the tools and the directions to convert it to GHB. The drug is typically made in illegal kitchen or basement labs and then sold locally on the street. *Newsweek* reported that in September of 2002 alone, "115 people in 84 cities" had been arrested "for peddling GHB on the Internet."

GHB Use Linked to Club Scene and Violent Crimes

GHB is one of several drugs that began dominating the club scene in the 1990s. Other common club drugs include ecstasy (MDMA), ketamine, 2C-B (Nexus), and Rohypnol. (Separate entries on these drugs are also available in this encyclopedia.) Along with Rohypnol (known most commonly as "roofies"), GHB quickly gained a reputation as a "date-rape" drug. Both drugs make potential crime victims unable to resist their attackers. In addition, the memory lapse caused by date-rape drugs makes it hard for victims of violent crimes to identify the offender later.

Because its taste can be hidden, and it is colorless and odorless, GHB can be slipped into a drink without someone's knowledge. "GHB can mentally and physically paralyze an individual, and these effects are intensified when the drug is combined with alcohol," wrote Jennifer Lloyd in a GHB fact sheet published by the Office of National Drug Control Policy (ONDCP). In high enough doses, GHB can cause a user to pass out. Various companies have created coasters and test kits designed to help people check their drinks for the presence of drugs before they consume them. The effectiveness of such testing devices is highly debated, however.

As of 2005, significant strides had been made in detecting GHB in trace, or very small, amounts of blood, urine, and other bodily fluids. In cases where an unused portion of the drug cannot be recovered, gas chromatography-mass spectrometry (a high-technology instrument that separates a chemical mixture and identifies its composition) can be used to detect GHB and related compounds. All evidence in a case of suspected GHB poisoning must be collected and processed quickly. According to Matthias E. Liechti and Hugo Kupferschmidt in *Swiss Medical Weekly,* "GHB levels decrease rapidly over several hours." The drug is "undetectable in blood within 4-8 hours of administration and in urine after a maximum of 12 hours."

In 2004 a new matchbox-sized drink testing kit was launched in London. Called Drink Detective, it tests for various date rape substances. *© Stephen Hird/Reuters/Corbis.*

What Is It Made Of?

GHB is a natural substance produced in small amounts in the human body. It may act as a NEUROTRANSMITTER in the brain. The chemical formula for GHB is $C_4H_8O_3$. It is illegally manufactured and sold in its crystalline compound (or salt) form, which is called sodium oxybate. Sodium oxybate's chemical formula is $C_4H_7NaO_3$. GHB can be produced by combining drain cleaner with GBL.

How Is It Taken?

GHB usually comes in a colorless and odorless liquid form, but it is also available as a white soap-like powder. Either way, it is taken

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

orally, usually in small amounts mixed with a liquid such as a soft drink, a sports drink, or an alcoholic beverage to mask its salty taste. The distinctive saltiness is more obvious when mixed with plain water. GHB is sometimes disguised by adding food coloring or flavorings, or by storing it in mouthwash bottles or eye drop dispensers. It may be sold in small vials, capfuls, or "swigs" at club parties. According to the DEA's "Drugs and Chemicals of Concern" report, "the presence of GHB in the liquid can be detected by shaking the liquid. If it becomes cloudy, GHB may be present." On average, a teaspoon of the liquid contains 1 gram (0.035 ounces) to 5 grams (0.175 ounces) of GHB and costs anywhere from $5 to $25 per dose.

Are There Any Medical Reasons for Taking This Substance?

Although GHB was initially developed as an anesthetic, it has never been used in the United States for that purpose. Several countries in Europe have approved GHB for anesthesia and other uses. In an article for *Forensic Science Communications,* Carl S. Hornfeldt and his coauthors cited several European studies that found GHB to be effective in relieving alcohol craving and alcohol WITHDRAWAL symptoms. Another study investigated the potential use of GHB to treat opiate withdrawal symptoms. (A separate entry on opium is available in this encyclopedia.)

Help for Narcoleptics

Although GHB is generally viewed as a dangerous drug, it seems to help people who have an unusual and hard-to-treat daytime sleep disorder called NARCOLEPSY. On July 17, 2002, the FDA approved Xyrem (an oral solution of sodium oxybate, or GHB) "as a treatment to reduce the incidences of cataplexy in patients with narcolepsy," according to Jennifer Lloyd in a GHB fact sheet written for the White House Office of National Drug Control Policy. Cataplexy is a sudden episode of muscle weakness that can cause a person to collapse unexpectedly during waking hours. The way GHB works on narcoleptics is not completely known, but it may help keep them "awake during the day by giving them a better night's sleep," explained Jeff Levine in a *WebMD* article.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

narcolepsy: a rare sleep disorder characterized by daytime tiredness and sudden attacks of sleep

When used as a narcolepsy treatment, Xyrem is considered a Schedule III substance under the CSA of 1970. Schedule III substances have less potential for abuse and dependence than Schedule I and II substances. Even though Xyrem has an accepted medical use,

selling it, distributing it, or using it for anything other than its prescribed use is against the law and subject to stiff Schedule I penalties.

Usage Trends

The DEA's Drug Intelligence Brief titled "An Overview of Club Drugs" was published just prior to GHB's classification as a Schedule I substance. In it, the author writes that club drugs such as ecstasy, ketamine, Rohypnol, and GHB initially "gained popularity primarily due to the false perception that they [were] not as harmful, nor as addictive, as mainstream drugs such as heroin." (Entries on ecstasy, ketamine, Rohypnol, and heroin are available in this encyclopedia.)

Fast GHB Facts

According to the U.S. Department of Justice:

- Typical GHB users and sellers are between eighteen and thirty years old.
- Approximately three out of every five people involved in GHB-related emergency department visits are between eighteen and twenty-five years old.
- When diluted, a gallon of GBL can produce 4,000 to 5,000 doses of GHB.
- A 55-gallon drum of GBL can yield 240,000 capfuls of GHB.
- Every dose of GHB can be thought of as containing the possibility of another date rape.

Young Users

The increase in GHB use can also be traced to its price. At $5 to $10 per capful, it has been viewed by teens as a cheap alternative to ecstasy or speed. Typical GHB users and sellers are between eighteen and thirty years old. "Pulse Check" statistics from 2004 indicate that GHB and GBL purchases most often occur in club settings frequented by young people, such as raves, nightclubs, bars, and parties, or through Internet Web sites.

The Case That Captured the Nation's Attention

Carlson High School ninth-graders Samantha Reid and Melanie Sindone were best friends. They lived in a downriver city just south of Detroit, Michigan. On a Saturday night in January 1999, the girls joined up with two boys from school, Daniel Brayman and Nicholas Holtschlag. Both were seniors. (A third girl, Sindone's stepsister, went along as well.) The five teens reportedly cruised around in Holtschlag's van for a while. For lack of anything better to do, the seniors ended up driving the girls to the apartment of an older friend, twenty-five-year-old Erick Limmer, on Grosse Ile in Michigan. Another teen, Joshua Cole, was already there with Limmer.

Cigarettes, joints, and alcohol were all part of the mix that night, but the drug that led to tragedy was GHB. Apparently, the party on

Grosse Ile was less exciting than everyone had hoped. The girls seemed very quiet, and the boys were looking for a way to liven things up. Three of the young men (excluding Limmer who was not in the room at the time) decided to slip some GHB into the girls' drinks. Reid was drinking a Mountain Dew and Sindone was having a screwdriver (orange juice and vodka). Limmer had purchased the GHB earlier. He was with Cole at the time of the sale and had told Cole not to touch it.

The girls did not know that the drinks had been spiked with a drug that could kill them. According to *Detroit News* writer Jodi S. Cohen, Sindone "remembers what it felt like as her body slowly went numb while she watched her friend slump down into a couch." Within minutes of consuming their GHB-laced drinks, the drug caused both girls to vomit and pass out.

Limmer was reportedly upset about the vomit stains on his rug and furniture. The girls were moved to the bathroom floor, where they continued to choke on and off. Sindone's stepsister did not become ill. Two of the boys headed out to a nearby store to pick up some carpet cleaning equipment. Hours went by, but the girls did not sleep off the effects of the GHB.

Emergency Care Too Late

It was not until 4:30 A.M. that the boys finally took Reid and Sindone to the hospital. The girls were both INTUBATED and restrained. Sindone survived, but her best friend did not. Reid died of the complications that occurred after vomit entered her lungs.

At the time of Reid's death in early 1999, little was known about GHB. "When Grosse Ile detectives confronted Joshua Cole, . . . it became clear that he . . . didn't know he was experimenting with an unpredictable, potentially deadly substance," wrote Cohen. Michigan police officials had not been trained to recognize the symptoms of GHB poisoning, and hospital emergency room staffs had no way to test for it. In response to a lack of awareness about the drug, Reid's mother, Judi Clark, founded the Samantha Reid Foundation to help educate communities about the dangers of GHB. As noted in the *Detroit News,* Clark became determined to "warn the world about GHB." In remembering Reid, Clark read from one of her daughter's poems: "*For I shall not go quietly into the night; / I shall succeed and no battle will be won until I have had my fight. / Harsh hammers and evil enemies look out, / I am on my way.*"

intubated: to insert a plastic tube into the lungs through the nose and throat, thus opening the airway of a person unable to breathe independently

From left, Joshua Cole, Erick Limmer, Daniel Brayman, and Nicholas Holtschlag stand as the jury enters a courtroom in Michigan. The men were tried in the GHB poisoning death of teenager Samantha Reid. *AP/Wide World Photos.*

The Aftermath

A little more than a year after the incident, the four men stood trial for the death of Samantha Reid. The three teens—Cole, Brayman, and Holtschlag—were convicted of involuntary MANSLAUGHTER and poisoning. Limmer was found guilty of being an accessory to manslaughter and poisoning. In March of 2000, the three younger men were sentenced to up to fifteen years in prison. Limmer received a lighter sentence of up to five years. Defense attorneys argued that the penalties were too stiff and appealed the decision.

Three years later, the Michigan State Court of Appeals threw out the manslaughter charges. According to the *New York Times,* "prosecutors vowed to appeal the ruling." In 2004 the case went

manslaughter: unintentional killing of a human being

before the Michigan Supreme Court and the manslaughter convictions were reinstated. As of mid-2005, three of the men were in their twenties, one in his thirties, and they remained in prison.

Law Stiffens in 2000

The key to surviving a GHB-related overdose is getting prompt medical treatment. Without help, victims of GHB poisoning may suffer brain damage due to an insufficient supply of oxygen, or they may stop breathing. The effects of the drug wear off relatively quickly, so with proper care the chances for recovery are good. "In the absence of complications," noted Pittman, many patients hospitalized for a GHB overdose "can be discharged within a few hours." Doctors suspect that if Reid had been taken to an emergency room as soon as she became ill, she might have survived.

The case was watched closely by authorities. In response to public outcry over Samantha Reid's death, Congress banned GHB in 2000. President Bill Clinton signed the Hillory J. Farias and Samantha Reid Date-Rape Drug Prohibition Act into law on February 18, 2000. The law also commemorates Farias, a seventeen-year-old high-school senior from La Porte, Texas, who died from a GHB overdose after someone slipped it into her soft drink.

At the time he signed the act into law, Clinton stated: "Making GHB a Schedule I controlled substance appropriately reflects the Congress' judgment that GHB has a high potential for abuse by sexual predators." He added, however, that the act would "not impede ongoing research into the potential legitimate use of this drug to treat the special needs of those suffering from narcolepsy."

Usage Reaches Its Peak

Drug experts believe that GHB use has already reached its peak in the United States. After a particularly high number of GHB-related illnesses reported in 2000, poison control centers and medical observers throughout the country noted a decline in both usage and overdose rates. The results of the 2004 Monitoring the Future (MTF) study were released to the public on December 21, 2004. Conducted by the University of Michigan (U of M), it is sponsored by research grants from the National Institute on Drug Abuse (NIDAO). The authors of the study considered GHB among those drugs "holding steady" in use among students in the eighth, tenth, and twelfth grades.

The Drug Abuse Warning Network (DAWN) tracks hospital emergency department (ED) visits caused by drug use. The growth in GHB-related ED visits skyrocketed in the middle and late 1990s. DAWN listed 20 GHB-induced ED visits in 1992, 56 in 1994, 1,282 in 1998, 2,973 in 1999, and 4,969 in 2000. After that, ED visits related to GHB began to fall, possibly due to the decreased availability of the drug after it became a Schedule I substance. In 2002, the number was down to 3,200. The latest statistics published as of mid-2005 were from the last two quarters of 2003. During those six months, 990 ED visits were reported for GHB poisoning. Approximately three out of every five people involved in GHB-related ED visits were between eighteen and twenty-five years old.

Effects on the Body

The effects of GHB on the human body are dose related. As Olive pointed out, "The difference between getting high and ending up in a coma can be only a few drops." The makers of illegal drugs like GHB often know little about the strength and quality of the ingredients they are mixing. GHB and other SYNTHETIC drugs are typically brewed in a kitchen sink from an Internet recipe. One batch is never the same as the next. Furthermore, as Elizabeth Russell Connelly noted in *Psychological Disorders Related to Designer Drugs*, "the toxic chemicals used in the synthesis of GHB may cause chemical burns to the esophagus, mouth, and throat."

Fast-Acting and Potentially Deadly

At low doses, GHB is said to produce a high similar to the early stages of drunkenness. Users report feelings of well-being, relaxation, and increased sociability. They may also experience an increase in sex drive and a heightening of the senses, which makes sights, sounds, and TACTILE feelings more intense.

Usually, people under the influence of higher doses of GHB become less aware of their surroundings and begin to feel out of control. Confusion, aggressive behavior, and impaired judgment often result. GHB is a fast-acting drug. Its effects can be seen within fifteen to twenty minutes and last for about three to six hours. The drug can cause RESPIRATORY DEPRESSION, slowed heart action, and extreme grogginess. Nausea and vomiting, tremors, and a lowered

synthetic: made in a laboratory

tactile: pronounced TAK-tuhl; relating to the sense of touch

respiratory depression: a slowed breathing rate; severe cases can cause a person to slip into a coma or even stop breathing entirely

To avoid becoming a victim of GHB poisoning, experts suggest making a pact with friends to look out for one another. Friends can watch to be sure that no one tampers with a drink and can call for emergency medical help if someone begins acting unusual or passes out. *© Don Mason/Corbis.*

body temperature may also occur. Patients who have overdosed may need to be restrained because of seizure-like activity and combativeness. If breathing rates go down to a dangerously low level, or if there is a chance that patients will choke on their vomit, intubation may be necessary.

In cases of overdose, GHB can bring on seizures, periods of unconsciousness, coma, and death. Most users who live through an overdose suffer severe memory loss and may not even realize what has happened to them.

The Risk of Addiction

Some people take GHB as a recreational drug—a drug used solely to get high, not to treat a medical condition. Those who take

Avoid Being a Victim

As of 2002, GHB was being used more often than Rohypnol in drug-related sexual assaults. But women are not the only victims of GHB poisoning. Men have been knocked out by GHB as well, usually before being robbed. Here are some ways to avoid becoming a victim of GHB poisoning:

- Don't accept a drink from someone you don't know.
- Drink only from cans or bottles that you've opened yourself.
- Never take a drink from a punch bowl. It's very easy for a drug to be slipped into a communal drinking source.
- Don't leave your drink unattended. If you haven't kept an eye on your glass because you've been dancing or you took a trip to the restroom, dump the drink.
- Make a pact with friends to watch out for one another. If you begin to feel ill after taking a drink, let someone you trust know about it *immediately*.
- The Drug Enforcement Administration (DEA) notes that GHB use often causes "slurred speech, disorientation, and drunken behavior without the odor of alcohol." If you notice these symptoms in yourself or your friends, call 911 right away and try to save a sample of the drink that caused these behaviors.

GHB recreationally run the risk of experiencing a number of problems. Because the drug is so unpredictable, users risk a deadly overdose every time they take it. The danger of a fatal overdose is increased when GHB is combined with alcohol.

Some GHB users become hooked on the drug to such an extent that they need a dose every few hours. Frequent users who stop taking the drug may experience a set of severe withdrawal symptoms known as GHB withdrawal syndrome. These symptoms include: 1) extreme anxiety; 2) confused thinking; 3) hallucinations—visions or other perceptions of things that are not really present; 4) paranoia—abnormal feelings of suspicion and fear; 5) insomnia—a sleep disorder; 6) tremors; 7) convulsions; 8) dangerously high blood pressure; and 9) possible death.

Reactions with Other Drugs or Substances

GHB is a depressant and can be fatal when taken alone. It is capable of shutting down the breathing center of the brain. Other depressants such as alcohol slow respiration as well. Club drug users often consume more than one drug at a time, and alcohol is almost always part of the mix. Alcohol and other nervous system

depressants such as BENZODIAZEPINES, painkillers, allergy medications, or sleeping pills are known to enhance the effects of GHB. (A separate entry on benzodiazepine is available in this encyclopedia.) Mixing GHB with any of these drugs increases the risk of serious breathing problems that can lead to death.

Treatment for Habitual Users

Users of GHB develop a TOLERANCE to the drug over time. If they increase their dosage, they face a greater risk of death from an overdose. As of 2005, there was no ANTIDOTE for GHB poisoning.

Long-term GHB users who stop taking the drug can become extremely ill. The withdrawal process typically lasts from three to twelve days, but symptoms may continue for as long as fifteen days. Habitual GHB users are likely to benefit from drug dependency treatment programs, including counseling.

Consequences

Use of GHB can impair judgment and cause memory loss, increasing the possibility of risk-taking behavior among users. RECREATIONAL USERS report that the drug decreases their INHIBITIONS. People with lowered inhibitions are more likely to engage in unsafe sex, putting themselves at risk for contracting HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome). GHB also impairs the user's ability to drive, causing the same reckless driving patterns seen in alcohol-related traffic crashes. The long-term health threats associated with GHB abuse were not known as of 2005.

benzodiazepines: a type of drug used to treat anxiety

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

antidote: a remedy to reverse the effects of a poison

recreational users: people who use drugs solely to achieve a high, not to treat a medical condition

inhibitions: inner thoughts that keep people from engaging in certain activities

The Law

GHB was once legal in the United States. It was sold at health food stores across the country. Numerous cases of illness related to GHB use led the U.S. government to declare it unsafe and illegal, except for approved medical use, in 1990. Nevertheless, use of the drug increased dramatically throughout the decade. Then, in 2000—following reports of thousands of GHB overdoses—a significant drop in GHB use appeared in national statistics. This decrease coincided with President Clinton's signing of the Hillory J. Farias and Samantha Reid Date-Rape Drug Prohibition Act of 2000.

With a bottle of evidence at his side, then-U.S. Attorney General John Ashcroft informs the press about a major crackdown on Internet sales of illegal drugs in 2002. Among those arrested were 115 dealers of the date rape drug GHB. *AP/Wide World Photos.*

GHB is now a Schedule I controlled substance. The penalty for manufacturing or distributing GHB includes large fines and a prison term of twenty years or more. Possession of GHB carries a penalty of at least a $1,000 fine and up to one year in prison. Repeat offenders typically receive harsher penalties.

GHB is also officially classified as a date-rape drug. The Drug-Induced Rape Prevention and Punishment Act of 1996 makes

it a crime to give an unsuspecting person a drug with the intent of committing violence, including rape. It also imposes penalties of large fines and up to twenty years in prison for importing or distributing more than one gram of these drugs, including GHB.

According to Jodi L. Avergun, chief of the Narcotic and Dangerous Drug Section of the U.S. Justice Department's Criminal Division, drugs are estimated to be used in as many as 15 to 20 percent of sexual assaults. "With approximately 95,000 sexual assaults on women" in the United States each year, she stated, "it is fair to assume that GHB has been used in thousands of crimes of violence." Avergun testified before the United States Sentencing Commission in 2004, seeking stiffer sentences for GHB sales and use.

In some European countries, GHB remains legal for use as an anesthetic and a treatment for alcohol withdrawal. Data available in 2005 showed that the drug was banned in the United States, Switzerland, and Canada.

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See also: 2C-B (Nexus); Alcohol; Benzodiazepines; Designer Drugs; Ecstasy (MDMA); GBL; Ketamine; Opium; Rohypnol

Herbal Drugs

Official Drug Name: Botanicals, dietary supplements, herbals, phytomedicines (the prefix *phyto*—pronounced FIGHT-oh—means "plant")
Also Known As: Butterbur (*Petasites hybridus*), chamomile (KAMM-eh-meal; *Chamaemelum nobile* and *Matricaria recutita*), comfrey (*Symphytum officinale*), echinacea (eck-inn-AY-shuh; *Echinacea purpurea*), elderberry (*Sambucus nigra*), ephedra (ih-FEH-druh; *Ephedra sinica*), garlic (*Allium sativum*), ginkgo (*Ginkgo biloba*), ginseng (JINN-sing; *Panax ginseng*), green tea (*Camellia sinensis*), kava (KAH-vuh; *Piper methysticum*), pennyroyal (*Mentha pulegium*), saw palmetto (*Serenoa repens*), St. John's wort (*Hypericum perforatum*), and valerian (*Valeriana officinalis*)
Drug Classifications: Not scheduled; dietary supplements

What Kind of Drug Is It?

Some debate exists as to whether herbal remedies are actually drugs. In *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy*, Cynthia Kuhn and her coauthors state: "Anything you take with the intention of changing how your body acts is a drug. Any drug that comes from a plant is herbal." The U.S. Congress disagrees with this definition. In 1994, Congress classified herbal preparations as dietary supplements rather than drugs.

Overview

The medicinal use of herbs can be traced back to the earliest human civilizations. A renewed interest in herbal drugs began in the early 1990s. *Miracle Herbs* authors Stephen Holt and Linda Comac suggest that the limited success of so-called "conventional" medical treatments for certain ailments sparked a consumer revolution in the United States. "Consumers of health care services are seeking more control over their health and bodies," they wrote. In their search for "new solutions," people throughout the world have discovered ancient treatments from Egypt, Greece, India, China, and the rain forest regions. "A question that repeatedly arises," reported Holt and Comac, is "Would these remedies have endured if they had no effectiveness?"

Are They Drugs or Not?

Herbal drugs are made from the roots, stems, leaves, bark, fruit, seeds, or flowers of plants that are believed to have medicinal properties. Many prescription drugs are also derived from plants. In fact, the word "drug" comes from the French word *drogue,* meaning dried herb.

Prescription and over-the-counter (OTC) drugs are quite different from herbals. Drugs prescribed by a physician or purchased in a drugstore are compounds made from "ACTIVE INGREDIENTS," along with certain fillers called "inactive ingredients." The active ingredients may be synthetic, meaning they

active ingredients: chemicals or substances in a compound known or believed to have therapeutic, or healing, effects

were manufactured in a laboratory. Or, they may be natural, meaning they were derived from animals, minerals, or plants. Either way, with prescription and over-the-counter drugs, patients receive precise amounts of these "active ingredients" in each dose of medicine they take. However, herbal drugs are typically made up of *all* the substances and chemicals in the plant. Sometimes herbal drug manufacturers are not really sure which substance in the plant is the active ingredient, or how much active ingredient their herbal product delivers. Even when the active ingredient is known, the amount and strength of it can vary widely from one product to another.

Herbal Supplements and the FDA

Because herbal drugs are not regulated as drugs by the U.S. Food and Drug Administration (FDA), they can be sold without undergoing extensive tests for safety. The manufacturers of prescription and over-the-counter drugs must conduct extensive scientific studies of new drugs in animals and in people to prove the safety and effectiveness of their products. Only then will the FDA approve the sale and use of the drug.

With herbal drugs, though, the situation is quite different. According to the Dietary Supplement Health and Education Act (DSHEA) passed by the U.S. Congress in 1994, herbals fall under the definition of a dietary supplement, not a drug. In "Dietary Supplements: Background Information," the Office of Dietary Supplements, a division of the National Institutes of Health (NIH), states: "Manufacturers do not have to provide the FDA with evidence that dietary supplements are effective or safe; however, they are not permitted to market unsafe or ineffective products. Once a dietary supplement is marketed, the FDA has to prove that the product is not safe in order to restrict its use or remove it from the market."

In April of 2005, the FDA released new guidelines "to help assure that the dietary supplements sold in the United States (U.S.) are properly labeled." The problem with the guidelines is that they are not legally binding, so manufacturers are not forced to follow these recommendations.

Early Herbal Use

Herbal drugs have likely been around as long as humans have. Medicinal herbs were found on the body of an "ice man" frozen in the Swiss Alps for more than 5,000 years. Scientists think the man used these herbs to treat an intestinal disorder.

In this piece of art, female druggists in ancient Egypt are squeezing an animal skin containing herbs to create an herbal medicine. *© Bettmann/Corbis.*

Before the creation of modern and synthetic drugs in the nineteenth century, the United States had its own folk medicine tradition. Remedies for different ailments were discovered through trial and error, and details on the curative properties of various plants were passed down through the generations. In colonial times, settlers often relied on homemade botanical remedies based on the folk traditions of their original countries. Botanicals, according to the U.S. Office of Dietary Supplements, are plants, including herbs, that are valued for their "medicinal or therapeutic properties, flavor, and/or scent." People also learned about the healing properties of local plants from Native Americans.

As more Europeans came to the Americas and settlements grew into cities, some herbal remedies transformed into "patent medicines," which people could buy at the local store or from traveling salesmen. Packaged in fancy bottles and laced with generous amounts of alcohol, most of these medicines were of little, if any, value. Their labels, however, claimed they could cure just about anything.

In the late 1700s and early 1800s, doctors, pharmacists, and scientists began to examine herbal remedies more closely. An English physician named William Withering (1741–1799) revolutionized the treatment of heart failure when he created digitalis (dij-ih-TAL-us) from the dried leaves of the foxglove plant (*Digitalis purpurea*). Digitalis makes heart contractions stronger and faster, thereby improving the circulation of blood throughout the body. In 1785, Withering published a famous book on the properties of the foxglove plant, *An Account of the Foxglove and Some of Its Medical Uses.* Several decades later in 1829, a French pharmacist named Henri Leroux purified the drug salicin (SALL-uh-sin) from the bark of the willow tree. This led to the discovery in 1840 of salicylic acid, a colorless substance used as an antiseptic and a painkiller. Aspirin is derived from salicylic acid.

Alternative Methods of Healing

Interest in herbal remedies began to decline in the early 1900s, as chemists found they were able to synthesize new drugs in the laboratory. It became cheaper and easier to synthesize the substances once derived from plants, rather than extract them from the herbs themselves. Herbal drugs did not regain their popularity until the 1960s, when widespread interest in alternative and complementary medicine sprang up in the United States and Europe.

The National Center for Complementary and Alternative Medicine (NCCAM), a division of the National Institutes of Health (NIH), defines complementary medicine as "medicine used *together with* conventional medicine." Conventional medicine is the type that is practiced by medical doctors (MDs) in the United States. Alternative medicine "is used *in place of* conventional medicine."

The Growth of a Multi-Billion-Dollar Industry

The growing interest in alternative medicine, which includes the use of herbal drugs, has continued into the twenty-first century. By 2005, herbal medicine was a multi-billion-dollar industry. Historians, public health officials, and cultural experts were not sure why alternative medicine had become so popular, but several factors may have influenced the trend. Among these factors are: 1) the rising cost of conventional health care; 2) the growing questions about the safety of synthetic drugs; 3) the large number of people who have conditions that conventional medicine cannot seem to cure; and 4) the renewed focus on using "natural" things.

Herbal Facts

The National Center for Complementary and Alternative Medicine (NCCAM), available at http://nccam.nih.gov, offers extensive information on dietary supplements. Some key facts to remember about herbal supplements are:

- Most herbal remedies have *not* been tested by medical experts.
- The term "natural" on an herbal supplement label does not mean that the product is safe.
- NCCAM researchers are working to identify the active ingredients in many herbal remedies. As of 2005, experts did not clearly understand how various herbs affect the body.
- Herbal supplements sometimes contain ingredients that are not listed on their labels.
- In general, herbals should not be used by pregnant women, breastfeeding mothers, or small children.
- The most common side effects of herbal remedies are headache, rapid heartbeat, and high blood pressure.

What Is It Made Of?

The chemical composition of herbal drugs is highly complex and uncertain, especially when compared with conventional drugs. Herbal drugs contain all the chemicals present in a plant. They may also have additives, contaminants such as pesticides or metals, and even different plants than they are supposed to have in them.

Even when the active ingredient in an herbal product is known (or suspected), it is difficult for manufacturers to standardize how much active ingredient their product contains. The strength of herbal drugs is affected by growing conditions, storage, handling, and the way the product is manufactured.

How Is It Taken?

Herbal drugs are taken in a variety of ways. Different methods of preparing them follow.

- A *decoction* is a tea made from boiling the bark, roots, or other woody parts of the plant in water.
- An *infusion* is a tea made by pouring hot water over the dried leaves, flowers, or fruit of the plant and allowing it to steep, or soak. The water is usually boiling, but some infusions use cold water.
- A *liniment* is an extract of an herb added to either alcohol or vinegar and then applied to the skin.

Herbs and their uses

erb	arious uses
Chamomile	Relieving insomnia, easing stomachaches and intestinal gas
Echinacea	Protecting against colds, relieving sore throats and skin infections
Garlic	Lowering high blood pressure, relieving colds and flu, reducing allergy symptoms, and generally boosting the immune system
Ginkgo	Improving memory, easing heart problems
Ginseng	Reducing stress and nervous tension, stimulating the immune system, relieving fatigue
Green tea	Boosting the immune system, preventing tooth decay
Saw palmetto	Relieving symptoms of urinary tract problems
St. John's wort	Producing sedative effects and providing pain relief
Valerian	Lowering high blood pressure, decreasing anxiety, relieving insomnia

SOURCE: Prepared by Barbara C. Bigelow for Thomson Gale, 2005.

- A *poultice* is a soft, moist mass of plant material that has been wrapped in a fine woven cloth. It is usually applied to burns or other skin wounds.
- A *tincture* is an extract, or the concentrated liquid form, of an herb. Tinctures are made by soaking herbs in GLYCERIN, alcohol, or vinegar for several weeks. What remains of the herb after soaking is strained out of the liquid. The resulting tincture contains high levels of the active ingredients in the herb. It can be consumed by the spoonful or mixed with a beverage.

Are There Any Medical Reasons for Taking This Substance?

The healing effects of herbal drugs have not been extensively tested or proven, but the scientific study of herbals is under way in the United States and abroad. Because herbal medicines are not classified as drugs by the FDA, the manufacturers of herbals cannot make claims that their product is effective at treating any disease or disorder. They can, however, make more general—and carefully worded—health claims. For example, companies that sell St. John's wort cannot say their product is useful for treating depression or anxiety, but they can say St. John's wort helps support a healthy emotional balance or helps maintain a positive attitude.

Some medical researchers question the healing effects of herbals and believe that herbal remedies act as PLACEBOS. Sometimes, if patients believe they are taking an effective medication, their attitude about their illness improves and they begin to feel better. This so-called "PLACEBO EFFECT" can cause patients to report improvements in symptoms that are hard to measure, such as pain or depression. Studies continue on whether herbals exert more of a mental effect than a physical effect on users.

glycerin: a syrupy form of alcohol

placebos: pronounced pluh-SEE-bohs; "sugar pills" or "dummy pills" that contain no medicine

placebo effect: a psychological effect noted by researchers in which patients' conditions improve if they *believe* they are taking a medication that will relieve their symptoms

Usage Trends

Estimates of herbal drug use in the United States vary, but it is generally believed that one out of every five Americans uses some sort of herbal remedy. The figure for usage among Europeans

During the severe acute respiratory syndrome (SARS) scare in 2002 and 2003, many people visited Chinese herbalists to purchase a mixture of herbs to help protect them from the disease. This trend was not only common in China but in shops like this one in Vancouver, British Columbia, Canada. *© Christopher J. Morris/Corbis.*

is much higher, at about 60 percent. In parts of the Far East, however, traditional herbals remain the first line of defense against illness for the majority of the population.

The SARS Threat

The outbreak of severe acute respiratory syndrome (SARS) that occurred in 2002 and 2003 offers a good example of herbal use in modern times. SARS is a virus that attacks the respiratory system. Infected individuals become feverish and achy within two to ten days of exposure to the virus. As the illness progresses, the level of oxygen in the blood becomes low and PNEUMONIA develops.

pneumonia: a disease of the lung, usually brought on by infection, that causes inflammation of the lung tissue, fluid buildup inside the lungs, lowered oxygen levels in the blood, and difficulty breathing

SARS was first seen in the southern part of China late in 2002. It is believed to have originated when a diseased wild mongoose was butchered in a meat market in the nation's Guangdong province. SARS is spread through close contact, usually when an infected person coughs or sneezes. The virus is also excreted in urine and feces and can stay alive in raw sewage for several days. Common sense precautions, including frequent hand washing, are among the best ways to avoid infection with SARS.

By March of 2003, SARS was considered "a global threat," according to the U.S. Centers for Disease Control and Prevention (CDC). In early April, the Chinese people began seeing "nearly one thousand new cases per week until mid-May, while frantic steps were taken to inhibit its spread," wrote Subhuti Dharmananda, director of the Institute for Traditional Medicine in Portland, Oregon. Infected people were QUARANTINED, large public gatherings were canceled, and attempts were made to treat the disease with anti-viral drugs.

Herbal Remedies Sought Many Chinese turned to traditional herbs in an effort to protect themselves from the virus. Herbalists prepared preventive mixtures of herbal roots, leaves, and flowers; those who feared catching SARS scrambled to buy these mixtures. The ingredients in the herbal preparations included wild barley, isatis root, chrysanthemum, dried honeysuckle, lonicera flower, astragalus, forsythia, coix, white fungus, andrographis, and dryopteris. Because there was no known cure for SARS, even the medical community sought help from herbalists. Herbal formulas were reportedly taken—with much success—by the staff members working with SARS patients at the University of Hong Kong School of Chinese Medicine.

The World Health Organization (WHO) estimated that more than 8,000 people were sickened by SARS between November of 2002 and July of 2003. Nearly 10 percent, or 774 people, died from it. Only eight people in the United States caught SARS during this time, and all of them recovered. Dharmananda views the entire SARS scare as a valuable learning experience. It gave the rest of the world the opportunity to "understand how Chinese herbs are utilized in their native land to prevent and treat infectious diseases."

Common Ailments

Despite the lack of conclusive evidence of their effectiveness, herbal drugs are widely believed to be useful in treating a variety of conditions. People take herbal drugs to treat common ailments, including colds and flu, muscular aches and pains, acne, indigestion,

quarantined: isolated in order to prevent the spread of disease

constipation, coughs, menstrual cramps, dandruff, diarrhea, fatigue, hair loss, headaches, heartburn, gas, insect bites, lice, motion sickness, nausea, insomnia (a sleeping disorder), dizziness, and warts.

People also take herbal drugs for more serious conditions such as depression; arthritis; asthma (AZ-muh), a breathing disorder; high blood pressure; various cancers; DIABETES; EPILEPSY; sexually transmitted diseases; obesity; and ulcers.

Effects on the Body

Some widely used herbal remedies include chamomile, echinacea, garlic, ginkgo, ginseng, green tea, saw palmetto, St. John's wort, and valerian.

Chamomile

Chamomile is a popular herbal remedy. The plant's daisy-like flowers smell like apples. Chamomile tea, made from dried flowers, is said to produce a calming effect and to ease an upset stomach. According to Penelope Ody in *The Complete Medicinal Herbal,* "One home-dried flower can give more flavor than a tea bag of commercial offerings." Despite its widespread use, chamomile tea may bring on severe respiratory reactions if consumed by people with allergies to ragweed and certain flowers.

Echinacea

Several varieties of echinacea, also called the purple coneflower, are said to strengthen the body's immune system and fight colds and flu. Before Europeans arrived in the New World, echinacea was used by Native Americans to treat respiratory infections, inflammation of the eyes, toothaches, and snakebites. Colonists quickly adopted the use of the herb. In the nineteenth century, European Americans used echinacea as a "blood purifier," believing that it cleared the blood of disease-causing TOXINS.

Whether echinacea is really an effective substance in treating or preventing colds is debatable. Sixteen CLINICAL TRIALS, or scientific tests, involving more than 3,000 patients have produced mixed results. A 2003 study funded by NCCAM looked at the use of the herb as a cold treatment in children age two through eleven. Researchers found that the "use of echinacea from the onset of symptoms did not lessen the number of days the cold lasted or the severity of the symptoms." Furthermore, researchers suggested that additional studies be conducted "to determine whether echinacea has any role in preventing colds."

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

toxins: poisonous substances

clinical trials: scientific experiments that test the effect of a drug in humans

Echinacea plants bloom near the volcanic peak of Mt. Adams in Washington. The plant is said to strengthen the body's immune system and fight colds and flu. *© Steve Terrill/Corbis.*

Echinacea is not known to interact negatively with any other drugs. However, it can cause serious reactions in people with allergies to certain plants and flowers. Additionally, it is not recommended for use by people suffering from diseases of the immune system. In Germany, echinacea is valued as an immune-boosting herb and is often combined with antibiotics to treat bacterial infections. No studies have evaluated the safety or effectiveness of this combination.

Garlic

According to Mark Blumenthal, founder and executive director of the American Botanical Council, garlic dietary supplements were the top-selling herbal supplement in the United States in 2004. Fresh

and dried garlic is used to treat the common cold, coughs, bronchitis, fever, and inflammation of the mouth. More than two dozen clinical trials have tested garlic's CHOLESTEROL-lowering properties. Preliminary results indicate that garlic can actually reduce cholesterol levels, but the degree of reduction was rather low, at about 10 percent overall.

In April of 2005, results of a German study on Kwai garlic were detailed in a press release posted on the *American Botanical Council* Web site. The study showed "that garlic can play a role in preventing and potentially reversing or dispersing arteriosclerotic plaque formation." This means that the active ingredients in garlic help to flush away the clogging deposits that can build up inside blood vessels. In addition, garlic may actually stop plaque from developing in the first place. The presence of plaque in the blood vessels "can lead to a number of CARDIOVASCULAR ILLNESSES, including high blood pressure and STROKE," noted the press release.

On the downside, the use of garlic supplements can cause bad breath, body odor, and intestinal gas. Depending on the brand and dosage taken, a garlicky smell may be excreted through the skin and mouth of garlic supplement users. Although odor-free garlic pills are available, herbalists generally agree that some of the herb's medicinal value is lost during processing.

Garlic is also used in the treatment of menstrual pain and diabetes, although its effectiveness for these conditions has not been determined.

cholesterol: pronounced kuh-LESS-tuh-rol; an essential substance made of carbon, hydrogen, and oxygen that is found in animal cells and body fluids; in high amounts, it may be deposited in blood vessels, resulting in dangerous blockages of blood flow

cardiovascular illnesses: illnesses involving the heart and blood vessels

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

Alzheimer's disease: a brain disease that usually strikes older individuals and results in memory loss, impaired thinking, and personality changes; symptoms worsen over time

Ginkgo

The wild maidenhair tree, or ginkgo tree, dates back "at least 200 million years," noted Ody, "but cultivated trees survived in Far Eastern Temple gardens." The tree grows in eastern China and is known for its shade-producing fan-shaped leaves. In 1730, the tree was brought to Europe from China. It was not until the 1950s that a German researcher investigated the properties of the ginkgo leaf for possible medical use. Asian herbalists brew teas from ginkgo to treat memory loss and asthma. Ginkgo supplements began catching on in the United States in the 1980s.

Ginkgo contains a substance that helps dilate, or open up, blood vessels, thus improving blood circulation throughout the body. It is often used to relieve the pain associated with poor circulation in the legs. The herb is also said to improve, or at least stabilize, age-related memory loss and the mental confusion that accompanies ALZHEIMER'S DISEASE. These actions are credited to gingko's ability to increase blood flow to the brain.

Factory workers in South Korea sort and weigh dried ginseng roots as they process them to be sold. Such roots are said to act as a "general tonic" that protects users from disease, increases stamina and sexual power, and aids in concentration. © *Setboun/Corbis.*

Ginseng

Ginseng is a Chinese herb, but a ginseng-like herb grows in North America. The ginseng plant has five leaflets per leaf, bright red berries, and roots that are believed to have a variety of medicinal uses. When dried, the roots are considered a type of "general tonic" that protects users from disease, increases stamina and sexual power, and aids in concentration. It reportedly takes several weeks of regular use for the effects of ginseng to kick in. As of 2004, few studies of ginseng had been conducted in the United States. Although used in China for more than five centuries, the herb has "only recently become popular in the West," explained Andrew Weil and Winifred Rosen in *From Chocolate to Morphine,* "and Western scientists still do not understand it very well."

Green Tea

Green tea is widely regarded as an immune-system booster. Herbalists from the Far East claim it helps prevent stomach cancer. It also has a rather unusual effect. Because of its high fluoride content, green tea may reduce the risk of tooth decay. Its caffeine content can cause nervousness and insomnia in some individuals.

Saw Palmetto

Saw palmetto grows along the southern coastal regions of the United States. Tea made from the plant's berries is used to relieve urination problems caused by an enlarged PROSTATE gland. Sixteen short-term clinical trials involving approximately 3,000 men indicate that saw palmetto is effective for this use, although long-term trials need to be done to confirm the herb's effectiveness. The herb improves urine flow and is commonly prescribed in Europe for men with an enlarged prostate. Saw palmetto is also available in tablet and capsule form.

St. John's Wort

St. John's wort, a low-growing bush with yellow flowers, contains about ten different compounds that can exert effects on the human body. The dried buds and flowers of this plant are used to treat depression and anxiety. Studies on the herb involving thousands of patients were conducted throughout the 1990s. The results showed that St. John's wort seemed to work about as well as prescription antidepressants on mildly to moderately depressed patients—with fewer side effects. (A separate entry on antidepressants is available in this encyclopedia.)

In early 2005, a European study confirmed these results but went one step further. The *British Medical Journal* reported on the study in its February 11, 2005 issue, noting that German researchers found St. John's wort equally effective in patients who had been diagnosed with *moderate to severe* levels of major depression. The National Institutes of Health (NIH), however, maintains that St. John's wort has *not* been proven effective in treating *severe* depression.

Valerian

Valerian grows naturally in Europe and Asia and was brought to North America. Its rhizomes, or underground stems, are used to make teas and other herbal remedies for nervous tension and insomnia. Weil and Rosen described valerian as "a strong natural SEDATIVE that does not depress vital functions or cause the kind of dependence that sleeping pills do." Experts claim that fresh valerian is far

prostate: a male reproductive gland

sedative: a drug used to treat anxiety and calm people down

superior to pills and capsules because the manufacturing process makes the rhizomes lose their strength. Some users swear by its calming effects, even if it does smell like stinky gym shoes.

Lesser-Known Herbs

In late 2004 and early 2005, the American Botanical Council published new research results on butterbur and elderberry. An extract of the European butterbur root significantly reduced the number of migraine headache attacks in children and adolescents, according to a four-month study documented in *Headache.* Migraines are especially difficult to treat in children, and conventional drugs often fail to relieve young patients' pain. The butterbur remedy, though, cut the number of migraine episodes in half for more than three out of four children in the study.

Results of trials using elderberry for flu symptoms were promising as well. The European elder tree has creamy white flowers and bluish-black berries. The flowers and berries of the plant have gained popularity in the United States in the treatment of coughs, colds, fever, and flu. In clinical trials cited in "The ABC Clinical Guide to Elder Berry," elderberry syrup was shown to be effective in reducing flu symptoms. "The treatment group recovered significantly faster (by days two or three) than the CONTROL GROUP (by day six)," according to the guide.

Ephedra and Other Potentially Dangerous Herbs

The long-term health effects of herbals have not yet been determined. Some herbals, however, are known to cause serious side effects. Among them are ephedra, comfrey, kava, and pennyroyal. (A separate entry on ephedra is available in this encyclopedia.)

The Chinese herbal remedy ephedra, also called *ma huang* (ma-HWANG), received more press coverage in the early 2000s than any other herb. The twigs of this desert plant have been used as a treatment for asthma for thousands of years. Ephedra contains AMPHETAMINE-like substances that can have a powerful stimulating effect on the heart. (A separate entry on amphetamines is available in this encyclopedia.) Until it was banned by the FDA in 2004, ephedra was most often taken by young and middle-aged adults for weight loss, increased energy, and bodybuilding. Serious side effects associated with ephedra include high blood pressure, irregular heart rate, seizures, heart attacks, and strokes. According to FDA figures, the use of this herbal stimulant has been linked to 155 deaths. As of early 2005, the controversy surrounding ephedra—and its ban—had not been settled.

control group: in a drug test, the group that does *not* receive the drug being tested

amphetamine: pronounced am-FETT-uh-meen; a stimulant drug that increases mental alertness, reduces appetite, and helps keep users awake

Herbalists have prescribed comfrey tea and pills to treat back pain, ulcers, and diarrhea. Ointments were used traditionally to heal bone fractures. However, the FDA advised dietary supplement manufacturers to take comfrey off the market in 2001 because of mounting evidence that comfrey tea and pills can cause severe damage to the liver. The FDA also noted a lack of evidence for comfrey's effectiveness.

Kava is taken from the roots of a plant found on the South Pacific islands. The root can be chewed or brewed into a tea, but capsule and tablet forms are also available. This spicy herb is related to black pepper. Kava acts as an herbal DEPRESSANT, reportedly bringing on feelings of relaxation and numbness in the user. In the 1990s, it was a popular remedy for stress and anxiety. It has also been used for its ANESTHETIC properties. Preliminary research shows that regular use of kava reduces anxiety, tension, and agitation without the side effects of prescription anti-anxiety drugs such as BENZODIAZEPINES. (A separate entry on benzodiazepines is available in this encyclopedia.) Weil and Rosen noted, however, that "cases of severe liver disease" have been reported "in people using kava; as a result, its popularity has dropped off sharply" in both the United States and Europe since the early 2000s.

Pennyroyal is a widely available herb of the mint family. It is usually consumed as a tea and used for digestive disorders, colds, and skin diseases. At high doses, it can cause pregnant women to abort their babies. Also, it is known to be toxic to the liver.

The Truth about Guarana

The stimulant guarana (gwah-rah-NAH) is sold as an herbal tonic that supposedly increases endurance. Actually, it is just a natural form of caffeine. (An entry on caffeine is available in this encyclopedia.) Guarana is made from the mashed seeds of the *Paullinia cupana,* a woody Brazilian shrub. The per-tablet dosage provides the user with about as much caffeine as a cup of coffee. Guarana is an active ingredient in many caffeinated energy drinks.

Reactions with Other Drugs or Substances

"Herbs have the reputation of being natural and gentle," explained registered dietician Karen Collins on *MSNBC.com,* "but they contain compounds that can profoundly affect the body." Self-medicating with herbal drugs can be risky, especially among patients who take prescription drugs.

Most herbals have not yet been studied for possible interactions with prescription drugs, but some information is already available. For example, valerian may intensify the sedative effects of

depressant: a substance that slows down the activity of an organism or one of its parts

anesthetic: a substance used to deaden pain

benzodiazepines: a type of drug used to treat anxiety

Various forms of St. John's wort are displayed. The dried buds and flowers of this plant are used to treat depression and anxiety.

BARBITURATES, so they should not be taken together. (A separate entry on barbiturates is available in this encyclopedia.)

According to an NIH study, garlic supplements can slow the time it takes for blood to clot. Because of garlic's blood-thinning properties, it should be used with caution by patients who are already on blood-thinning drugs. High-dosage garlic supplements are also thought to decrease the effectiveness of certain drugs used to fight AIDS (acquired immunodeficiency syndrome).

The American Botanical Council noted that St. John's wort interacts with a variety of prescription drugs, "lowering their levels and effectiveness." According to a National Institute of Mental Health (NIMH) publication on depression, patients being treated with FDA-approved prescription medications for AIDS, heart disease, depression, seizures, certain cancers, and transplant rejection should not take St. John's wort.

barbiturates: pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers"

Treatment for Habitual Users

The abuse of herbal remedies is likely to be overlooked by both users and health care professionals. Herbals are perceived as being safe and are not even considered drugs by the FDA. But users can overdose on herbal drugs. If this happens, emergency medical treatment is necessary.

Kuhn pointed out that "'herbal remedies' are completely unregulated and the amount and purity of what you buy is unknown." Because the strength of herbals can vary so widely from manufacturer to manufacturer and even from batch to batch, users can never be sure of how much—or even what herb—they are ingesting. Self-medicating with herbal remedies can be particularly problematic if people increase their doses to dangerous levels.

Consequences

The main risks of herbal drug use involve dosage errors. Sometimes the boundary between an effective dose and a fatally poisonous one is dangerously slim. Users uneducated in the finer points of herbal dosing may jeopardize their health.

Shunning conventional treatments for serious illnesses can have serious negative consequences. Patients who use herbs and other alternative treatments are less likely to take advantage of conventional medical treatments. Kuhn and her coauthors caution that "while many effective medicines derive from herbal sources, many ineffective ones do as well." One case in point involves patients with early-stage cancer who decide to treat themselves with herbal drugs rather than undergo conventional cancer treatments such as chemotherapy. With diseases like cancer, early treatment is the key to survival. Treating cancer with herbal remedies may allow cancerous growths to progress to a more deadly stage, reducing the chances for successful chemotherapy and radiation treatment later.

In addition, doctors warn that people who take herbals may be more likely to continue unhealthy behavior, such as smoking or drinking large amounts of alcohol. They may have the mistaken belief that their herbal remedies will protect them from the health risks.

The Law

For decades, the FDA and the herbal products industry have argued over the proper way to regulate herbal drugs. The FDA's job is to protect consumers from ineffective or unsafe products. But

herbal manufacturers, who have grown more influential as their products have increased in popularity, maintain that consumers should be allowed to make their own decisions about health care. The 1994 Dietary Supplement Health and Education Act classifies an herb as a dietary supplement. Under this law, the FDA bears the burden of having to prove an herbal is unsafe before restricting its use.

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See also: Amphetamines; Caffeine; Diuretics; Ephedra; Over-the-Counter Drugs

Heroin

Official Drug Name: Diacetylmorphine (DIE-uh-SEE-tuhl-MOR-feen); heroin
Also Known As: AIP, antifreeze, aries, Aunt Hazel, big H, big Harry, black pearl, black tar, bonita, bozo, brain damage, brick gum, brown sugar, bull dog, bundle, Charley, China white, diesel, H, Harry, manteca, Mexican mud, mud, nice and easy, noise, number 4, number 8, nurse, peg, sh#t, skag, smack, stuff, tootsie roll, white stuff
Drug Classifications: Schedule I; narcotic

What Kind of Drug Is It?

Heroin is a powerful narcotic drug that is very habit-forming. It is derived from the opium poppy plant. Its sale and use are illegal in most parts of the world. However, this has not stopped the cultivation or farming of poppies and the creation of heroin in many countries in Southeast Asia, Southwest Asia, Central America, South America, and Mexico.

Highly addictive and quick-acting, heroin is a Schedule I controlled substance in the United States. The federal government does not believe that heroin has any medical value in treating illness, but it does consider heroin a very dangerous drug for RECREATIONAL USE or experimentation.

Production Soars

In December 2004, the *Knight Ridder/Tribune News Service* reported that prices for heroin being sold on the street had reached twenty-year lows, while the purity of illegal heroin had increased. The major reason this occurred was because opium poppy farmers in Afghanistan had started growing huge amounts of the plants again. The supply of opium out of Afghanistan greatly increased after the fall of the country's Taliban government in late 2001.

The Taliban government had tightly controlled opium production before being overthrown by U.S. troops and their allies during Operation Enduring Freedom. The United States and its allies invaded Afghanistan after terrorists flew airplanes into the World Trade Center in New York and the Pentagon in Washington, D.C., on September 11, 2001. The Taliban was suspected of allowing terrorists to train in Afghanistan. After the fall of the Taliban, poppy production soared, giving American drug dealers plentiful supplies of more affordable heroin to peddle to consumers.

Increased Purity

The increased purity meant that users could experience the heroin high without having to inject the drug into a vein. Typically, heroin users snort, smoke, or inject the drug just under the skin or into a muscle. Some people mistakenly believe that they will not

recreational use: using a drug solely to achieve a high, not to treat a medical condition

Heroin and Terrorism

According to a *Washington Times* report in December 2004, Mark Steven Kirk, a Republican congressman from Illinois, returned from Afghanistan with startling news. He reported that terrorist Osama bin Laden was using cash earned from heroin deals to pay for his personal bodyguards, weapons, and secret hiding places. Al Qaeda, the group Osama bin Laden heads, is said to pay Pakistani drug lords to help keep him hidden from U.S. troops.

become addicted to the substance if they do not inject it. Like all other natural and SYNTHETIC OPIATES, powdered heroin carries a high risk of producing dependence over a period of time. Dependence is the physical need for a drug in order to ward off withdrawal symptoms.

No one gets out of bed one day and decides on a whim to seek out a dark alley in a rundown neighborhood to buy a bag of heroin, convert it to a liquid, and then shoot it into a vein with a hypodermic needle. However, this is often the end result of continued recreational use of the drug. As the testimony of countless former addicts shows—as well as the number of emergency room visits—the drug can take hold of a user and destroy his or her life.

According to the Drug Abuse Warning Network (DAWN), between 1990 and 2000, emergency room visits related to heroin nearly tripled, from 33,884 in 1990 to 97,287 in 2000. DAWN statistics from the last half of 2003 showed that heroin was involved in 47,604 drug-related emergency department visits during that time. In addition, the California Department of Alcohol and Drug Programs reported that the average age of American heroin users dropped from 27.4 years to 17.6 years between 1988 and 1997. Heroin fatalities strike rich and famous users as well as poor and anonymous users. It is an illegal substance that lures new addicts all over the world every year.

Overview

Heroin is made from the fluid that drips out of opium poppy bulbs. The use of opium poppies for medication dates back more than 6,000 years. The first archaeological record of poppy use can be found in the ancient cultures of the Fertile Crescent (now the nations or Iraq and Iran). A document discovered in the ancient Egyptian city of Thebes, dated to 1552 BCE, lists more than 700 illnesses for which opium was used. By the time of the great civilizations of ancient Greece and Rome, opium was well known for its painkilling properties—and for its effects on the brain. The Greek god Morpheus, god of dreams, is depicted in artwork carrying a bouquet of opium poppies.

synthetic: made in a laboratory

opiates: drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

Heroin is derived from the sap of the opium poppy plant. Opium farmers cut the bulbs to "bleed" the sap. Once the sap is retrieved, it is used to make heroin and other drugs, including codeine and morphine.

Centuries-Long History

During the Middle Ages (c. 500–c. 1500), physicians experimented with opium for use in treating diarrhea and ANXIETY. Swiss scientist Paracelsus (1493–1541) mixed opium with alcohol and called the resulting TINCTURE *laudanum,* the Latin word for "to be praised." In the centuries that followed, opium would appear in a variety of widely dispensed medicines, even for teething babies. American inventor Benjamin Franklin (1706–1790) used opium to relieve the pain of gout and was believed to have been addicted to opium when he died.

In the nineteenth century, opium use was legal. In most cases it was socially acceptable and not considered any worse than smoking tobacco. Poets such as Samuel Taylor Coleridge (1772–1834) wrote under its influence, and wealthy women used it habitually for a

anxiety: a feeling of being extremely overwhelmed, restless, fearful, and worried

tincture: combination of an active drug and a liquid alcohol

variety of complaints. In 1803, a German pharmacist isolated the active ingredients in opium and was able to create morphine, which was named after the Greek god Morpheus. Stronger and faster-acting than opium, morphine quickly gained a following as a painkiller. Its habit-forming nature soon became evident, too. In 1848, the modern hypodermic needle was invented. This allowed surgeons to inject patients with liquid morphine to ease pain. This proved a boon during surgery and recovery, but it also created addicts. So many soldiers came home from the American Civil War (1861–1865) with morphine addiction that the condition was called "the soldiers' disease."

It was the search for a less habit-forming painkiller that led to the creation of heroin. In 1874, British chemist Alder Wright boiled morphine with an acid called acetic anhydride. The compound he produced, diacetylmorphine, at first seemed to be a miracle drug. It was a better painkiller than morphine, and it was quickly put to use for chronic coughs, especially in those suffering from TUBERCULOSIS. The German pharmaceutical company Bayer began marketing diacetylmorphine under the trade name "heroin" in 1898, principally as a cough suppressant.

At the beginning of the twentieth century, the medical community began to admit that opiate addiction had become a public health crisis. In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger wrote that an estimated 250,000 Americans in a population of 75 million (or 1 in 300) were morphine, heroin, or opium addicts. The most noticeable of these were the opium smokers, who frequented "OPIUM DENS" where they smoked the drug to get high.

But just as serious was the use of medicines that contained opium derivatives, most of which did not even list the ingredients. Cranky infants were given "soothing syrups" that contained morphine, codeine, or heroin. Sometimes they died of overdoses. Men and women from all economic levels depended on their "tinctures" and "elixirs." Even the fictional detective Sherlock Holmes, created by Scottish author Sir Arthur Conan Doyle (1859–1930), solved one of his cases by visiting an opium den.

tuberculosis: pronounced tuh-burk-yuh-LOH-siss; a highly contagious disease of the lungs

opium dens: darkly lit establishments, often in the Chinatown section of big cities, where people went to smoke opium; many dens had beds, boards, or sofas upon which people could recline while experiencing the effects of the drug

Crackdowns on Use

In 1906 the Pure Food and Drug Act made it illegal to dispense medicine without listing the ingredients on the bottle. Less than ten years later, the Harrison Narcotic Act prohibited opium and its derivatives (including heroin) in all but prescription medications. The particular dangers of heroin singled it out

Upon its discovery, heroin was thought to be a miracle drug. In 1898, the Bayer company used it in a medication to suppress coughs (as shown in this advertisement). Eventually people discovered heroin's truly addictive nature. Today, it is considered to be of no medical value. *© Bettmann/Corbis.*

even further from its less powerful cousins, morphine and codeine. (Entries on morphine and codeine are available in this encyclopedia.) Heroin production in the United States was outlawed in 1924. For some time after that, doctors were able to obtain imported heroin for use as a painkiller. However, in 1956 the drug was completely outlawed, even for medical use. As such, heroin was one of the first drugs to go from being used in medicines to being classified as an illegal substance.

Outlawing heroin promoted its use as a recreational drug. A post-World War II generation of young people, resistant to authority and eager to try new things, began experimenting with heroin and other opiates. One of them, William S. Burroughs

Heroin Chronology

c. 4000 BCE Opium poppies are cultivated in the Fertile Crescent by the ancient cultures of Mesopotamia.

1552 BCE An ancient Egyptian document lists 700 uses for opium.

800 BCE The poet Homer writes of a drug called *nepenthe* "to lull all pain" in *The Iliad*.

600-900 Arabic traders introduce opium to China.

1524 Swiss scientist Paracelsus mixes opium with alcohol and names the product *laudanum*.

1803 A German scientist isolates morphine as the most active ingredient in the opium poppy.

1848 The hypodermic needle is invented, allowing for quicker delivery of painkillers to the brain.

1874 British chemist Alder Wright creates diacetylmorphine (heroin), in an effort to produce a less addictive painkiller.

1898 Bayer Pharmaceuticals of Germany is the first company to market diacetylmorphine under the brand name "heroin."

1924 Heroin production is outlawed in the United States.

1953 William S. Burroughs writes *Junkie,* about his addiction to opiates.

1956 Heroin is completely outlawed in the United States.

1970 The Comprehensive Drug Abuse Prevention and Control Act names heroin a Schedule I controlled substance, carrying the highest criminal penalties if sold or possessed.

1982 Comedian and actor John Belushi is found dead in a hotel room after being injected with a "speedball" (mixture of heroin and cocaine).

1994 Rock singer/songwriter Kurt Cobain of the band Nirvana fatally shoots himself during a heroin high.

2004 The Office of National Drug Control Policy confirms that street prices for heroin have reached a twenty-year low.

(1914–1997), would go on to describe his experiences as an addict in novels such as *Junkie* (1953) and *The Naked Lunch* (1959). Illegal heroin gained popularity as a recreational drug in the 1960s and 1970s, drawing many artists, musicians, and actors into its grip. Some of them, like comedian John Belushi (1949–1982) and singer/songwriter Kurt Cobain (1967–1994), died during heroin highs. Others, like musician Eric Clapton (1945–), successfully battled addiction.

In the early 1980s a new danger crept into heroin abuse. Addicts who injected heroin and shared needles already knew that they ran a greater risk of contracting HEPATITIS. But a new virus called AIDS (acquired immunodeficiency syndrome) was found to spread

hepatitis: a group of viruses that infect the liver and cause damage to that organ

quickly through shared needles, too. AIDS is an infectious disease that destroys the body's immune system, leading to illness and death. By the mid-1980s, public health officials were warning that AIDS was spreading at higher rates among drug addicts than in other at-risk groups. The addition of AIDS to the heroin addict's list of dangers accounts for part of the rise in emergency room visits related to heroin in the 1980s and 1990s.

For a time, the risk of AIDS lowered the use of heroin in the United States. But the introduction of purer doses that could be snorted or smoked has brought the drug new users. These users do not run the risk of contracting AIDS by using dirty needles. However, heroin use can lead to risky behaviors, like having unprotected sex, which can lead to AIDS. In addition, users still face all the other dangers associated with heroin, including its tendency to promote dependence. As abusers build a TOLERANCE to heroin over time, they become more likely to inject the drug, since this is the quickest way to achieve a high.

What Is It Made Of?

Heroin is simply an organic, or plant-derived, compound that combines morphine with acetic acid (vinegar) or acetic anhydride (an acid). It is processed from the same raw gum opium that can produce morphine, codeine, or thebaine. Farmers drain the sap from ripening opium poppies and boil it down into a sticky gum. The gum is treated in a water base with chemicals such as lime, ammonium chloride, activated charcoal, and hydrochloric acid. This causes the morphine to leach out of the gum.

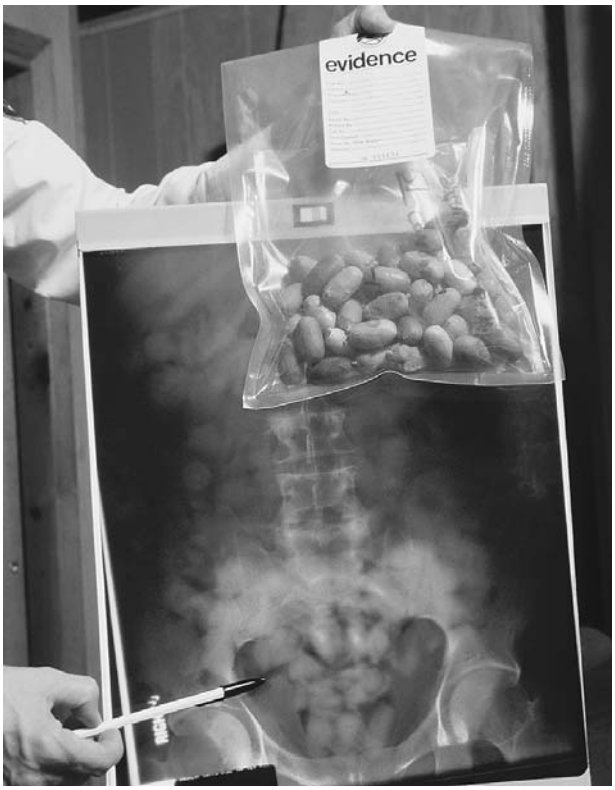
When this product is dry, it is shaped into bricks. The bricks are then sent to other secret laboratories that mix the morphine with acetic anhydride, more activated charcoal, and sodium bicarbonate (baking soda). Once again the particles are allowed to settle in water. When the particles have dried, they are treated with hydrochloric acid, producing the heroin hydrochloride that is sold on the streets as a white powder.

Most of the white powder heroin sold in the United States comes from Vietnam, Afghanistan, and Pakistan. The product sold to users is never pure heroin. Instead the heroin is "cut" with a number of other water-soluble substances, including sugar, over-the-counter painkillers like acetaminophen (Tylenol), TRANQUILIZERS, baking soda, powdered milk, starch, and talcum powder. Some batches of heroin reportedly have been cut with rat poison or laundry detergent. CUTTING reduces the purity of the product and allows the dealer to stretch the supply. It also provides the user with an uncertain dosage that can range from 70 percent heroin to 20 percent heroin.

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

tranquilizers: drugs such as Valium and Librium that treat anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens)

cutting: adding other ingredients to a powdered drug to stretch the drug for more sales



Heroin is smuggled into the United States in various ways. One method is to have drug couriers swallow small pouches of the powder and carry the drug into the country in their bodies. Here, a customs official shows an X ray of the drug pouches concealed in a smuggler's stomach and those same pouches in a plastic evidence bag after they were retrieved.

In Mexico, Central America, and South America, underground growers and chemists produce "tar heroin" that comes to the American BLACK MARKET as a sticky black or brown substance with an odor of vinegar.

How Is It Taken?

Heroin is popular because its effects can be felt almost immediately. This is because heroin is the most *fat soluble* of the natural opiates. This means that a highly fat-soluble drug enters the bloodstream faster and moves to the brain faster, no matter how it is taken.

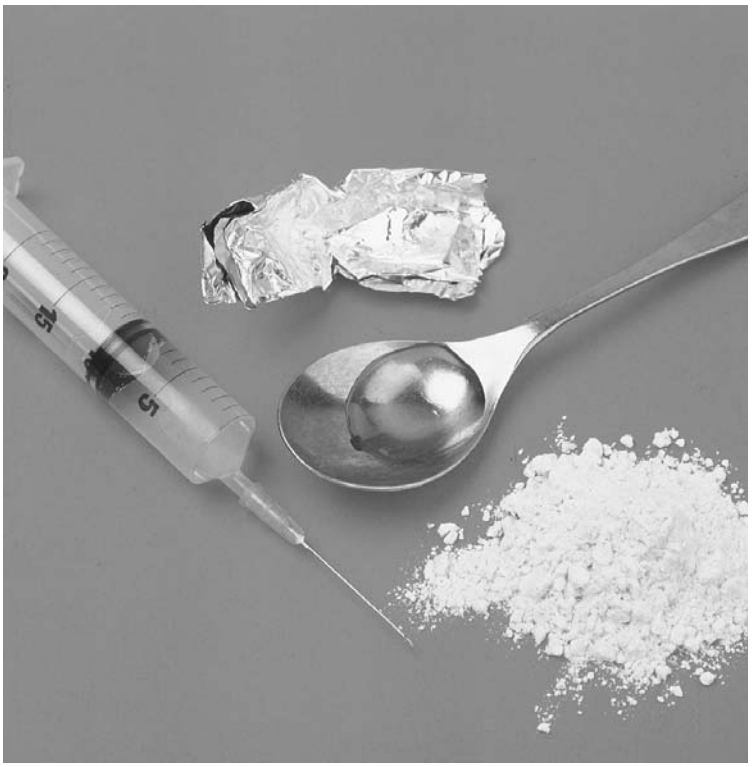
The traditional picture of a heroin user is well known from photographs and films. A user buys powdered heroin from a dealer (usually a few doses at a time), dissolves the heroin in water, and then "cooks" the dose over heat. The user then draws up a dose into a hypodermic needle and injects it into a vein. Users must be careful to inject a vein and not an artery, because heroin injected into an artery can cause severe damage to a limb or an internal organ. Over time, veins subjected to repeated injections grow hard or collapse, and the user must find new veins in other parts of the body. Hard-core heroin use leaves tell-tale needle tracks in the arms.

Injected heroin causes a brief, intense rush of pleasure, followed by a four- to six-hour period of weariness and well-being. Breathing slows, and the user experiences no pain. However, he or she may experience skin irritation that is relieved by scratching. Heroin activates the part of the brain that governs vomiting, so users often throw up right after injecting. They sometimes use the force of their nausea to judge the strength of the dose.

Some users inject heroin right under the skin—a process called "chipping." Users also inject it into muscle tissue as well. Both of these processes delay the onset of the high by several minutes.

The increased purity of street heroin has led to two new delivery systems: smoking and snorting. Many first-time users snort the drug, confident that they are avoiding AIDS and other infections caused by

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"



Many heroin users inject the drug after converting the powder to liquid form. Over time, veins subjected to repeated injections grow hard or collapse. Hard-core heroin use leaves tell-tale needle tracks in the arms and legs. *Garry Watson/Science Photo Library.*

needle sharing. Some users may be under the impression that snorting or smoking heroin reduces the chances of dependence. This is not the case. Any method of heroin intake can expose the user to a cycle of increased usage, leading eventually to addiction and (in many cases) the use of needles to get the best high for the price.

Are There Any Medical Reasons for Taking This Substance?

Heroin was once used as a painkiller, but today that work is done by other medications, from morphine to the synthetic OPIOIDS such as fentanyl. (An entry for fentanyl is available in this encyclopedia.) Some doctors have lobbied for use of heroin in terminally ill cancer patients, for whom addiction is not an issue. But as of mid-2005, the drug had not been approved for this use.

opioids: substances created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine

Heroin users who inject the drug run the risk of contracting hepatitis or HIV because they often share dirty needles. In an effort to combat the spread of these diseases, needle exchange programs were begun in cities such as Vancouver, British Columbia, Canada. *© Annie Griffiths Belt/Corbis.*

In 2005 the Canadian government joined several European nations (most notably the Netherlands) in a pilot program to give free heroin to heroin addicts. Public health officials in Canada expressed the hope that those receiving free heroin would be able to live crime-free lives; would no longer be forced to share dirty needles; and would be more open to beginning the process of DETOXIFICATION. The Canadian program works with the most dedicated addicts—people who have tried and failed at least twice to quit using the drug.

Those who support the plan say that, at the very least, giving addicts free heroin will reduce crime. They believe that such addicts will no longer need to steal or become prostitutes to earn enough for a FIX. Those who oppose the plan—including officials in the U.S. government—say that the program encourages drug abuse. A reporter in *The Economist* wrote: "The hope is that if hard-core addicts no

detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

fix: a slang term referring to a dose of a drug that the user highly craves or desires

longer have to commit crimes to fund their habits they are more likely to become productive citizens and leave drugs behind."

The "free heroin" plans in Canada and parts of Europe are not necessarily just for the addicts, but also for the non-abusing public at large. Canadian officials hope to reduce crime and the costs of fighting it, as well as the spread of infectious diseases like AIDS and hepatitis.

Usage Trends

According to the National Survey on Drug Use and Health (NSDUH), in 2003 an estimated 19.5 million Americans age twelve and up used illicit (illegal) drugs. Of these, an estimated 119,000 teenagers between twelve and eighteen had tried heroin at least once.

The Drug That Does Not Discriminate

The image of a heroin user is typically a poor, unemployed, uneducated person who lives in an inner city. It is true that some poor, uneducated people do abuse heroin. However, there is no such thing as a "typical" heroin user. In 2004 for example, Colin Farrell, one of the year's top Hollywood actors, admitted to the press that he had tried the drug. The list of actors, artists, musicians, students, business executives, and politicians, among others, who have had a heroin habit is long. As such, heroin is abused by people from all segments of the population—young and old; rich and poor; uneducated and educated; employed and unemployed; and people living in the city, suburbs, and rural areas.

From 1995 until 1999, Dr. Lance L. Gooberman ran an "ultra rapid detox" facility for heroin abusers in a New Jersey-area suburb. According to Carol Ann Campbell in the Newark, New Jersey *Star-Ledger,* an investigation of Dr. Gooberman's practice "has shone a light into the hidden world of suburban heroin use." The reporter added: "Gooberman's clients included business executives, college students and parents who opened their checkbooks to get themselves or their children off drugs." In another *Star-Ledger* piece, Gooberman himself said he received 2,000 calls each week for his services. "We get all kinds—jail to Yale," he said. "We've had rock stars, an oil company heir, a Kuwaiti prince."

Heroin is not just a drug for the poor. It has found its way into the wealthiest neighborhoods in America. It is safe to say that heroin does not play a major role in the "club drug" scene. Under the influence of heroin, users become quiet and withdrawn. They tend to sit or lie in one place, nodding. Their speech becomes slurred. This sort of behavior does not fit the "RAVE" or dance party environment.

rave: a wild overnight dance party that typically involves huge crowds of people, loud techno music, and illegal drug use

Kurt Cobain (1967–1994)

Kurt Cobain was the guitarist and lead singer of the Seattle-based band Nirvana. The band's "grunge" style music transformed rock music during the late 1980s and early 1990s. The group combined the sounds of punk and alternative rock with angry lyrics. The band's debut album, *Bleach* (1989), was popular with critics, but the release of the band's album *Nevermind* (1991) led Nirvana on a quick rise to fame.

The hit song "Smells Like Teen Spirit" remained at the top of pop charts for several weeks in 1991. Cobain and band members Krist Novoselic and Dave Grohl made millions of dollars from the sales of the album and became instant celebrities. In 1993 the band released the album *In Utero,* which also shot to the top of the charts. Songs like "All Apologies" and "Heart-Shaped Box" brought in more fans and more money.

As the front man for a band whose lyrics scorned popular success, Cobain was disturbed by the band's sudden fame. Cobain was also increasingly uncomfortable with the notoriety and pressures created by the band's popularity. He was particularly upset by media coverage of his controversial marriage to singer Courtney Love; the birth of their daughter, Frances Bean, in 1992; and the rumors of his and Love's drug use.

Cobain's journals, published in 2002, reveal that the singer battled depression for years prior to Nirvana's formation. He had also been in intense physical pain due to a chronic stomach condition that doctors had been unable to diagnose or treat for several years before his death. He began using heroin occasionally in 1990 in an attempt to self-medicate. In his journals, Cobain wrote about using heroin to treat his medical condition. He explained: "It was a stupid thing to do and I'll never do it again and I feel real sorry for anyone who thinks they can use heroin as a medicine because um, duh, it don't work."

Yet by 1993, after repeated attempts to stop using the drug, Cobain's heroin use

Can scientists identify a particular personality trait that may lead someone to experiment with heroin or abuse it? According to Nora Volkow, the director of the National Institute on Drug Abuse (NIDA), neurobiology, the workings of the brain, do play a part in determining who may develop a heroin habit. Volkow told *Psychology Today* that addiction "may be a malfunction of the normal human craving for stimulation. . . . If you connect to the world in a meaningful way, and have more chances to get excited about natural stimuli, you're less likely to need an artificial boost." However, people who tend to look at the world in a dark way may be at a greater risk for drug addiction. This includes people who are easily bored or who feel bad about

Kurt Cobain of Nirvana fought a heroin addiction.

had turned into an addiction. Friends and family members attempted to assist him with an intervention and rehabilitation. In 1994, after several days in a drug rehabilitation center in Marina del Ray, California, Cobain left the facility. He was missing for several days, but his body was found on April 8, 1994.

Cobain's death was caused by a gunshot wound to the head, allegedly self-inflicted on April 5, after he injected himself with a large dose of heroin. The cause of death, officially ruled a suicide, has been controversial ever since. Some claim that the amount of heroin in Cobain's bloodstream was enough to have knocked him out. This would rule out the possibility that he could have pulled the trigger of the weapon that caused his death.

Nirvana's music and Kurt Cobain's influence on the rock music scene continue to live on among fans.

themselves, people who are stressed by work or school, or people who feel unpopular and disliked.

Heroin abuse and addiction is not just an American problem, either. Sohail Abdul Nasir in the *Bulletin of the Atomic Scientists* estimates that 4.5 million Pakistanis are addicted to the drug. Arrests for possession or sale of heroin have occurred on every continent except Antarctica, and some countries have extremely harsh penalties for those caught with the drug. The problem is so serious in the United Kingdom, Germany, and the Netherlands that those nations have established a few, carefully controlled "free heroin" clinics for addicts in hopes of reducing crime and the spread of illness.

Smack

According to Sean Connolly in the book *Just the Facts: Heroin,* when heroin is injected directly into a vein with a hypodermic needle, it produces a high in seven to ten seconds. The nickname "smack" comes from this sudden rush of sensation.

The populations that show the least use of heroin are those where the poppies are actually grown. To many opium poppy farmers, growing the plants is just business—a way to provide for their families.

Effects on the Body

Whether injected, sniffed, or snorted, heroin speeds to the brain and spinal cord. Users feel an almost immediate rush, or "smack" of EUPHORIA, especially when the drug is injected. This is because heroin turns to morphine in the brain and floods the brain's receptors that search for ENDORPHINS and ENKEPHALINS. The user's pleasure centers literally all fire at once, and the feeling is one of complete release from pain, anxiety, and unhappiness, replaced by a warm sensation of pleasure. After the immediate rush, the user settles into a "high" in which the pleasurable sensations continue, along with drowsiness and a general unwillingness to move or disrupt the dreamlike state. Users' heads may bob up and down. They may develop itchy skin from a mild allergic reaction to the heroin. They may become nauseated and vomit.

Within four to six hours, the heroin-turned-to-morphine slowly clears the brain. During the high, the body reacts to the opiate surge by causing slowed breathing, cessation (stopping) of coughing, and pinpoint pupils. Since all opiates work on the part of the brain that controls breathing, an overdose of any of them can cause a user to stop breathing. If the user is alone at the time of an overdose, he or she will die of suffocation. Cessation of breathing is one of the leading causes of death in heroin overdose cases.

Addiction, Cravings, and Withdrawal

Can a person become dependent on heroin after a single dose? In truth, heroin is less addictive than nicotine or cocaine. (Entries on nicotine and cocaine are available in this encyclopedia.) Some people can use it occasionally without developing a habit. But the fact remains that the intense rush of pleasure associated with a heroin high is quite seductive. The same is true of the longer-lasting sense of well-being and freedom from anxiety that follows the rush. If a user makes a point of seeking the drug a second time, that could indicate the onset of habitual behavior.

Repeated use of heroin requires higher doses to achieve the high. This is known as "tolerance." Eventually, when dependence sets in,

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

enkephalins: pronounced en-KEFF-uh-linz; naturally occurring brain chemicals that produce drowsiness and dull pain

the user rarely achieves the same high that drew him or her to the drug the first time. Instead, the user seeks the drug to avoid WITHDRAWAL symptoms. Life becomes a constant struggle to find the money to pay for another fix, to find the dealer and buy the fix, and to find a way to achieve the high.

Some experts estimate that as many as 80 percent of heroin addicts never free themselves from opiates. Once the habitual use is established, it is extremely difficult to stop.

Heroin withdrawal begins with a three- to five-day period of intense anxiety, INSOMNIA, and a host of flu-like symptoms from uncontrolled coughing and yawning to stuffy nose, cramps, chills, sweating, diarrhea, and "goose bumps." Having goose bumps led to the origin of the phrase "quitting cold turkey." Additionally, muscles that have been relaxed by the drug tighten and twitch, causing severe pain and uncontrolled, reflexive motion ("kicking the habit"). A recovering addict named Joey Peets told *Scholastic Choices:* "It's the worst feeling. Most people say they'd rather be shot than be sick on drugs. . . . Being addicted and having to get off drugs is the worst experience. I wouldn't wish it on my worst enemy."

Yet, these desperate physical symptoms of withdrawal are not the worst aspect of opiate addiction. The addict experiences psychological CRAVINGS that are so intense that they become nearly impossible to fight. To quote Alfred Lubrano of the *Knight Ridder/Tribune News Service:* "The smell of burned matches, the sight of a $10 bill (the price for a 'dime bag' of drugs), even those 'Just Say No' anti-drug posters with a crossed-out needle, all act as potent cues that could bring even long-clean addicts to their knees, screaming for dope." Scientists have actually shown recovering addicts films of drug abuse while monitoring the drug users' brain activity. The results: Watching someone else use drugs, even on a film, spurs activity in the parts of the brain that govern motivation and craving.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

insomnia: difficulty falling asleep or an inability to sleep

cravings: overwhelming urges to do something, such as take an illegal drug

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

Reactions with Other Drugs or Substances

"Speedballs" are a deadly combination of cocaine and heroin. "Hot rocks"—a combination of heroin and crack cocaine—are often fatal to users as well. Many other drugs enhance the dangers of heroin, including tranquilizers and alcohol. Taking AMPHETAMINES with heroin can cause an irregular heartbeat. (An entry on amphetamines is also available in this encyclopedia.)

One of the worst aspects of heroin use is that dosages vary. Dealers cut the pure heroin with fillers ranging from powdered milk to the ingredients found in rat poison. The purity of the heroin arriving from

abroad can vary, too, depending on the health of the poppy crop and how the raw opium was processed. Those who use heroin never really know the strength of the product they are about to ingest. This can lead to overdose in even the most opiate-tolerant individuals.

Research has also shown that heroin addicts can have different reactions to the same dose of heroin if they take it in unfamiliar surroundings. A dose they can manage in a comfortable setting may become an overdose in a different setting. Scientists can offer no explanation for this particular reaction.

A person who has stopped taking heroin for some time, perhaps during detoxification or other therapy, can die of an overdose if he or she returns to the drug. Once the brain's chemical levels come closer to normal, doses that a user tolerated as an addict can become fatal. It was a return to heroin use after a period of detox that led to the death of the up-and-coming young American artist Jean-Michel Basquiat in 1988. Basquiat was just twenty-seven years old.

Treatment for Habitual Users

When heroin was first introduced to the medical community at the beginning of the twentieth century, it was used to help people overcome opium and morphine addiction. Heroin was considered a "step-down" drug. However, the cure was worse than the original addiction. It is no coincidence that heroin was the first opiate product declared illegal in the United States. Once a dependence is established, it is very difficult to end.

The "rapid detox" method used in New Jersey in the 1990s was declared illegal after nearly a dozen patients ended up in emergency rooms with life-threatening complications. Many of those who successfully completed the "rapid detox"—being put to sleep while an opiate ANTAGONIST, Narcan, was shot into the brain—returned to heroin use due to inadequate psychiatric follow-up. The dream of easy, pain-free detoxification from heroin has remained just that—a dream.

Typically, heroin addicts undergo several steps before seeking treatment. First, they come to recognize that the drug has altered their lives. This may happen when a marriage breaks up, when an addict resorts to crime to pay for drugs, when a friend dies of an overdose, or when an addict begins to have serious health problems related to drug use. At that point addicts might decide to continue to use heroin simply to avoid any withdrawal symptoms. In the next step, addicts may ask about the types of help they can expect and talk to health care workers about what might happen in an inpatient setting or a methadone clinic. (Methadone is a drug that is used to

antagonist: pronounced ann-TAG-uh-nist; a drug that opposes the action of another drug

Once a dependence on heroin is established, it is very difficult to end. Some users seek out treatment in rehabilitation facilities, also known as detox centers. For habitual users, it is important to discover the reason they turned to abusing drugs initially. *© Ed Kashi/Corbis.*

help addicts overcome heroin addiction. An entry on methadone is available in this encyclopedia.) In the third step, addicts decide to accept help.

Drug Treatment for Heroin Addiction

Heroin addiction is treated with several other drugs. One of them is the opiate methadone, which is most often taken in liquid or pill form. It is released slowly into the body and keeps withdrawal symptoms away but does not provide the high of heroin. Ideally, recovering heroin addicts begin with high doses of methadone and gradually taper down until they are drug-free. They combine the medication with talk therapy and lifestyle changes. The course of methadone treatment is rarely smooth, however. Sometimes addicts return to heroin. Sometimes they abuse the methadone instead.

As part of a youthful offender program, a former heroin addict takes a biology class as she works to earn her high school diploma. Such programs seek to build confidence and self-esteem. The teen says that without the program, she might have ended up back on the street or in jail.

AP/Wide World Photos.

Nevertheless, at the beginning of the twenty-first century, methadone was still the medication of choice for treating opiate addiction.

Another drug, naloxone (Narcan), works differently. This substance quickly frees the pleasure centers of the brain from the opiate. Emergency room doctors use Narcan to revive victims of heroin overdose who have stopped breathing. However, naloxone causes violent withdrawal symptoms if administered by injection. Scientists are experimenting with a continuous release form of naloxone that would be implanted under the skin and would block the effects of heroin even if the user took a dose. Doctors are also prescribing buprenorphine (byoo-preh-NORR-feen), another drug found to block the absorption of heroin in the brain. Buprenorphine (Temgesic, Subutex) lasts longer than methodone—seventy-two hours rather than twenty-four. This allows recovering addicts to make fewer visits to clinics. It is still in the experimental stages.

People can overcome heroin addiction. Self-help groups such as Narcotics Anonymous (NA) provide group therapy and the experiences of other recovering users to bolster the addict's courage. The group provides emotional support during the difficult times. Recovering heroin users must also be willing to undergo counseling to understand what underlying feelings led them to experiment with the drug—and how to cope with the cravings when they occur. It is sometimes necessary to begin a "whole new life," separating from the friends, settings, and personal habits that the user employed during addiction. It is also necessary to realize that cravings for the high will continue, sometimes for years, especially in times of stress or on occasions when something reminds the user of the drug experience.

Consequences

Heroin addicts are at far greater risk than the general public for contracting HIV/AIDS, a deadly illness. Heroin users also run a greater risk of contracting any one of several hepatitis viruses, all of which attack the liver. These infectious illnesses are spread through the use of shared needles. If a heroin addict manages to avoid AIDS and hepatitis, long-term use of the drug can lead to: 1) damaged veins ("tracks"); 2) bacterial infections that damage blood vessels and the heart; 3) kidney and liver disease; 4) pneumonia; or 5) tuberculosis. Because heroin causes slower breathing, lung and brain damage can occur from repeated use. Sometimes those who inject heroin suffer strokes when some undissolved particle lodges in a blood vessel.

There are many health risks associated with injecting the substances that are used to cut the purity of heroin. Along with stroke, users might have breathing problems if the drug has been cut with tranquilizers, or irregular heartbeat if the drug contains amphetamines. Long-term use of heroin leads to tooth decay and gum disease, since the drug reduces the production of saliva.

One of the most destructive consequences of heroin use is loss of lifestyle. The American and international press is filled with accounts of parents who have lost custody of children because they neglected their kids while searching for more drugs. Some heroin habits climb to as much as $100 a day. People go through their life savings, sell their belongings, and eventually turn to crime to support their habits. Theft, drug dealing, and prostitution go hand-in-hand with heroin addiction. Such crimes can lead to jail time, where authorities are unlikely to help the addict manage his or her withdrawal symptoms.

Detoxification and rehabilitation in a clinical setting can be costly too. Few heroin addicts beat their dependence on the drug

and still have a steady job or an intact marriage waiting for them. Recovering addicts often must deal with guilt over broken relationships, criminal records, and loss of peer respect.

The Law

Heroin is a Schedule I controlled substance in the United States. It is illegal to possess or sell even a small amount of it. Heroin is also illegal in every country in Europe, as well as in Mexico, Canada, and the countries of Central and South America. Even where it is grown, the drug is illegal and must be produced and refined without government knowledge.

A person convicted on U.S. federal charges of possessing a Schedule I substance faces prison terms and hefty fines. Those who manage to avoid prison on a first offense are subject to probation and random urine tests for drugs. Any detection of drugs during a test sends the user to jail. Other fines and sentences vary from state to state. For instance, in many places people can be arrested for possessing the pipes and needles used to ingest heroin—so-called "drug paraphernalia."

The penalties for second and third offenses are much greater and almost always involve as much as two years in prison. States with "three strikes" programs give life sentences to those convicted of a third instance of selling a controlled substance.

Heroin dependence carries with it many opportunities to run afoul of the law. Theft and prostitution both result in criminal records, possible jail time, and publicity. Many hard-core drug users turn to drug dealing to support their habits, thus increasing their chances of stiff sentences if they are arrested. People caught selling drugs within 1,000 feet of a school face the most serious sentences of all. Even first-time convictions carry minimum prison terms and double fines.

Some people and organizations have pressed to make some Schedule I drugs legal. However, no doctors, religious sects, or research scientists have asked that heroin be made available to anyone, for any reason. Opinion of the drug is universally low among those who understand its workings on the brain.

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See also: Cocaine; Codeine; Fentanyl; Hydromorphone; Methadone; Morphine; Opium; Oxycodone

Hydromorphone

Official Drug Name: Hydromorphone hydrochloride [4,5-epoxy-3-hydroxy-17-methylmorphinian-6-one, dihydrohydroxycodeinone; dihydromorphinone; dimorphone]; brand names include Dilaudid and Palladone
Also Known As: Big d, d's, delantz, delaud, delida, dillies, drug store heroin, dust, footballs, juice, little d, lords, smack
Drug Classifications: Schedule II, semi-synthetic opiate

What Kind of Drug Is It?

Hydromorphone is a prescription painkiller made by chemically altering morphine molecules. Morphine is an organic, or carbon-containing compound, extracted from opium, a strongly addictive drug that is made from the opium poppy. (Entries on morphine and opium are also included in this encyclopedia.) Available in pill and injectable form, hydromorphone is about five to eight times stronger than morphine and is sometimes used instead of morphine to regulate pain from injuries, surgery, cancer, and severe migraine headaches. Doctors generally do not prescribe hydromorphone products as a first course for pain relief. Its use is restricted to longer bouts of pain that do not respond to weaker ANALGESICS or over-the-counter (OTC) medicines.

Because hydromorphone is so addictive, doctors who prescribe it are careful to monitor their patients. Physicians also help their patients to gradually stop taking the drug when the medicine is no longer needed. For people who need help managing severe pain, hydromorphone carries few side effects beyond drowsiness and CONSTIPATION.

Abuse of hydromorphone presents a completely different situation. Peddled on the street as "drug store heroin," the medicine, when crushed and snorted or injected, behaves like morphine in the brain. Since hydromorphone is stronger than morphine, however, its use as a RECREATIONAL DRUG can be deadly, even on the first dose. Abuse leads to addiction, a physical and psychological craving for the drug.

According to the Monitoring the Future survey conducted in 2004, most types of illegal drug use have declined since the 1990s. The exception is abuse of prescription drugs, especially painkillers such as hydromorphone. Interestingly enough, abuse of prescription drugs is not limited to young adults but can affect all segments of the population—people of all ages, from teens to senior citizens. However, hydromorphone is not mentioned as frequently in the media as its related compound, oxycodone. (An entry on oxycodone is also

analgesics: pain relievers or the qualities of pain relief

constipation: an inability to have a bowel movement

recreational drug: a drug used solely to achieve a high, not to treat a medical condition

Purdue Pharma, maker of the painkiller Palladone, voluntarily recalled the new drug in July 2005 pending further research. The FDA asked for the withdrawal after receiving reports that Palladone's extended release mechanism could fail if the user took the drug with alcohol. This failure could result in dose-dumping, or the dangerous rapid release of the drug into the bloodstream. *AP/Wide World Photos.*

available in this encyclopedia.) Nevertheless, abuse of hydromorphone has killed or sickened many thousands of people, including those who obtain it illegally and legally.

Overview

Use of the opium poppy for medical purposes dates back more than 6,000 years. The first archeological record of poppy use can be found in the ancient cultures of the Fertile Crescent (now Iraq and Iran). The ancient Egyptians, Greeks, and Romans all sought opium products for relief of many ailments, from diarrhea to headaches. The Greeks and Romans also knew that opium could be used

as a poison. The Greek god of dreams, Morpheus, is depicted in artworks holding opium poppies in his hands.

Between 1000 and 300 BCE, users had learned that the best way to experience EUPHORIA from opium was to smoke it. By the Middle Ages (c. 500–c. 1500), opium use was widespread in Asia, the Middle East, and the Far East. The drug was mixed into wine or other stronger liquors and called *laudanum,* the Latin word for "to be praised."

Completely legal in the nineteenth century, opium was used and abused by poets such as Samuel Taylor Coleridge (1772–1834) and Elizabeth Barrett Browning (1806–1861), as well as wide segments of the general population. The drug was both cheaper and easier to get than alcohol. In fact, some doctors used it to treat alcoholism. In Europe during this era, opium-based medicines were liquids containing small doses of the drug. Taking such medicines orally further limited the drug's power. Thus, it was possible to use "TINCTURES" and "elixirs" containing opium for many years while maintaining a fairly ordinary lifestyle. However, it was also easy to take higher doses of the "tinctures" than recommended, leading to addiction and changes in behavior.

Morphine Is Introduced

Morphine, one of the active ingredients in the opium poppy, was first isolated in 1803 by German scientist Friedrich Sertürner (1783–1841). He named the substance after the Greek god Morpheus. By 1832 morphine salts could be obtained in most pharmacies without a doctor's order. The invention of the hypodermic needle in 1848 provided a whole new way to deliver morphine. The hypodermic needle is sharp and hollow and used for administering an injection into the skin. Surgeons used needles to deliver morphine to ease pain during the American Civil War (1861–1865), sending many soldiers home with healed wounds—and addiction problems. In the late 1800s, morphine addiction was called the "soldiers' disease."

After the Civil War, the medical profession set out to discover a way to keep morphine's pain-relieving qualities while removing its potential for addiction. In 1874 British chemist Alder Wright boiled morphine with acetic anhydride, a type of acid. The resulting drug, heroin, was at first thought to be that perfect painkiller. But heroin actually proved more habit-forming than morphine. (An entry for heroin is available in this encyclopedia.) Meanwhile, the growth of OPIUM DENS and the abuse of clearly addictive "tonics" raised new alarms about the hazards of morphine, opium, and heroin. The

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

tinctures: combinations of an active drug and a liquid alcohol

opium dens: darkly lit establishments, often in the Chinatown section of big cities, where people went to smoke opium; many dens had beds, boards, or sofas upon which people could recline while experiencing the effects of the drug

In an effort to keep powerful prescription drugs from falling into drug dealers' hands, the FDA announced plans to track such drugs by using radio frequency identification (RFID) tags. According to then-acting FDA commissioner Lester Crawford (pictured here), RFID technology allows drugs to be tracked from the manufacturer to the pharmacy to the consumer. *AP/Wide World Photos.*

Harrison Narcotics Act of 1914 removed all OPIATES from over-the-counter medicines and made them available only by a doctor's prescription. In 1924 heroin was made illegal.

Dilaudid Hits the Market

As of 2005, opiates are separated into two categories: completely illegal Schedule I substances, such as heroin, and regulated Schedule II substances, including morphine, codeine, and hydromorphone. Hydromorphone, a slight alteration of the morphine molecule, was first created and patented by Abbott Laboratories as the prescription painkiller Dilaudid. Stronger than morphine and available in pill, injection, and SUPPOSITORY form, Dilaudid quickly became popular as a pain reliever for patients in long-lasting, or chronic, pain. It could also be used safely by patients who had allergic reactions to morphine.

With the explosion of drug experimentation in the 1960s and 1970s, Dilaudid began to appear on the streets under a variety of names, including "dillies" and "drug store heroin." Other problems arose with the prescription painkiller. Some people did not use it correctly and became addicted to it. Others gave away their prescriptions, or sold them, or allowed family members to use the pills. Such tactics began occurring in the early twenty-first century with the popular painkillers OxyContin and Vicodin.

In 2005, Purdue Pharma introduced a new, extended-release hydromorphone capsule called Palladone. Stronger and more dangerous than OxyContin, Palladone was regulated by the most sophisticated tracking devices in an effort to keep it from falling into illegal use. Palladone is a Schedule II controlled substance.

In July 2005 Purdue Pharma voluntarily recalled Palladone after reports surfaced that the drug could prove fatal if combined with alcohol. Although the company warned people not to use the drug with alcohol, it withdrew Palladone pending further investigation. Alcohol can affect the extended-release mechanism in the drug, causing the contents of the pill to be released rapidly

opiates: drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

suppository: medicine that is delivered through the anus

rather than slowly. This dose dumping could prove fatal, hence the recall.

What Is It Made Of?

Hydromorphone is called a "semi-synthetic" drug, meaning that it is a chemically altered version of the naturally occurring opiate morphine. By weight it is five to eight times more powerful than morphine. In its most basic form it is a fine, white (or nearly white) powder. Because the substance is so closely related to morphine, urine tests for the presence of opiates will detect it.

In prescription pill form, Dilaudid appears as a pale yellow pill, and Palladone as a capsule containing pellets of various colors. Dilaudid is also available in suppositories and in a liquid formula, which is occasionally prescribed for persistent coughs. Dilaudid is dispensed in five strengths: 1 milligram, 2 milligrams, 3 milligrams, 4 milligrams, and 8 milligrams per dose. Palladone extended relief capsules come in 12 milligram, 16 milligram, 24 milligram, and 32 milligram doses.

How Is It Taken?

Dilaudid and Palladone are the prescription names for hydromorphone hydrochloride. Both are made as pills. Dilaudid is a powder-based pill that immediately dissolves in the stomach. Palladone is a time-release capsule. The capsule's shell dissolves in the stomach and the medicine moves on into the intestines in the form of small pellets coated with substances that dissolve over time. Some pellets have more coating than others, allowing for a continuous release of the medicine into the bloodstream.

In the past, doctors used injections of hydromorphone during and after surgery for pain relief. In more recent decades fentanyl has replaced hydromorphone for use in surgeries and also as a time-release painkiller. (An entry for fentanyl is available in this encyclopedia.)

Abusers of dilaudid have been known to crush the pills and snort or inject the powder. Injection can be dangerous because the powder-form pills contain fillers that do not always dissolve completely. The injection of these particles into the blood can damage veins.

Doctors who issue legal prescriptions for hydromorphone are ordered to stress the medication's potential for abuse. Patients needing the medicine are told to take it only as prescribed. They are not to

Fast Hydromorphone Facts

How much do you know about hydromorphone? Did you know that:

- In the twentieth century, chemists altered natural morphine to produce hydromorphone, a pain reliever that could be used by people with allergies to organic morphine. The new product was marketed under the brand name Dilaudid.
- In 2005 Purdue Pharma introduced Palladone, an extended-release form of hydromorphone. The oral pain reliever, in capsule form, provided continuous pain relief for twenty-four hours. Palladone was shipped from the manufacturer with the most advanced form of tracking technology, called Radio Frequency Identification (RFID). Each individual bottle of Palladone contained a tag that could be scanned electronically, tracking it as it moved from factory to pharmacy to consumer. By July 2005, Purdue Pharma voluntarily pulled the drug from the market pending further research.

double-up on doses. Also, they are told to flush any leftover medicine down the toilet so that it cannot be stolen. Patients who take the medication for more than a few weeks will need "taper down" doses to avoid WITHDRAWAL symptoms.

Are There Any Medical Reasons for Taking This Substance?

Many Americans will need treatment for pain at some point in their lives. Hydromorphone is considered a "last resort" medication for pain that has not responded to other drugs, for those who have already developed a TOLERANCE for opiates such as morphine, and for terminally ill cancer patients. Victims of serious traffic crashes or difficult and painful surgical procedures may be given prescriptions of hydromorphone to help them through the first weeks of recovery. Occasionally, the drug is prescribed for severe back pain, but only after the existence of the pain is proven with X rays or a Magnetic Resonance Imagery (MRI).

Hydromorphone was developed, in part, to provide opiate-grade pain relief to people who have allergies to pure opiates such as morphine and codeine. With other SYNTHETIC and semi-synthetic drugs available, use of hydromorphone has dropped in the hospital setting.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

synthetic: made in a laboratory

Usage Trends

According to the Monitoring the Future study, theft and abuse of prescription drugs is one area of growth in the illicit, or illegal, drug market. Abusers seeking a rush of euphoria will open OxyContin tablets, crush the contents, and swallow the ground-up particles. Dilaudid also has a history of being ground into a powder and snorted or injected. How the drug Palladone will enter this illegal arena remains to be seen. Palladone is stronger than OxyContin. Purdue Pharma has issued strict warnings that crushing the contents of a Palladone capsule and swallowing the powder could be

immediately fatal. For that reason, the drug may not appeal to thieves and dealers.

A Prescription for Abuse

Opiate abuse and addiction is a problem not just for the young. Men and women of all ages have been killed by, or treated for, prescription opiate abuse. Some people resort to "DOCTOR SHOPPING." They visit more than one doctor and describe the same symptoms in order to double up on prescriptions. Doctor shoppers are more likely to be adults than teenagers. And no matter how careful doctors and patients are with their pain management, some legal users will become addicted to the drug.

According to the U.S. Drug Enforcement Administration's Diversion Control Program, Dilaudid was one of the "leading opioid products for abuse and diversion during the 1970s and 1980s." The DEA has prosecuted people who forged prescriptions, criminally minded doctors and pharmacists, and thieves who rob hospitals, drugstores, and nursing homes in search of hydromorphone. On its Web site in October of 2004, the DEA noted: "Recently the diversion of Dilaudid has been reported by a number of DEA field offices including, New York, Chicago, St. Louis, San Antonio, Atlanta, Boston, Dallas, Detroit, Houston, Los Angeles, and Washington, DC." The problem also exists in suburban areas. In October of 2002, a *South Florida Sun-Sentinel* feature story confirmed "almost 400 deaths during the past two years in seven South Florida counties from prescription drug abuse, many ordered by doctors to control discomfort."

Middle-aged and upper- or middle-class people are far more likely to abuse prescription painkillers than to smoke marijuana or buy illegal street drugs. Even the doctors who prescribe such medications can fall victim to them. On November 30, 2003, the *South Florida Sun-Sentinel* reported on a doctor who died just two days prior to his forty-seventh birthday from an overdose of cocaine, oxycodone, and a muscle relaxant. He had been working as a pain specialist at a local clinic. Nurses have been prosecuted for stealing hydromorphone from their workplaces as well.

One of the stranger stories reported in the press is a 2002 case in Brighton Beach, New York. Two elderly women—one seventy-nine, the other seventy-seven—were arrested for selling their prescription hydromorphone tablets on the street. Their customers, who were willing to pay as much as $10 for a single pill, included local teenagers. Both women were charged with possessing and selling a controlled substance.

doctor shopping: a practice in which an individual continually switches physicians so that he or she can get enough of a prescription drug to feed an addiction; this makes it difficult for physicians to track whether the patient has already been prescribed the same drug by another physician

Overdose Tragedy

Catya Sassoon, the daughter of world-famous hairstylist Vidal Sassoon, died of an overdose of hydromorphone in March of 2002. She was thirty-three at the time.

Effects on the Body

In the book *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy,* Cynthia Kuhn and her coauthors wrote: "Opiates act on specific receptor molecules for the endorphin/enkephalin class of NEUROTRANSMITTERS in the brain." This means that hydromorphone enters the brain and floods nerves that are searching for ENDORPHINS and ENKEPHALINS. The human brain produces its own endorphins and enkephalins, allowing people to experience happiness and peaceful feelings. Hydromorphone and its related compounds stimulate all of the endorphin/enkephalin receptors at once. These receptors serve several functions. They control the "fight or flight" response, govern the amount of pain a person feels, and suppress coughing.

After taking a normal dose of hydromorphone, a patient in severe pain will receive relief within forty-five minutes. The drug's effects last several hours. Continuous release capsules last even longer. Taken in the proper amounts, as prescribed, hydromorphone promotes pain relief with side effects of drowsiness, dizziness, slower breathing, and constipation. Usually the patient will not feel the rush of euphoria that characterizes abuse. The drug simply relieves pain and allows a patient to move about or interact without constant distress.

Healthy people who abuse hydromorphone do so for the high. This is a brief but intense rush of enhanced happiness, feelings of well-being, loss of anxiety, and relaxation. In *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger noted: "Opiates affect almost every part of the body. . . . The muscles are relaxed: speech becomes slurred and slowed, the eyelids droop, and the head may begin to nod. It may become difficult to walk. The pupils of the eyes become pinpointed and do not react to light." The natural opiates such as morphine also cause nausea and vomiting. Hydromorphone can also cause nausea, but it does not affect the stomach as severely as morphine or heroin.

Hydromorphone Abuse

When the effects of a dose of recreational hydromorphone begin to wear off, the user will experience a "rebound" that includes heightened anxiety, muscle tension, and diarrhea. It becomes highly tempting to take another pill to relieve these uncomfortable symptoms. Over time—days or weeks—the body builds a tolerance to the

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

enkephalins: pronounced en-KEFF-uh-linz naturally occurring brain chemicals that produce drowsiness and dull pain

pleasurable effects of hydromorphone abuse, while the uncomfortable symptoms of withdrawal become worse.

A woman identified only as "Sadie" told *Cosmopolitan* magazine that she began using her father's Dilaudid while caring for him as he battled terminal cancer. After two months of moderate use, she suffered severe withdrawal symptoms. "It had a vise grip around me," she said of the drug. "I couldn't [quit]." The *Cosmopolitan* story also stated that women are more likely to receive prescription pain relievers than men, and that women also become addicted to them more easily than men. Culture may play a part in this: Men tend to view pain as something they can live through. Biology may play a role as well. Women are more likely to suffer from anxiety and depression—and to find relief in prescription medicines.

On Opiates/Off Opiates

Each pleasant effect of an opiate like hydromorphone has a rebound withdrawal effect that can be severe. Paul M. Gahlinger discusses these effects in his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse*. They include:

- Absence of pain *becomes* heightened sensation to pain.
- Euphoria *becomes* anxiety and depression.
- Constipation *becomes* diarrhea.
- Slowed breathing *becomes* coughing.
- Dry mouth *becomes* sweating, flu-like runny nose.
- Relaxed muscles *become* cramps, twitching, uncontrolled reflexes.

Suffocation and Death

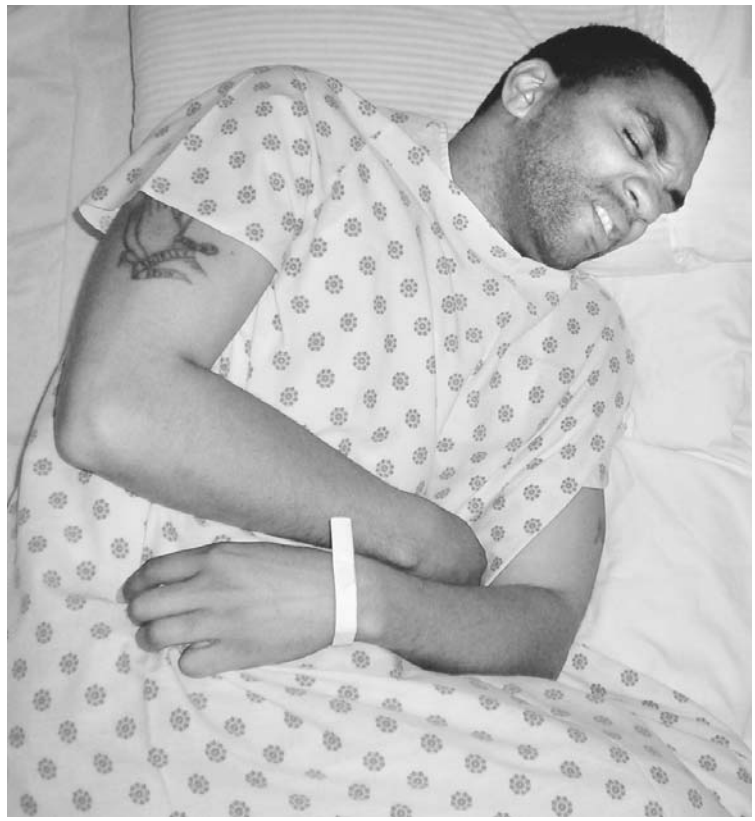
Hydromorphone shares the dangers of the other opiates in terms of breathing. The drug works on the part of the brain that automatically orders the body to breathe. Pain patients and drug abusers alike have been known to stop breathing after a dose of hydromorphone. If found in time, these users can be revived using the drug naloxone (Narcan), a substance that quickly rids the body of opiates. Many victims are not found in time, however, and they die of ASPHYXIATION.

In a hospital setting, first-time users of hydromorphone are monitored closely until their tolerance level is established so that they do not quit breathing and die. Doctors may also prescribe some sort of laxative, a drug that brings on a bowel movement, to help with the constipation brought on by the drug's action on the muscles in the intestines.

Reactions with Other Drugs or Substances

Since it is a powerful central nervous system depressant, hydromorphone will enhance the effects of other drugs and alcohol. Drinking alcohol while taking hydromorphone will increase the likelihood of breathing problems and loss of muscle control. The

asphyxiation: death or unconsciousness caused by one of three things: 1) a lack of adequate oxygen, 2) the inhalation of physically harmful substances, or 3) the obstruction of normal breathing



Addiction to narcotics is extremely difficult to overcome. Abusers of powerful opiates often need to be hospitalized in a rehabilitation clinic.
Photograph by Leitha Etheridge-Sims.

drug also should not be combined with ANTIHISTAMINES such as Benadryl; drugs for nervous disorders such as Nembutol, Restoril, Thorazine, Valium, or Xanax; or antidepressants such as Elavil and Tofranil. Persons taking other opiate painkillers such as Vicodin, Demerol, Percocet, or fentanyl should not use hydromorphone.

Because it reacts so strongly with other drugs—and because it is a powerful painkiller with potentially dangerous side effects—hydromorphone is not prescribed to be taken on an "as needed" basis. People receiving valid, legal prescriptions for hydromorphone need to take it on a daily schedule, sometimes for a prolonged period of time. Patients receiving hydromorphone need to tell their doctors about any other medications they are taking. The medicine must be kept out of reach of children. Palladone was not prescribed for anyone under eighteen.

antihistamines: drugs that block *histamine,* a chemical that causes nasal congestion related to allergies

After taking hydromorphone for a period of weeks, patients will need to gradually lower the dosage slowly to avoid withdrawal symptoms. This is done under a doctor's supervision.

Treatment for Habitual Users

Narcotics addiction is extremely difficult to overcome. Abusers of powerful opiates such as hydromorphone often need to be hospitalized in a rehabilitation clinic, sometimes for as long as thirty days. Attempting to quit the drug without medical assistance can lead to a host of withdrawal symptoms, including uncontrolled muscle spasms, cramps, diarrhea, sweating, clammy skin, anxiety and panic attacks, nausea, and a prolonged period of depression. Often the addict just caves in and goes looking for the drug again.

Under a doctor's care, the hydromorphone abuser might receive methadone, another opiate that controls withdrawal symptoms without producing a "high." (A separate entry on methadone is available in this encyclopedia.) Patients should also undergo counseling. Some are prescribed anxiety-relieving medications. Nonprofit organizations like Narcotics Anonymous (NA) provide support from other recovering addicts through a twelve-step program of regular meetings, a telephone hotline, and a "buddy system" that pairs newcomers with successfully drug-free members.

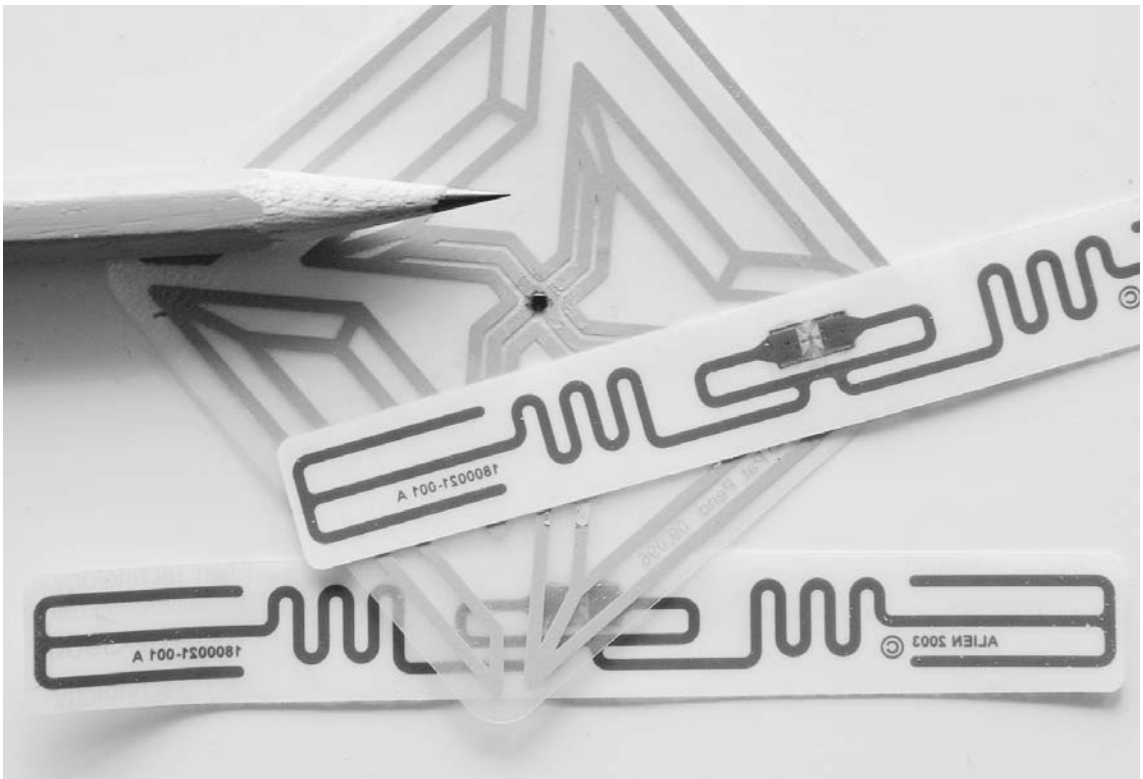
Many recovering addicts discover that the drug abuse has so altered their lifestyles that they literally need to "begin again" with a new life. Drug abusers trying to go straight are always counseled to end friendships that developed around the abusive lifestyle, to avoid the places they went to purchase or steal drugs, and to seek new social and professional contacts. This can prove particularly difficult for those in the health care industry—the doctors, nurses, and other medical support staff—who abuse painkillers.

Addiction to opiates does not end when the withdrawal symptoms ease. The brain rebounds from its altered chemistry by undergoing a lengthy period of adjustment. Recovering addicts may feel *bad*—depressed, anxious, joyless—for months or even years. It is this ongoing DYSPHORIA that sends some addicts back into drug abuse. Also, it is this syndrome that self-help groups such as Narcotics Anonymous try to combat.

Consequences

Studies have shown that prolonged use of opiates such as hydromorphone cause little damage to the human body *in and of*

dysphoria: pronounced diss-FOR-ee-yuh; an abnormal feeling of anxiety, discontent, or discomfort; the opposite of euphoria



In 2005 the FDA launched a pilot program using radio frequency identification (RFID) tags to track the movement of bottles of the most addictive prescription painkillers. *AP/Wide World Photos.*

themselves. Nevertheless, the drug can wreak havoc on a person's health. In pursuit of the next dose, the addict might resort to criminal behavior such as theft, robbery, or prostitution. Trading sexual favors for drugs can lead to numerous diseases, from syphilis to AIDS (acquired immunodeficiency syndrome). Shared needles also expose the user to AIDS and HEPATITIS. Since opiates produce nausea and vomiting, users tend to eat less, wasting away as the habit consumes their lives. While high on opiates, users may not be able to drive or operate machinery with the proper amount of control.

Hydromorphone depresses the region of the brain that controls breathing. Taken in large doses, or in strange settings, or in combination with other drugs, hydromorphone can make the user stop breathing. Drug abusers are sometimes found dead in bed or on the bathroom floor by those who love them most.

hepatitis: a group of viruses that infect the liver and cause damage to that organ

The Law

Hydromorphone is a Schedule II controlled substance, overseen by the DEA. It is illegal to possess the drug without a valid prescription from a licensed physician. Doctors face possible legal sanctions if they over-prescribe painkillers to their patients. Although doctors are allowed to assess each individual case, many tend to be very conservative when treating pain. The illegal abuse of hydromorphone has made it more difficult for truly needy patients to obtain it.

Once a patient has received a prescription, it is illegal to alter that prescription—for instance, to change a "30" to a "300" by adding a zero. In 2004, a thirty-seven-year-old woman was caught altering a Dilaudid prescription that she received from a doctor in Tampa, Florida. Her bail was set at $10,000.

"Doctor Shopping" and Pharmaceutical Theft

It is also illegal to "doctor shop." Patients who doctor shop typically move from physician to physician, reporting the same symptoms to each doctor. They receive the same prescriptions from each doctor. Of course, the doctors do not know that the patient has already seen someone else and received a prescription for the same complaint. Doctors, too, have been arrested for running "pill mills." This occurs when doctors prescribe painkillers to patients with vague symptoms, no X rays or other evidence of the reported pain, or feeble reasons for seeking more medicine, such as having lost the first prescription.

The DEA reported in 2004 that robberies of pharmacies, hospitals, and nursing homes were on the rise. In some cases, thieves have posed as safety inspectors or other hospital personnel in attempts to snatch pharmaceuticals. In 2005, strangers entered a hospital under false pretenses and the incident was investigated by the U.S. Department of Homeland Security as a possible terrorist attack. Needless to say, theft of prescription drugs carries very serious penalties, usually including jail time.

Radio Frequency Identification (RFID)

In 2005 the Food and Drug Administration (FDA) launched a pilot tracking program for the most addictive prescription painkillers, including Palladone. The new system, called Radio Frequency Identification (RFID), places a small tracking tag on each individual bottle of pills. The electronic tag can be scanned as the bottle of medicine moves from the factory where it is made, to the package it

is shipped in, to the pharmacy where it will be sold, and ultimately to the legal consumer. Acting FDA commissioner Lester Crawford told the *Chain Drug Review:* "These actions are designed with one goal in mind: to increase the safety of medications consumers receive by creating the capacity to track a drug from the manufacturer all the way to the pharmacy."

Penalties for illegal use and sale of hydromorphone vary from state to state and become more severe for each repeat offense. The burden of keeping illegal hydromorphone off the BLACK MARKET falls on the federal government, doctors, nurses, hospital staff, and ultimately patients who really need it.

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See also: Codeine; Fentanyl; Heroin; Meperidine; Methadone; Morphine; Opium; Oxycodone

Inhalants

Official Drug Name: Acetone (AH-sih-tone), benzene (BEN-zeen), butane (BYOO-tane), carbon tetrachloride (teh-truh-KLOR-ide), chlorofluorocarbons (KLOR-oh-FLOOR-oh-car-binz), chloroform (KLOR-uh-form), difluoroethane (DY-FLOOR-oh-ETH-ane), ether (EETH-uhr), fluorocarbons (FLOOR-oh-car-binz), hexane (HECK-sane), hydrocarbons, isopropane (ICE-oh-PROH-pane), methanol, methylene chloride (METH-uh-leen KLOR-ide), nitrites, nitrous oxide, propane, tetrachloroethylene (TEH-truh-KLOR-oh-ETH-uh-leen), toluene (TOL-yuh-ween), trichloroethane (TRY-KLOR-oh-ETH-ane), trichloroethylene (TRY-KLOR-oh-ETH-uh-leen), xylene (ZY-leen)
Also Known As: Air blast, bang, discorama, gas, glue, hippie crack, honey oil, huff, kick, Medusa, moon gas, Oz, poor man's pot, sniff, Texas shoeshine, toilet water, whiteout (for solvents); amys, locker room, pearls, poppers, rush, snappers, thrust (for nitrites); balloons, buzz bombs, laughing gas, shoot the breeze, whippets (for nitrous oxide)
Drug Classifications: Not scheduled; depressants, except for nitrites, which are stimulants

What Kind of Drug Is It?

Inhalants are legal household, industrial, medical, and office products that can be deadly when misused. They contain dangerous vapors—gas or fumes that can be irritating or physically harmful when inhaled. Such vapors produce PSYCHOACTIVE effects when breathed in through the mouth or nose.

There are three main characteristics of inhalants: 1) They are volatile. This means that they are unstable or easily converted to a vapor at room temperature. 2) They do not fall into the category of drugs that are usually inhaled, such as nicotine or cocaine. 3) They are deliberately inhaled by users in concentrated form so that the users can get high. Substances that fit into this category include gasoline, lighter fluid, glues, liquid cleaning agents, and spray paint, just to name a few. These products were never intended to be used as drugs.

Overview

More than 1,000 household and industrial products—including felt-tip markers, correction fluid, nail polish remover, shoe polish, cooking spray, and certain glues—are abused for the highs they produce. These items are referred to as inhalants because they produce an INTOXICATING effect when inhaled through the mouth or nose. Inhalants are generally inexpensive and easy to buy. When purchased for their intended uses, they are perfectly legal. When abused, they can be deadly.

Abused products contain chemicals that are volatile. Inhalant abusers deliberately breathe in these toxic fumes to experience a quick high. The vapors affect both the brain and the body of users who inhale them in concentrated amounts. Most products used as inhalants carry warning labels that direct consumers to use them in "well-ventilated areas." These messages are ignored by abusers, as are further warnings regarding the damage such chemicals can do to their bodies. A standard warning label reads: "Do not inhale because the fumes can be dangerous to your health."

The U.S. Drug Enforcement Administration (DEA) reported in its "Get It Straight" publication on inhalants that "in just ten years

psychoactive: mind-altering; a psychoactive substance alters the user's mental state or changes one's behavior

intoxicating: causing drunkenness, but not necessarily from alcohol; the loss of physical or mental control due to the use of any drug is termed "intoxication"

Physician James Young Simpson (1811–1870) and two of his colleagues experience the effects of chloroform, which knocks them out.

the number of youth who have used inhalants has nearly doubled." According to the 2003 National Survey on Drug Use and Health (NSDUH), the number of new inhalant users rose from about 625,000 in 1994 to 1 million in 2002. (New inhalant users are defined by the NSDUH as Americans who tried inhalants for the first time. Inhalants are defined as "liquids, sprays, and gases that people sniff or inhale to get high or to make them feel good.")

Sniffing through History

The intoxicating effects of certain chemical vapors are believed to have been discovered by the ancient Greeks about 3,500 years ago. ANESTHETIC gases were the first inhalants to become popular in more modern times. In the 1700s and the 1800s, chemists, doctors, and dentists in Europe and the United States experimented with three different anesthetic gases: nitrous oxide, ether, and chloroform. (A separate entry on nitrous oxide is available in this encyclopedia.)

anesthetic: a substance used to deaden pain

Early Leaders in Anesthesiology

Important figures in the history of anesthesia include:

Humphry Davy (1778–1829), a British chemist who experimented with nitrous oxide. Although he did not discover the gas, he did discover—and popularize—its mind-altering characteristics.

Horace Wells (1815–1848), an American dentist who recognized that nitrous oxide could be used as an anesthetic in surgical and dental procedures. However, he injured a woman while he was intoxicated by the surgical anesthetic chloroform. He went to prison, where he later killed himself.

James Young Simpson (1811–1870), a Scottish physician who pioneered the use of ether and chloroform as anesthetics for women during childbirth.

Such compounds revolutionized surgical and dental procedures by allowing patients to "sleep" through the painful experiences. But the highs they produced soon led to their use and abuse as intoxicating drugs. In fact, in the 1800s, some people had "ether parties." Partygoers would gather together to inhale the substance and experience its effects. The ether mainly caused giddiness or silliness. Some of these parties were held by medical students who took the opportunity to learn more about how the substance affected people.

The anesthetic gas craze of the 1800s gave way to glue sniffing in the mid-1900s. In *The Consumers Union Report on Licit and Illicit Drugs,* Edward M. Brecher and his coauthors stated that "before 1959, . . . glue sniffing was essentially unknown," and there were no "documented studies" of the practice. But in the summer of 1959, the *Denver Post* ran an article about a new trend occurring in Pueblo, Colorado. Youths were coating the palms of their hands with model airplane glue and then inhaling the fumes for their intoxicating effects. Brecher called the *Denver Post* article "the first full description [of glue sniffing] in the mass media." He also suggested that the warnings prompted by the article fueled "a further spread" of the inhalant problem. Instead of discouraging inhalant abuse, it seemed to increase interest among teens in this new method of getting high.

Inhaling gasoline gained popularity in the 1950s and 1960s. Gasoline remains a dangerous and widely abused inhalant around the world. At the end of the 1960s, the sniffing of other SOLVENTS such as paint thinner, varnish remover, and lighter fluid was not yet common. AEROSOL sprays, however, became the inhalant of choice in the early 1970s.

Accessibility Adds to Problem

Preteens and teens often experiment with inhalants before any other drug. The main reason for this is the accessibility of inhalable products. Products that can be used as inhalants are available in just about every kitchen, bathroom, and home office. In addition, these products are inexpensive, legal, and easy to hide. Inhalants are also popular because they produce a high that, in general, hits fast and wears off quickly.

solvents: substances, usually liquids, that dissolve another substance

aerosol: gas used to propel, or shoot out, liquid substances from a pressurized can

In "Sucking the Life from Your Child," an article that appeared on the *Preteenagers Today* Web site, Sue Marquette Poremba noted: "Oftentimes, kids don't consider it [inhalant use] drug use because they aren't using an illegal substance, like marijuana." The truth about inhalants is often shocking to individuals who have not been educated about their effects. Inhalants can kill, even if they are used just once. Inhalant use has been linked to the sudden deaths of otherwise healthy people. Even short-term use can cause damage to the brain, heart, liver, kidneys, and lungs. With prolonged use, inhalant abusers may also lose their sense of taste and develop problems with their hearing, vision, immune system, and muscle functions.

What Is It Made Of?

Inhalants come in many forms. According to the National Institute on Drug Abuse (NIDA), there are four general categories of inhalants: volatile solvents, aerosols, gases, and nitrites.

Volatile Solvents

Volatile solvents are liquids that vaporize at room temperature. Products containing volatile solvents are widely available for household and industrial use. Some examples include paint thinner and remover, nail polish remover, gasoline, model airplane glue, correction fluid, and felt-tip marker fluid.

Aerosols

Aerosols are sprays that contain propellants and solvents. Bathroom cleaners, air fresheners, and bug-killing sprays found in any supermarket are just a few examples of easily obtainable aerosol spray products. Consumers can tell an aerosol spray from a pump spray in two main ways. First, aerosol cans are usually made of metal, while pump sprays are made of plastic. Second, an aerosol spray delivers its product in a fine and continuous mist. The mist is released from the can as long as the user presses down on the spray button. Pump sprays deliver short, premeasured bursts of a liquid. The button must be "pumped," or pushed down, for each spray. Spray paints, hair sprays, computer air dusters, body deodorants, and nonstick cooking sprays were among the most commonly used aerosol inhalants in early 2005.

Gases

Gases fall into two categories: 1) medical anesthetics such as ether, chloroform, and nitrous oxide (N_2O), or "laughing gas"; and

Shaggy Takes a Hit

Abusing nitrous oxide from whipped cream cans made its way into at least one kid-friendly movie in the early twenty-first century. The Warner Bros. movie *Scooby-Doo 2: Monsters Unleashed* (2004) received a PG rating for language, rude humor, and its potential to scare younger kids. But no reference was made to "drug use" in the movie. Still, the picture contains a scene that clearly shows the character Shaggy inhaling nitrous oxide from a whipped cream can while Scooby watches. Shaggy then jokes about the experience and acts giddy and intoxicated.

Parents of children who have died from inhalant abuse were outraged by the scene in the film. Many contacted the National Inhalation Prevention Coalition (NIPC), which published the parents' complaints on the group's Web site. One parent who lost a child to inhalant abuse wrote that the scene was "so outrageous it leaves me speechless." Various groups urged Warner Bros. to drop the scene from the DVD and video versions of the movie.

2) fuel gases found in products such as butane lighters, propane tanks, and air conditioners.

Nitrous oxide, though usually associated with dentistry, was actually the most frequently abused gas in the early 2000s. It is purchased at dance clubs in balloons or ready-to-use canisters. Another well-known source of nitrous oxide is canned whipped cream. (Whipping cream cartridges, nicknamed "whippets," also contain nitrous oxide.) Whipped cream is usually dispensed from its container by turning the can upside down and depressing the lever. Nitrous oxide is the substance used to force the whipped cream out of the can. Abusers breathe in the nitrous oxide propellant without dispensing any cream.

Nitrites

A nitrite is a chemical compound that contains one nitrogen atom joined to two oxygen atoms. (A separate entry on nitrites, listed under the title "Amyl nitrite," is available in this encyclopedia.) Nitrites are STIMULANTS, not DEPRESSANTS, and work differently on the body systems than other inhalants. Most abusers are drawn to inhalants for their psychoactive effects. Users of nitrites are the exception. Inhaled nitrites dilate, or open up, blood vessels, increase the heart rate, and create a brief but powerful sense of warmth and sexual excitement in the user.

Amyl nitrite was especially popular among gay men in the 1970s. The drug was intended for use by heart patients suffering from severe chest pain. Amyl nitrite ampules (small, sealed vials) earned the nickname "poppers" among drug users on the dance party circuit because they had to be crushed, or "popped," to release their chemical vapors. In 1979, amyl nitrite became available by prescription only in the United States. Two closely related chemical compounds—butyl nitrite and isobutyl nitrite—quickly took its place. These substances also contain a single nitrogen atom attached to two oxygen atoms and are generally sold as room odorizers. They are packaged in small, dark-colored glass bottles and sniffed in concentrated form. Nitrite-based inhalants produce an almost instant high that lasts for two to five minutes.

stimulants: substances that increase the activity of a living organism or one of its parts

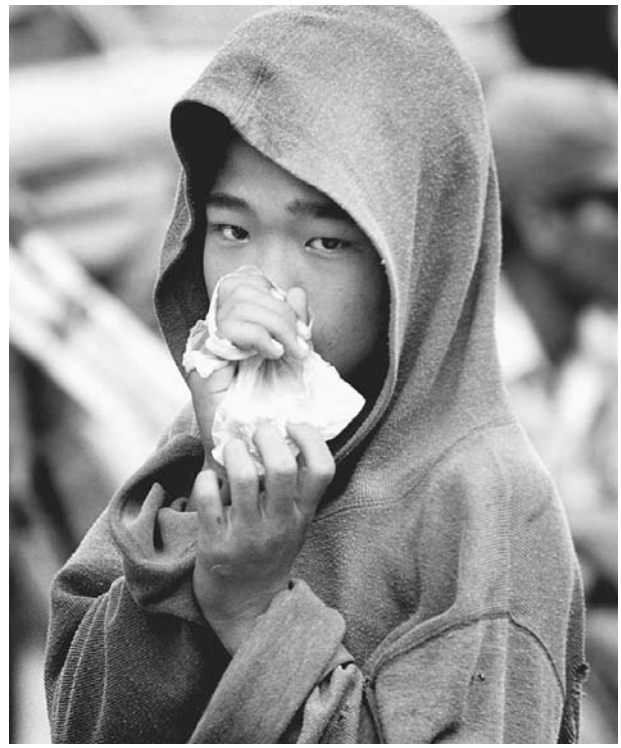
depressants: substances that slow down the activity of an organism or one of its parts

How Is It Taken?

The vapors from inhalants are deliberately breathed in through the nose or the mouth of the user. Sometimes the substances need to be heated in order to release the intoxicating vapors.

NIDA and the Partnership for a Drug-Free America describe several methods by which inhalants are consumed. They include:

- sniffing or snorting fumes from the container in which the inhalant is sold, such as glue from a can or a tube
- inhaling fumes sprayed directly from an aerosol can through the nose or mouth
- bagging, which involves holding an inhalant-filled plastic or paper bag over the mouth and nose, and then breathing in the fumes; sometimes, the entire bag is placed over the head, increasing the risk of suffocation
- huffing, which involves soaking a cloth with an inhalant, placing it over the nose and mouth, and then breathing in the vapors
- inhaling substances from balloons (often the method used when sniffing nitrous oxide) or empty soft drink cans (often the method used when sniffing paint or paint thinner)
- painting the fingernails with an inhalant such as correction fluid and then sniffing the substance from the nails
- spreading the inside of a painter's face mask with a toxic substance and inhaling. The substance is usually glue because it is thick enough to stick to the mask.



A young homeless boy in Cambodia is shown inhaling glue from a plastic bag. Some children sniff glue to ease the hunger and loneliness they feel. *AP/Wide World Photos.*

"Bagging" is the riskiest of all inhalant methods because the concentration, or strength, of the fumes inside the bag increases to extremely high levels. "Sniffed" fumes are diluted somewhat by the air, delivering lower amounts of dangerous vapors. "Huffed" fumes are more concentrated than sniffed fumes but less concentrated than bagged fumes.

Once inhaled, the chemicals from inhalants move into the lungs. From the lungs, they easily enter the bloodstream. Then, the blood quickly carries the TOXINS throughout the body.

toxins: poisonous substances

Adolescents at Risk

Data from the National Survey on Drug Use and Health (NSDUH) show that more youths age twelve and thirteen used inhalants than marijuana in 2003. The most commonly used inhalants in this age group include glue, shoe polish, toluene (solvent), gasoline, lighter fluid, and spray paint.

Are There Any Medical Reasons for Taking This Substance?

Fumes from household and industrial products are not meant to be inhaled. Inhalants with accepted medical uses include nitrous oxide and amyl nitrite. Nitrous oxide is an anesthetic used frequently by dentists to minimize pain during routine procedures. It is also used in operating rooms to prepare patients for surgery.

Amyl nitrite is a clear, yellowish liquid. It was originally manufactured and prescribed by physicians to relieve severe chest pain in people with heart disease. This pain, called angina pectoris, occurs when the blood supply to the heart is restricted. Amyl nitrite helps relax the muscles around the blood vessels of the heart, making it easier for blood to flow through them. Newer medicines for angina pectoris have become available, so amyl nitrate is rarely used to control chest pain anymore. The most important medical use for amyl nitrite since the late 1980s has been as an antidote for cyanide poisoning.

Usage Trends

Much inhalant use occurs during early adolescence, but experimentation may begin before that. In an article for the *Washington Post,* Shankar Vedantam reported that "children as young as fourth-graders [nine and ten year olds] are deliberately inhaling fumes of dangerous chemicals" to get a quick high. "Unlike the effect of alcohol," continued Vedantam, "these highs disappear within minutes, making it hard for parents to detect the abuse."

Rates of Use Rose in the Early Twenty-first Century

The "2003 National Survey on Drug Use and Health (NSDUH)," conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), revealed that 9.7 percent of Americans age twelve and over had used inhalants at some time in their lives. That is almost 23 million people. Approximately 718,000 of these people were between the ages of twelve and thirteen, and 2.6 million were seventeen or younger. From the mid-1990s to the early 2000s, the number of young females abusing inhalants increased. Long-term abusers, however, are usually male.

In 2004, the annual Monitoring the Future (MTF) study, conducted by the University of Michigan and funded by the National Institute on Drug Abuse, found that 17.3 percent of eighth graders had abused inhalants at least once. The rate in 2003 was lower, at roughly 15.8 percent. Results of the 2004 MTF study also revealed that eighth graders reported higher rates of current abuse than tenth and twelfth graders.

A Global Problem

Solvent abuse has been a worldwide problem for decades. The rates of young abusers are particularly high in poor nations with large populations of homeless children. Glue sniffing is an enormous public health issue in the southeast Asian nations of Cambodia and Singapore; the eastern African nations of Kenya, Tanzania, and Uganda; and the city of Bombay in eastern India. Street children with no money, food, or shelter sniff glue to ease the feelings of hunger—and sometimes the cold—they experience every day and night. In Singapore alone, the number of reported inhalant abuse cases rose from 24 in 1980 to 1,112 in 1987 before beginning a steep decline. And those are just the cases that were reported to the Central Narcotics Bureau of Singapore. Glue sniffing is widespread in parts of Mexico, Central America, and South America as well. It is not uncommon to see children high on inhalants lying in the streets. Many of them took up the habit when they were under the age of ten.

Inhalant use is also high in other regions. Sniffing gasoline is a serious problem among young Aborigines in Australia's rural desert communities and among the Native American population in Canada. The 1999 "European School Survey Project on Alcohol and Other Drugs" cited rates of lifetime inhalant use reported by graduating high school students throughout Europe. According to the survey, about one in every seven graduates in the United Kingdom reported using inhalants at some point in time. Rates in Ireland were slightly higher, with one in every five graduates reporting inhalant use.

Older Abusers

Inhalant use tends to be highest among adolescents. Some young people who abuse inhalants, especially when they do it repeatedly over a span of several days, find they have a strong need to keep using them. Early abusers may move from experimentation into regular, long-term use. Some continue to abuse the substances into their fifties and sixties. These users have become DEPENDENT on the

dependent: when a user has a physical or psychological need to take a certain substance in order to function

A homeless boy in Bombay, India, pours gasoline onto a cloth so that he can deliberately inhale the fumes. Inhalant abuse is common among street children who use substances such as gas, paint thinner, and glue.

chemical vapors and need treatment to kick their habit. Teens who continue abusing inhalants at later ages develop more severe social and psychological problems than do those who discontinue use after adolescence.

Effects on the Body

In *The Consumers Union Report on Licit and Illicit Drugs,* Brecher pointed out that "drugs of many kinds reach the brain more rapidly and efficiently when they are sniffed rather than swallowed." Inhalants deliver their mind-altering effects very quickly, satisfying the desires of users looking for a near-instant high. The effects occur within seconds.

Similar to Alcohol Intoxication

Most toxic vapors (except nitrites) act as depressants on the people who inhale them. The action of these vapors is similar to that of alcohol, sedatives, and anesthetics. (Sedatives are drugs used to treat anxiety and calm people down.) Users may actually feel slightly stimulated at first. They report feeling happy, giddy, and excited. This effect often occurs with the first alcoholic beverage that a person consumes. In fact, the effects of inhalants closely resemble drunkenness. But, like alcohol, the depressant action of inhalants kicks in soon after the initial stimulation. Users then begin to feel more relaxed and less inhibited.

Continued inhalation makes the user feel light-headed and drowsy. Higher doses may bring on feelings of agitation and anger, impaired judgment, slurred speech, muscle weakness, slowing of the reflexes, and a lack of coordination. Dizziness, tiredness, headache, nausea, and vomiting may also occur.

Inhaling Correction Fluid

Correction fluid is being used for more than just fixing typewritten and handwritten mistakes. The product—which contains titanium dioxide, ethanol, methanol, trichloroethane, and mineral spirits—is widely abused as an inhalant. Correction fluid goes by several names, depending on the brand. The original formula is sold under the name Liquid Paper. Other formulas go by variations on the term "white-out," spelling it *Whiteout* or *Wite Out*.

Whatever the name, every bottle carries the same warning: "Do not swallow or inhale. Intentional misuse by deliberately concentrating and inhaling contents can be harmful or fatal. Extremely flammable. Keep out of reach of children."

The Effects Intensify

Heavy inhalant use often causes people to feel completely out of control. Among the most frightening symptoms of heavy use are HALLUCINATIONS and DELUSIONS. The authors of the NIDA Research Report titled "Inhalant Abuse" state: "If sufficient amounts are inhaled, nearly all solvents and gases produce anesthesia, a loss of sensation, and even unconsciousness."

With time, regular abusers experience personality and behavioral changes. They may show signs of memory loss and an inability to reason. Severe mood swings, violent behavior, depression, hyperactivity, physical and mental dependence, and tolerance are often seen among long-time abusers as well. Tolerance is a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced.

The irritating effects of inhaled chemicals can cause abusers to sneeze repeatedly, cough heavily, and even drool. Other observable signs of inhalant use include pale skin, breath that smells like chemicals, weight loss, nosebleeds, bloodshot eyes, tremors, and even seizures. Inhalants are dangerous for pregnant women and their

hallucinations: visions or other perceptions of things that are not really present

delusions: false, unshakable beliefs indicating severe mental difficulties; "delusional" refers to the inability to distinguish between what is real and what seems to be real

developing babies. Studies of animals indicate that inhalant use by mothers leads to low birth weights, skeletal abnormalities, and developmental delays in exposed offspring.

Organ and Nerve Damage

Depending on the chemicals involved, inhalants damage the heart, liver, kidneys, bone marrow, and lungs. They may also reduce the blood's ability to carry oxygen throughout the body.

Shrinking the Brain: The use of inhalants can damage the brain and the network of nerves that connects the brain and spinal cord to other organs. As described in NIDA's article "Mind over Matter: Inhalants," the vapors from inhalants "don't go away when you exhale." Instead, they stay in your brain and nervous system "for a long time."

The effects of inhalants on the brain can be devastating. In 2002, NIDA conducted a study using brain imaging techniques and other tests to compare the effects of inhalants and cocaine on the brain. Robert Mathias explained in *NIDA Notes* that long-term inhalers of volatile solvents showed more extensive brain abnormalities than cocaine abusers. All of the participants in the NIDA study had abused either cocaine or inhalants regularly for at least ten years. TOLUENE was the most-abused product among the members of the inhalant-abusing group. Mathias noted that the inhalant abusers "did significantly worse than cocaine abusers on tests of working memory and the ability to focus attention, plan, and solve problems." They also had difficulty controlling their behaviors.

Inhalants are attracted to fatty tissue like a magnet is attracted to steel. Researchers suggest that this attraction is what causes nerve and brain damage in inhalant abusers. Nerve cell fibers in the brain and body are surrounded by white fatty wrappers called myelin (MY-uh-linn) sheaths. Since myelin sheaths are made of fat, inhalants are quickly drawn to them. The chemical vapors in inhalants can damage the myelin, slowing the ordinarily rapid flow of messages from one nerve to another. Mathias noted that these effects dull the part of the brain involved in intellectual activities such as language comprehension. The authors of "Mind over Matter" explained: "Someone who repeatedly uses inhalants may lose the ability to learn new things, may not recognize familiar things, or may have a hard time keeping track of simple conversations."

toluene: pronounced TOL-yuh-ween; a household and industrial solvent common in many inhaled substances, including model airplane glue, spray paint, correction fluid, paint thinners, and paint removers

The toxic chemicals in inhalants are stored in fatty tissue in the body for weeks. Thus, when long-term abusers attempt to quit, they may develop withdrawal symptoms several hours to a few days after

Two public service announcements from the National Institute on Drug Abuse warn that office supplies, such as markers and correction fluid, can have deadly consequences when inhaled. *National Institute on Drug Abuse.*

stopping the abuse. Withdrawal symptoms are the physiological effects one experiences as the body adjusts to not having the drug anymore. Common withdrawal symptoms for inhalants include hand tremors, excessive sweating, constant headache, rapid pulse, sleeping difficulties, nausea, vomiting, anxiety, and possibly hallucinations and seizures.

Toluene: An Example of a Brain-Damaging Solvent: Damage to nerve fibers in the brain is particularly associated with toluene abuse. Toluene is a liquid HYDROCARBON that is used as a solvent and a gasoline additive. Its chemical formula is C_7H_8. Toluene is clear, strong-smelling, and highly flammable. According to Francha Roffe Menhard in *The Facts about Inhalants,* "shortly after inhalation, concentrations of toluene may be ten times greater in the brain than in the blood."

hydrocarbon: a compound containing only two elements: carbon and hydrogen; hydrocarbons are found in petroleum and natural gas

Users inhale toluene because it seems to activate a NEUROTRANSMITTER called dopamine (pronounced DOPE-uh-meen), which controls movement, emotion, motivation, and pleasure. The authors of NIDA's "Inhalant Abuse" report note that "the dopamine system has been shown to play a role in the rewarding effects of many drugs of abuse." Because it activates the "feel-good" centers of the brain, this dangerous solvent can cause dependence in users.

Volatile solvents such as toluene dissolve fats. That is what makes them so useful as degreasers and industrial-strength cleaners. When breathed in through the mouth or nose, however, toluene goes straight to the brain, where it begins its "dissolving" action. Indeed, brain scans of long-term heavy toluene abusers show visible shrinkage of brain tissue. Toluene tends to affect areas of the brain that control physical movement. Abusers of this type of inhalant often have trouble coordinating their movements. The way they walk may seem stiff or spastic. Toluene can also produce giddiness, headaches, and even DELIRIUM in users.

Sudden Sniffing Death (SSD)

In the January 24, 2005, issue of the *Washington Post,* Shankar Vedantam pointed out that it is hard to estimate the actual number of fatalities caused by inhalants because so "many deaths linked to abuse go unreported or are listed as accidents." The National Inhalation Prevention Coalition (NIPC), a nonprofit organization based in Austin, Texas, issued guidelines to assist medical examiners and coroners in recognizing and reporting inhalant deaths. The most common cause of inhalant abuse death is SUDDEN SNIFFING DEATH (SSD) SYNDROME. SSD occurs when the heart loses its regular rhythm and begins to beat in a fast and irregular manner. The NIPC guidelines describe a "typical scenario" of SSD: The victim experiences a sudden threat while under the influence of an inhalant. He or she may fear discovery by a teacher, a parent, or a police officer or be frightened by an extremely realistic hallucination. Then, "the individual begins to flee and suddenly collapses and dies at the scene."

When an otherwise healthy individual, especially a young person, dies for no apparent reason, inhalant abuse is considered as a possible cause. According to the NIPC guidelines, POSTMORTEM EXAMINATIONS of an inhalant overdose victim may reveal:

- paint stains on the face, hands, or clothing
- correction fluid stains on the fingernails
- skin eruptions known as "huffer's rash" on the face and mouth
- chemical burns on the face or hands
- burns on the mucus membranes of the mouth and airway

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

delirium: a mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating

sudden sniffing death (SSD) syndrome: death that occurs very quickly after inhaled fumes take the place of oxygen in the lungs; SSD is most often caused by butane, propane, and aerosol abuse

postmortem examinations: examining the body after death; also called an autopsy

- eye irritation
- cyanosis—bluish or purplish skin caused by a lack of oxygen in the blood
- the presence of vomit in the mouth and lungs

Sometimes, clues to the inhaler's death can be found near the body. The presence of the following items all point to the possibility of an inhalant-related death: 1) plastic bags; 2) balloons; 3) chemical-soaked rags; 4) open or crushed felt-tip pens; 5) empty glue tubes or aerosol cans; or 6) open bottles of nail polish, nail polish remover, or correction fluid.

Nitrites and AIDS

Nitrites carry special risks, even with occasional use. Nitrites significantly decrease the INHIBITIONS of people who use them, making them more likely to engage in risky activities, such as having unprotected sex. In addition, drug researchers suspect that nitrite abuse reduces the efficiency of the immune system. This may hinder the body's efforts to fight infections and resist the growth of tumors. According to NIDA, users of nitrites put themselves at a high risk for contracting HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome).

Chemicals in Everyday Items

Many ordinary household items contain toxic chemicals. Here is a list of the chemicals found in some of the products used as inhalants.

- Degreasers contain tetrachloroethylene, trichloroethanes, trichloroethylene, and methylene chloride.
- Paints and glues contain hexane, toluene, trichloroethylene, and trichloroethanes.
- Lighter fluid, hair spray, and spray paints contain butane and propane.
- Gasoline contains toluene and benzene.
- Correction fluids, paint remover, and paint thinner contain toluene, methylene chloride, and methanol.
- Nail polish removers contain acetone or toluene.
- Refrigerants may contain carbon tetrachloride or chlorofluorocarbons.
- Sprayable computer air dusters contain difluoroethane.

The Death Toll

Inhalant abusers can die, even the first time they sniff, huff, or bag. Death can be caused by the physical effects of the chemicals or by the dangerous behavior related to the user's impaired state of mind. The NOXIOUS vapors in inhalants take the place of oxygen in the lungs. Other inhalant-related causes of death include: 1) ASPHYXIATION; 2) suffocation—an inability to breathe due to a blockage of air to the lungs; 3) choking on vomit; and 4) accidents—such as car crashes, drownings, falls, and burns—caused by the mental and physical effects of inhalants.

As of July of 2005, the NIPC reported approximately 100 to 150 inhalant deaths per year based on news reports and contacts with victims' families. However, according to the *NIPC* Web site, the actual

inhibitions: inner thoughts that keep people from engaging in certain activities

noxious: physically harmful

asphyxiation: death or unconsciousness caused by one of three things: 1) a lack of adequate oxygen, 2) the inhalation of physically harmful substances, or 3) the obstruction of normal breathing

Ignorance Is Not Bliss

A common problem among inhalant abusers is their lack of awareness about the dangers and effects of their habit. Convincing users of the risks of sniffing and huffing can be quite difficult. Many see no connection between their addiction to inhalants and any social, behavioral, or academic problems they might have. In addition, many parents are not aware of the signs of inhalant abuse.

"To reverse this alarming trend," stated NIDA director Dr. Nora D. Volkow, "NIDA will be working with CADCA [Community Anti-Drug Coalitions of America] and other partners to educate parents, children and others" about the risks of inhalants. "We'll also use the Internet to inform the public about inhalant abuse." Volkow encourages readers to log onto NIDA's Web site for the latest information on inhalants at www.inhalants.drugabuse.gov.

number is probably much higher. "Inhalant abuse related fatalities are underreported," state NIPC authors, "because they may not be recognized . . . or because of a perceived stigma [shame or disgrace]." Although inhalant abusers come from a variety of social backgrounds, inhalant use is often associated with poverty, low academic achievement, and unemployment.

Reactions with Other Drugs or Substances

When users combine inhalants with other drugs, the risks to their health are increased. For instance, alcohol slows the breakdown of toluene in the blood, thus raising the concentration of the solvent in the user's body. Cocaine can boost the chance of fatal irregular heart rhythms. Huffing correction fluid while taking Ritalin can kill. The stimulating effects of Ritalin dramatically increase the risk of SSD in users who combine these substances. Nitrites used in combination with the sexual-performance-boosting drug Viagra can also be deadly. Plus, because of the flammability of most inhalable substances, fires may result when they are used near an open flame or a lit cigarette.

Treatment for Habitual Users

In 2004, the Partnership for a Drug-Free America (PDFA) conducted a study of parents' attitudes toward inhalant abuse. According to the results, parents are indeed aware that inhalants are more available to their children than are other drugs. However, parents are actually less likely to discuss inhalants with their children than they are to discuss cigarettes, marijuana, alcohol, or other drugs. PDFA researchers noted that adults "mistakenly . . . believe their children see as much risk in inhalant abuse as they do. Believing their children know the risks of inhalants removes the perceived need to educate them." In addition, the study found that "only four percent of parents of sixth to eighth graders believe their child has tried inhalants." In reality, young people are five times more likely to have tried inhalants than their parents are willing to believe.

Jeanne Phillips, known as syndicated advice columnist Dear Abby (center), talks with high school students as she helps kick off National Inhalants and Poison Awareness Week. *AP/Wide World Photos.*

Getting the Word Out about Inhalants

Compounding the problem, according to the MTF survey, is the number of young teens who fail to see the risk of using inhalants. The 2004 MTF results indicate that with each year since 2001, fewer and fewer teens have viewed inhalants as potentially deadly substances. As of 2005, the NIPC, with the support of the Mental Health Services Administration Center for Substance Abuse Treatment, was trying to change this trend by educating the public about the dangers of inhalants. Each year during the third week in March, the coalition sponsors National Inhalants and Poison Awareness Week (NIPAW).

Jail Time vs. Rehab

In the 1960s, inhalant-abusing youths were arrested rather than treated for their dependency. Relapse and treatment failure rates remain high among inhalant abusers. Some professionals believe that programs specific to inhalant abuse, perhaps led by recovering abusers, are critical to improving treatment success. But programs like this are scarce.

Even in 2005, there were few treatment centers for inhalant abusers in the United States. When asked for recommendations, Harvey Weiss, the executive director of the NIPC, could report on only four centers in the entire country specializing in rehabilitation

for inhalers. The facilities he mentioned were Fairbanks Hospital in Indianapolis, Indiana; Pathway Family Center, also in Indianapolis; Four Winds Hospitals in Ketonah, New York; and the Tundra Swan McCann Treatment Center in Bethel, Arkansas.

According to SAMHSA, nearly 200,000 Americans are in need of treatment for inhalant dependency or abuse. The majority of inhalant users seeking treatment are white males under twenty. More than half of the individuals admitted to treatment centers began using inhalants before the age of fourteen.

Brighter Future

Long-term treatment, as long as two years, has yielded the best results for inhalant abusers. This treatment includes identifying the underlying causes of drug use among addicts, teaching them better coping skills, and helping them to sever ties with their drug-abusing peers.

Many questions have been raised about the lasting effects of inhalant damage to the brain and other organs. New research shows reasons for optimism about recovery. In the *NIDA Notes* report, Robert Mathias quoted Dr. Neil Rosenberg of the University of Colorado Health Sciences Center in Denver as saying, "Every day we learn more about the ability of the central nervous system to regenerate. . . . If you can stop the inhalant abuse, there's a good chance you can get significant recovery of function in chronic abusers." According to Dr. Rosenberg, the best method of treatment for inhalant abusers combines neurological rehabilitation with drug abuse treatment.

Consequences

SAMHSA researchers tracked the drug use patterns of Americans age eighteen through forty-nine in 2002 and 2003. They found that more than a third of the individuals who had started using inhalants at age thirteen or younger were hooked on alcohol or some other drug by the time they reached adulthood.

Inhalants affect the judgment of people who use them, so abusers may make poor choices and engage in high-risk behaviors. The side effects of inhalants increase the risks involved in activities such as driving a vehicle or operating machinery. Fire-related injuries may occur among users because inhalants are combustible, meaning they are capable of burning. In addition, inhalant abusers are likely to have trouble learning new information at school or holding onto a job. Their relationships with family and friends may also suffer because of the mood swings associated with inhalant use.

A man visits a makeshift memorial to five girls who died in a car crash in Pennsylvania. Four of the girls had traces of an inhalant in their bloodstreams. *AP/Wide World Photos.*

Inhalant Use and Social Problems

Researchers are studying possible links between inhalant abuse and social problems such as violent behavior and run-ins with the authorities. The authors of NIDA's "Inhalant Abuse" report state that "adverse socioeconomic conditions, a history of childhood abuse, poor grades, and dropping out of school all are associated with inhalant abuse."

Data from the 2003 NSDUH report showed that twelve- and thirteen-year-old inhalant users "were more than twice as likely to have been in a serious fight at school" in the last year than youths their age who did not use inhalants. They were also "six times as likely to have stolen or tried to steal anything worth more than $50." Furthermore, the tendency to abuse illegal drugs was much higher among twelve- and thirteen-year-old inhalant users than it was for nonusers in the same age group.

The Law

By 1968, according to Brecher in *The Consumers Union Report on Licit and Illicit Drugs,* thirteen states had issued laws prohibiting glue sniffing. The city of Anaheim, California, was one of the first

places to pass such a law. In 1962, it became illegal in Anaheim to "inhale, breathe, or drink any compound, liquid, chemical, or any substance known as glue . . . with the intention of becoming intoxicated." In the mid-1960s, the Federal Bureau of Investigation (FBI) proposed that the sale of certain glues to people under age twenty-one be prohibited.

The more than 1,000 household and industrial substances that can be used as inhalants are legal products. They are not regulated under the U.S. Controlled Substances Act (CSA) of 1970. At the start of the twenty-first century, thirty-eight states had enacted laws to address the issues of inhalant use among minors. In various ways, the laws attempt to prevent the sale, use, and distribution of abusable inhalants to consumers under the age of eighteen. In roughly half of the United States, it is illegal to inhale certain compounds for intoxication. Consequences vary from state to state but usually involve fines of several hundred dollars and up to six months in jail.

As of 2005, two inhalant bills were awaiting approval by the Tennessee and Wisconsin legislatures. Ricky and Johnson's Law, named for two Tennessee youths who died from huffing, would provide resources for inhalant education, prevention, and treatment. Aaron's Law, named for a Wisconsin teen, would make it illegal to sell abusable products to youths under eighteen.

The United Kingdom also controls the access of inhalants to its minors. The Intoxicating Substances Act of 1985 made it an offense to supply teens with inhalable products that will be abused. The Cigarette Lighter Refill Regulations of 1999 govern the sale of purified liquefied petroleum gas, mainly butane. This is the substance most often involved in inhalant fatalities in the United Kingdom. The 1999 law made it illegal to sell this type of cigarette lighter refill to anyone under the age of eighteen.

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See also: Amyl Nitrite; Nitrous Oxide

Ketamine

Official Drug Name: Ketamine (KEE-tuh-meen or KETT-uh-meen), ketamine hydrochloride (HIGH-droh-KLOR-ide); brand names include Ketaset and Ketalar
Also Known As: Blind squid, cat valium, honey oil, jet, K, ket, kit kat, Special K, vitamin K
Drug Classifications: Schedule III, hallucinogen

What Kind of Drug Is It?

Ketamine is a general anesthetic (pronounced ann-ess-THET-ik), which is a substance used to deaden pain. General anesthetics differ from local anesthetics in two key ways: 1) general anesthetics affect the entire body rather than just a specific body part; and 2) in addition to causing a loss of sensation, they bring on a loss of consciousness.

Ketamine is very similar in structure to another anesthetic called phencyclidine (fenn-SY-kluh-deen), also known as PCP. However, it is not as powerful. (An entry on PCP is available in this encyclopedia.) Both ketamine and PCP are known as DISSOCIATIVE ANESTHETICS because of the mind-altering side effects they produce.

Overview

The anesthetic ketamine was developed as an alternative to PCP for use in humans. Ketamine, a fast-acting drug, was discovered by Dr. Calvin Stevens of Wayne State University in Detroit, Michigan, in the early 1960s. It was considered a breakthrough drug in the field of anesthesia because of its ability to bring on sleep, relieve pain, and produce short-term memory loss in surgical patients. In addition, its anesthetic actions would not depress, or slow down, the breathing process. Doctors enthusiastically embraced the use of ketamine in the operating room, thinking the drug would make their patients feel more relaxed and comfortable when they awoke from surgery.

Ketamine was first used on patients in 1970. The U.S. military even used it as a battlefield anesthetic during the Vietnam war (1954–1975). However, with the increased use of ketamine came more and more reports of its unusual side effects. Many people who were given the anesthetic in prescribed doses in a medical setting experienced bizarre HALLUCINATIONS when they began regaining consciousness. Some claimed that they met up with dead relatives and friends, talked to angels, and had out-of-body experiences. As a result, the medical use of ketamine on humans dropped considerably.

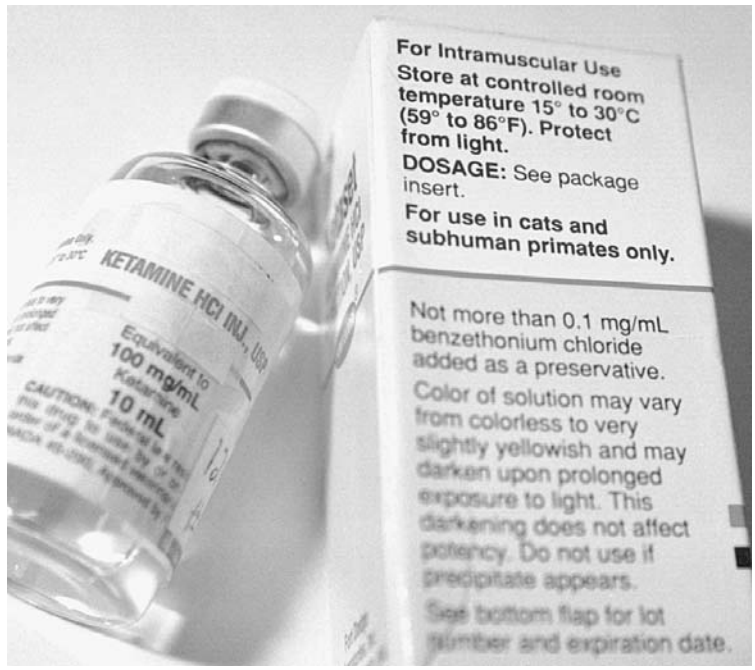
Ketamine use has also been linked to brain damage. As of 2005, ketamine was used mainly by veterinarians on animals as an INTRAVENOUS or INTRAMUSCULAR anesthetic.

dissociative anesthetics: pronounced dih-SOH-shee-uh-tiv; drugs that cause users to feel as if their minds are separated from their bodies

hallucinations: visions or other perceptions of things that are not really present

intravenous: injected into a vein

intramuscular: injected into a muscle



About 90 percent of the ketamine sold legally in the United States is intended for veterinary use. This availability has led some drug dealers to break into animal clinics to steal the drug.
AP/Wide World Photos.

From Experimental Hallucinogen to Club Drug

The use of hallucinogens—drugs that can produce hallucinations and distort reality—skyrocketed in the 1970s. Hallucinogens such as LSD (lysergic acid diethylamide) became extremely popular during this era of social and political upheaval. (A separate entry on LSD is available in this encyclopedia.) Stories about ketamine's effects soon captured the interest of experimental drug users. Ketamine use produces "trips," which are basically extended hallucinations of an intense and usually very visual nature. Ketamine trips are similar to those of other, better-known hallucinogenic drugs. However, ketamine—widely known as Special K—never really became a mainstream drug in the 1970s.

rave: a wild overnight dance party that typically involves huge crowds of people, loud techno music, and illegal drug use

Later, with the emergence of the RAVE scene in the late 1980s and early 1990s, ketamine gradually resurfaced as a club drug. Though used much less frequently than ecstasy (MDMA)

John C. Lilly: The Case of the Addicted Physician

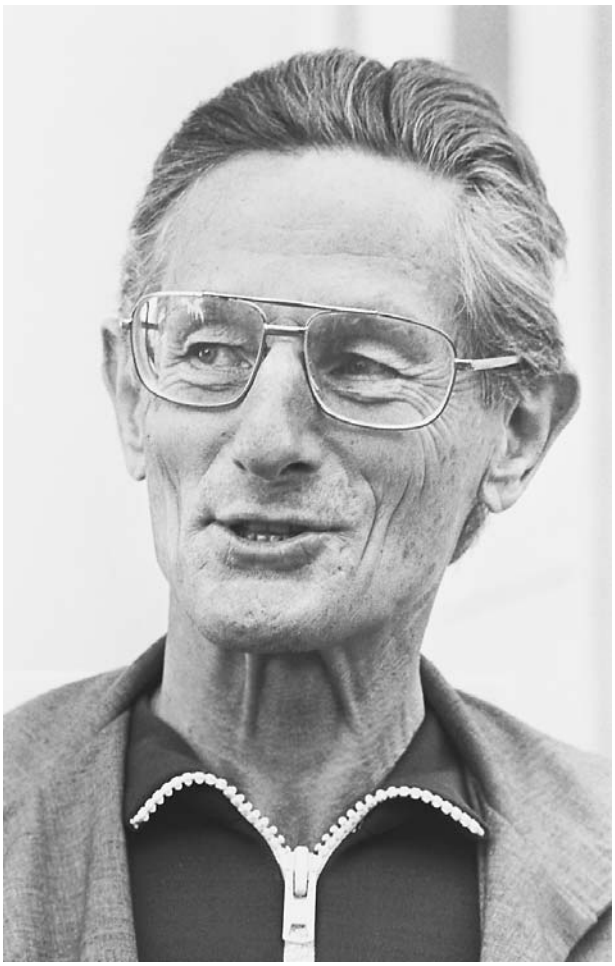
The man most closely associated with early ketamine experimentation and research was John C. Lilly (1915–2001). Lilly was an author, educator, and physician who specialized in the field of neurology, the branch of medicine that deals with the study of the brain, the spinal cord, and the nerves of the body. He is remembered for his groundbreaking research on human consciousness. Lilly's studies ranged from tracing the brain's pain and pleasure pathways to exploring the possibilities of human-dolphin communication. The films *Altered States* (1998) and *The Day of the Dolphin* (1973) are based on his ideas.

Lilly believed that brain researchers should undergo the same tests and experiences as their patients. His work led to the advanced electronic imaging used in medicine in the early 2000s. In an attempt to discover more about the workings of the brain, Lilly experimented with a variety of mind-altering drugs, including LSD and ketamine. He also invented the isolation tank to see what would happen if a person's senses were not stimulated for a given period of time. According to Lilly, he believed that his own experience with the device allowed him to view another reality.

This interest in exploring other realities led Lilly to abuse ketamine for its hallucinogenic effects. In his 1978 autobiography *The Scientist,* Lilly explains that he began taking ketamine injections to relieve the unbearable pain of his migraine headaches. He notes that he felt transformed by the drug's mind-altering properties. Lilly soon became addicted to ketamine. Within several months, he was injecting the drug several times a day. At the peak of his abuse, he took 50 milligrams of the drug every hour for stretches lasting up to twenty hours.

or methamphetamine, ketamine became increasingly popular among young people in the middle and late 1990s. (Entries on ecstasy and methamphetamine are available in this encyclopedia.) According to "An Overview of Club Drugs: Drug Intelligence Brief," published by the U.S. Drug Enforcement Administration (DEA), "a significant number of veterinary clinics" were being robbed around that time "specifically for their ketamine stock." These robberies came about because ketamine is a difficult drug to synthesize, or make in a laboratory. Some users found that it was actually easier to steal it than it was to make it.

In 1995, ketamine was added to the DEA's Emerging Drugs List, indicating that it was recognized as a threatening new substance among drug users. Four years later, on August 12, 1999, ketamine became illegal in the United States. It is considered a Schedule III drug according to the terms of the Controlled Substances Act of 1970.



John C. Lilly believed that brain researchers should undergo the same tests and experiences as their patients. In an attempt to discover more about the workings of the brain, Lilly experimented with a variety of mind-altering drugs, including LSD and ketamine. © *Roger Ressmeyer/Corbis.*

What Is It Made Of?

Ketamine belongs to the same family of drugs as: 1) dextromethorphan (DXM), which is found in some brands of over-the-counter cough syrup; 2) nitrous oxide, better known as "whippets," for the metal whipped cream chargers in which the gas is packaged; and 3) PCP, also known as angel dust. (Entries on each of these drugs are available in this encyclopedia.)

Ketamine is a synthetic drug, meaning that it does not occur naturally but is manufactured in a lab from chemicals. It is most commonly used in its HYDROCHLORIDE form. The chemical composition of ketamine hydrochloride is $C_{13}H_{16}ClNOHCl$. The chemical structure and effects of ketamine are similar to those of PCP. However, PCP is a longer lasting and more powerful drug than ketamine.

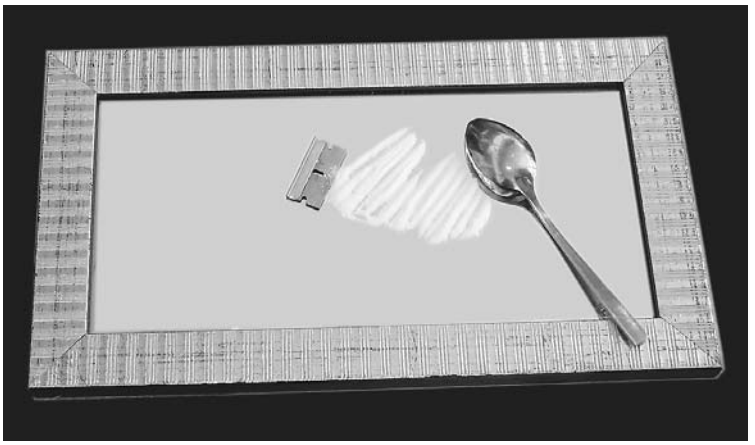
How Is It Taken?

Ketamine is snorted, smoked, or dissolved in water. The liquid form is swallowed or injected directly into a vein or muscle. When used by physicians or veterinarians as an anesthetic, ketamine comes in liquid form and is packaged in small glass vials. This liquid can be returned to a dry form by heating or "cooking" it. The "baked" drug is then crushed into a powder. Powdered ketamine is snorted through the nose in "bumps" (similar to "lines" of cocaine). It is also sprinkled on marijuana or tobacco and rolled into a homemade cigarette. In the United States, a 20-milligram unit of ketamine typically sells for about $25.

Users sometimes mix ketamine with a STIMULANT like cocaine or methamphetamine. When taken together, this combination is referred to as "trail mix." Sometimes, drug dealers "cut" ketamine with other substances to yield a bigger batch and make more money. Users can never be sure of the drug's purity. Samples of seized ketamine have included substances such as amphetamines, heroin, PCP, caffeine, and other fillers. Ketamine has also been compressed into pills or loaded

hydrochloride: a chemical compound composed of the elements hydrogen and chlorine, often in the form of a crystallized salt

stimulant: a substance that increases the activity of a living organism or one of its parts



Powdered ketamine is snorted through the nose in bumps (similar to lines of cocaine). *Photograph by Leitha Etheridge-Sims.*

into capsules and sold as other illegal drugs, including ecstasy. (Entries on cocaine, amphetamines, caffeine, ecstasy (MDMA), heroin, methamphetamine, and PCP are included in this encyclopedia.)

Are There Any Medical Reasons for Taking This Substance?

Ketamine has been approved for both human and animal use as an injectable anesthetic in medical settings since 1970. About 90 percent of the ketamine sold legally in the United States is intended for veterinary use. Its use in humans is usually limited to children and elderly patients. Individuals in both of these age groups seem to tolerate ketamine better than other general anesthetics. However, tranquilizers must be administered in combination with ketamine to keep these patients from experiencing hallucinations. (An entry on tranquilizers is included in this encyclopedia.)

Usage Trends

Before the late 1980s, ketamine was not widely abused. Its use was not considered extensive enough to prompt action by the U.S. Drug Enforcement Administration (DEA) until the 1990s.

The 2004 "Pulse Check" report released by the White House's Office of National Drug Control Policy stated that "young adults working independently are the primary dealers of ketamine,

A dancer holds a bottle of the designer drug ketamine, also known as "Special K," at a rave in Baltimore, Maryland. *© Scott Houston /Corbis.*

which they obtain through burglaries of veterinary clinics." Since the late 1990s, vets have been urged to install burglar alarms in their offices and lock up their ketamine supplies. Closer monitoring of ketamine supplies has made it more difficult to obtain.

Club Drugs, Raves, and "Date Rape"

An increase in ketamine use occurred with the growth of the rave culture beginning in the late 1980s and early 1990s. According to the Substance Abuse and Mental Health Services Administration (SAMHSA), a division of the U.S. Department of Health and Human Services, the typical American club drug user is between eighteen and twenty-five years old. Users in Australia and the United Kingdom are around the same age. This population dominates the club drug market and has made ecstasy and other so-called designer drugs some of the fastest-growing drugs of choice on the club circuit. (An entry on designer drugs is available in this encyclopedia.) Because of its

unpleasant side effects, however, ketamine has never been as popular as ecstasy among rave attendees.

Like other club drugs such as GHB and Rohypnol, ketamine has been used as a "date-rape" drug. Liquid ketamine is "odorless and tasteless," warns the Partnership for a Drug-Free America, "so it can be added to beverages without being detected." In addition, it causes memory loss. Victims of ketamine-related sexual assaults may find it impossible to identify their attackers. (Entries on GHB and Rohypnol are also available in this encyclopedia.)

Supplies and Usage Begin to Decline

The Drug Abuse Warning Network (DAWN) tracks hospital emergency department (ED) visits caused by drug use. ED visits related to ketamine use have remained at low levels since 1998. The DAWN statistics published in mid-2005 reflected data from the last two quarters of 2003. During those six months, 73 ED visits were reported for ketamine poisoning. During 2002, the number for the full year was 260.

The decline in ketamine use in the United States is closely tied to its decreased availability. According to "Pulse Check" data from 2004, the source of the drug was cut significantly with "the arrest of a main supplier in Mexico." "Pulse Check" researchers estimate that 80 percent of the U.S. ketamine supply comes from Mexico through San Diego, California.

The results of the 2004 Monitoring the Future (MTF) study were released to the public on December 21, 2004. Conducted by the University of Michigan (U of M), it is sponsored by research grants from the National Institute on Drug Abuse (NIDA). The authors of the study noted a considerable decrease in the annual use of ketamine by tenth graders. In 2003, 1.9 percent of tenth graders reported using ketamine in the last year. In 2004, annual usage had dropped to 1.3 percent.

Effects on the Body

Ketamine is a dissociative anesthetic. It produces all of the symptoms associated with anesthesia, including the inability to control movement, register pain, or recall memories. Common side effects of ketamine use include confusion; dizziness; tiredness; loss of muscle control; numbness; intoxication, the loss of physical or mental control; and AMNESIA.

Ketamine interferes with the brain's ability to receive, process, and send out certain signals. This distorts users' perceptions of sights, sounds, space, and time. Ketamine also brings on feelings of detachment, making users feel removed from their physical bodies.

amnesia: the loss of memory

The drug's effects occur shortly after it is taken, sometimes causing users to collapse suddenly. After using ketamine once, many people will not use it again.

A Place Called "K-Land"

A typical ketamine trip begins with a feeling of numbness all over the body. At low doses, users generally become somewhat disoriented, lose their sense of balance, and find it difficult to walk. Users then experience altered vision, muffled hearing, and a floating sensation as they enter a dreamy state known as "K-Land." In *Designer Drugs,* M. Foster Olive noted that "the perception of colors and music is enhanced" in the "K-Land" phase, and users may see "walls and carpets glowing different colors [and] ceilings turning to liquid." Some ketamine users claim that while in this relaxed state, they gain insights into their own personalities, the people they know, and the workings of the universe.

At higher doses, ketamine increases the sense of disconnection between the mind and the body. Users feel as if they are looking down at themselves from some higher place. These so-called "out-of-body experiences" are sometimes religious in nature. Some users claim they have seen visions of angels after taking ketamine. But the hallucinations associated with ketamine are not always pleasant.

The Terror of a "K-Hole"

Heavy use of ketamine intensifies the drug's effects dramatically. The user's judgment becomes extremely impaired, and vision becomes totally distorted. Auditory hallucinations may begin to appear as well. (Ongoing humming or buzzing sounds are the most common.) Some users find it very difficult to move or speak. They may also feel as if time has stopped completely.

Users who have experienced these symptoms run the risk of landing in a "K-Hole." The authors of the NIDA research report titled "Hallucinogens and Dissociative Drugs" describe the "K-Hole" experience as "a terrifying feeling of almost complete sensory detachment that is likened to a near-death experience." The "K-Hole" generates extremely vivid and often frightening hallucinations in users. These individuals may also experience nausea, vomiting, convulsions, DELIRIUM, RESPIRATORY DEPRESSION, and a loss of consciousness. Ketamine users who have eaten or consumed alcohol before taking high doses of

delirium: a mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating

respiratory depression: a slowed breathing rate; severe cases can cause a person to slip into a coma or even stop breathing entirely

In medical settings, various people who received ketamine as an anesthetic in prescribed doses experienced bizarre hallucinations as they began to regain consciousness. Some claimed that they met up with dead relatives and friends, talked to angels, and had out-of-body experiences.

the drug are likely to vomit and run the risk of choking to death.

The "K-Hole" is usually reached after snorting 100 milligrams of ketamine. When injected, however, lower doses of the drug can bring on "K-Hole" terrors. After coming out of a "K-Hole," users may not remember who they are, where they are, or what happened to them. Such feelings can trigger paranoia (abnormal feelings of suspicion and fear), extreme anger, and violent actions. A ketamine trip can last anywhere from forty-five minutes to several hours. However, according to a *Prevention Alert* article on ketamine, it usually takes twenty-four to forty-eight hours "before the user feels completely 'normal' again."

Did You Know?

Ketamine's effects on users multiply dramatically as the dose is increased, even if the increase is very small. The method by which the drug is taken—whether it is snorted through the nose, swallowed by mouth, or injected into a muscle—also has a lot to do with the effects it will produce.

When snorted, ketamine begins to act anywhere from five to fifteen minutes after it is taken. It can stay in the user's system for up to an hour. Most users who snort ketamine begin to feel its effects after taking about 10 milligrams of the drug. A 30- to 70-milligram dose affects vision, hearing, balance, and muscle coordination. The disconnection between mind and body known as the "dissociative" state typically appears after snorting dosages of 100 to 150 milligrams. Doses at or near 250 milligrams may cause unconsciousness for up to three hours or more.

When swallowed, it takes longer for ketamine to take effect (up to twenty minutes on a full stomach), and the effects of the drug last much longer, from three to six hours or more depending on the dose.

When injected into a muscle, ketamine acts much more quickly—usually in a minute or two. Taking ketamine by injection is extremely dangerous. The risks of accidental death or permanent injury from overdose by injection are greater than with any other method.

Brain Damage and Other Dangers

Hallucinogens interrupt the normal flow of NEUROTRANSMITTERS in the brain. Ketamine has an especially strong effect on the workings of the neurotransmitter glutamate. When the brain's supply of glutamate is blocked, people have difficulty perceiving and responding to changes in their environment.

Dissociative anesthetics like ketamine have been shown to cause brain damage. The DEA noted in "An Overview of Club Drugs" that heavy use of ketamine can bring on long-term memory problems and "cognitive difficulties." (Cognitive refers to intellectual activities.) The types of difficulties most often seen include slurred speech and a decreased attention span.

When used as a general anesthetic and administered by a trained medical professional, ketamine will not interfere with the normal breathing process. When abused, however, the drug can cause severe respiratory depression and an irregular heartbeat.

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

Women who take any dissociative anesthetic (ketamine, dextromethorphan, or PCP, to name a few) while pregnant expose

their developing babies to the drugs' toxic, or poisonous, effects. Children born to women who take ketamine during their pregnancy may suffer severe brain damage.

Reactions with Other Drugs or Substances

People who attend raves often take more than one drug at a time, with ketamine as part of the mix. The risks involved in ketamine use are increased when it is taken along with alcohol, BARBITURATES, or other drugs that cause respiratory depression. When the breathing rate and heart rate are slowed to dangerously low levels, the brain cannot get enough oxygen. Permanent brain damage or even death can occur in these cases.

Treatment for Habitual Users

Users of ketamine develop a TOLERANCE to the drug over time. Higher doses increase the likelihood and severity of "K-Hole" experiences. The PSYCHOLOGICAL DEPENDENCE associated with heavy ketamine use can be quite strong. Continued use of ketamine over extended periods of time can result in marked personality changes in the user.

Long-time ketamine users who want to stop taking the drug usually experience withdrawal symptoms as they begin gradually cutting back on the amount of the drug being taken until it is discontinued entirely. Symptoms of withdrawal include amnesia, slurred speech, difficulty concentrating, and a craving for the drug. Habitual users are likely to benefit from drug treatment programs that include counseling and psychotherapy. Through the help of a trained therapist, psychotherapy uses a variety of techniques to improve a patient's outlook on life.

barbiturates: pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers"

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

psychological dependence: the belief that a person needs to take a certain substance in order to function

schizophrenia: a mental disease characterized by a withdrawal from reality and other intellectual and emotional disturbances

Consequences

Ketamine can trigger severe emotional breakdowns in some users. People who suffer from SCHIZOPHRENIA or other mood disorders are at special risk, since hallucinogenic drug use may reactivate mental illnesses that were once under control.

In *Designer Drugs,* Olive pointed out that ketamine "impairs the user's senses and judgment for up to twenty-four hours after taking the drug, even though the initial trip wears off within an hour or so." As a result, the user loses the ability to drive a car or operate machinery safely. Ketamine is also dangerous because of its

A police lieutenant holds up a plastic bag containing the designer drug ketamine in Tampa, Florida. The officer is standing in front of a nightclub that was shut down for permitting illegal drugs to be used there.

painkilling properties. An individual under its influence may sustain a serious injury (such as a burn or a deep cut) without even knowing it. This occurs when the pain center of the brain is blocked.

In Hot Pursuit of Ketamine Dealers

Seizures of ketamine have been reported worldwide. Between 2003 and mid-2005, ketamine-related drug busts made news in the United States, Canada, India, Australia, the Philippines, and China. Here are some highlights.

- According to a 2003 *Microgram Bulletin* article, a mechanic in Maryland discovered what looked like individually wrapped sugar cubes while inspecting a vehicle. Foil-wrapped sugar cubes often contain LSD, but these were laced with ketamine.
- From the summer of 2003 through the winter of 2005, a huge online pharmacy based in India sold about $20 million worth of unprescribed drugs worldwide. The illegal drug network distributed numerous prescription drugs and one club drug—ketamine—through more than 200 Web sites. *Philadelphia Inquirer* staff writer Thomas Ginsberg reported that the drugs were shipped from India, Germany, and Hungary to Philadelphia, Pennsylvania, for repackaging. DEA officials nicknamed the international drug investigation "Operation Cyber Chase." The illegal Internet pharmacy bust led to the arrest of twenty-two people in the United States, Canada, and India.
- In April of 2005, the Central Narcotics Bureau (CNB) of Singapore reported the arrests of a twenty-four-year-old Chinese man and his two associates. The men were selling ketamine and ecstasy. More than 7 grams (0.245 ounces) of ketamine and 75 ecstasy tablets were seized from the trio. According to the *CNB* web site, the three men faced "a minimum sentence of five years imprisonment and five strokes of the cane" if convicted.
- In May of 2005, a Special Operations Task Force was tracking Chinese drug manufacturers operating in the Philippines. Johnson Chua, the leader of the illicit drug ring, allegedly concocted and sold a dangerous combination of ketamine and "shabu" (the Asian name for ecstasy). As of that time, drug agents in the Philippines had seized about 7 kilograms (246.92 ounces) of ketamine from Chua's labs, but Chua had not yet been found. Alfred Dalizon, writing in the *People's Journal,* referred to ketamine as "a new drug craze." According to the Philippines National Police, mixtures of ketamine and ecstasy "could be deadly to users as it could lead even to suicide."

Data published on NIDA's *Epidemiology of Youth Drug Abuse* Web site suggest that people who inject ketamine are often young, live in economically depressed urban areas, and have experience dealing drugs. Furthermore, they seem to lack, or ignore, basic knowledge about the dangers of sharing needles with other drug users. Consequently, many young users who inject ketamine run a high risk of contracting HIV (the human immunodeficiency virus), which can lead to AIDS

(acquired immunodeficiency syndrome). Likewise, the decrease in INHIBITIONS resulting from ketamine use is a cause for concern. Individuals under the influence of ketamine may engage in unsafe sexual activity. Unprotected sex is the leading cause of HIV transmission.

The Law

On August 12, 1999, the DEA added ketamine to the list of Schedule III drugs. Under the terms of the Controlled Substances Act, Schedule III drugs are approved for medical use. Their RECREATIONAL USE or abuse, however, can lead to dependence. It is illegal to buy or sell ketamine without a prescription in the United States. It cannot be used legally without a prescription.

Penalties for possession of ketamine can result in jail terms and fines. Repeat offenders may receive a prison sentence of up to ten years and a fine of up to $500,000. When ketamine is used by an individual in the commission of another crime, such as rape, the penalties are particularly severe. Any individual who uses ketamine or any other date-rape drug to commit a sexual assault could be sentenced to life in prison.

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inhibitions: inner thoughts that keep people from engaging in certain activities

recreational use: using a drug solely to achieve a high, not to treat a medical condition

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See also: Dimethyltryptamine (DMT); Ecstasy (MDMA); GHB; LSD (Lysergic Acid Diethylamide); PCP (Phencyclidine); Rohypnol

LSD (Lysergic Acid Diethylamide)

Official Drug Name: Lysergic acid diethylamide (lih-SERJ-ik AH-sid die-ETH-uhl-AH-mide), LSD 25, Delysid (brand name); almost always referred to as LSD
Also Known As: More than eighty street names, including acid, backbreaker, battery acid, blotter, boomers, brown acid, cid, contact lenses, doses, dots, electric kool-aid, looney tunes, Lucy in the sky with diamonds, microdots, panes, purple haze, sunshine, windowpanes, yellow sunshine, zen
Drug Classifications: Schedule I, hallucinogen

What Kind of Drug Is It?

LSD (lysergic acid diethylamide) is a powerful PSYCHEDELIC DRUG made from a naturally occurring compound called lysergic acid. This is how the drug got its nickname "acid." LSD is classified as an HALLUCINOGEN by the U.S. Drug Enforcement Administration (DEA). The National Institute on Drug Abuse (NIDA), in "NIDA InfoFacts: LSD," has called it "one of the most [powerful] mood-changing chemicals" known. LSD alters the way the brain works. In microscopic amounts, it affects the user's senses, thoughts, and movements for ten to twelve hours.

Unlike some other hallucinogenic drugs such as mescaline, LSD can only be produced under laboratory conditions. (An entry on mescaline is available in this encyclopedia.) LSD is termed a semi-synthetic drug rather than a pure synthetic drug because the key ingredients used in its manufacture are found in nature.

Overview

LSD was first synthesized, or made in a lab, in 1938. It was created from a mold called ERGOT that infests rye and other grains. Drug researchers initially hoped that this new substance would be useful in treating severe headaches. Because of its similarity to chemicals that occur in the human brain, it was later used in the study of mental illness.

History Dates Back to World War II

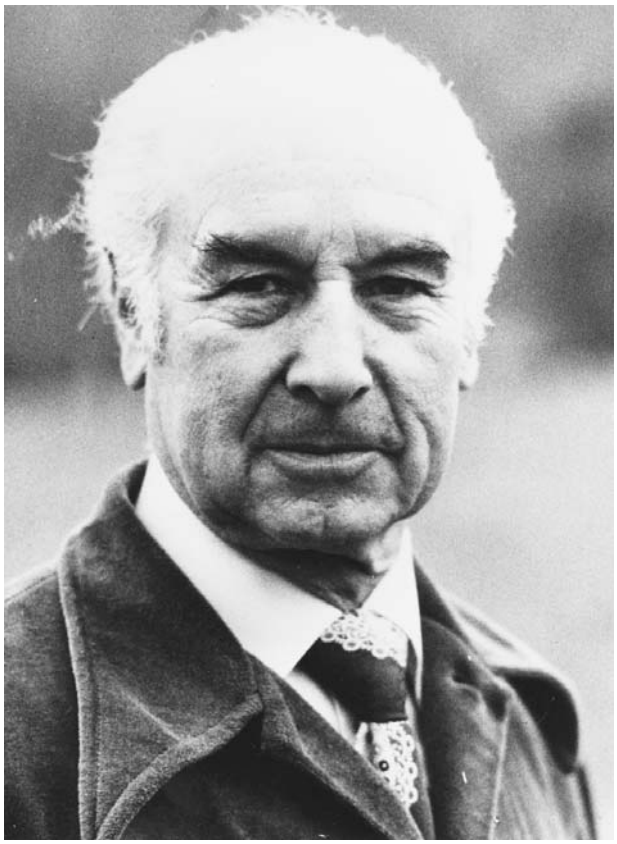
The hallucinogenic effects of LSD were discovered in 1943 in Basel, Switzerland. Swiss chemist Albert Hofmann (1906–), a researcher at Sandoz Laboratories, had produced the first batch of the drug five years earlier. One day in April of 1943, Hofmann accidentally ingested some of the compound while experimenting with various ergot-based products. He soon experienced extraordinary visual symptoms similar to the mosaic pattern seen through a kaleidoscope.

When Hofmann's vision returned to normal, he deliberately took a larger second dose to see if the same effects would occur.

psychedelic drug: a drug that can produce hallucinations and distort reality

hallucinogen: a substance that brings on hallucinations, which alter the user's perception of reality

ergot: pronounced URH-got; a fungus that grows on grains, particularly rye, and contains lysergic acid, a chemical used to make LSD



Swiss chemist Albert Hofmann discovered LSD and tried it on himself. He described his first experience with the drug in his book *LSD: My Problem Child*: "A demon had invaded me, had taken possession of my body, mind, and soul." *Photo by Keystone/Getty Images.*

The bizarre sensations returned but proved to be even more intense. Soon after taking this second dose, Hofmann began feeling dizzy and disoriented. While bicycling home from his laboratory, he developed distortions of his senses. They included profound changes in his hearing, the perception of fantastically vivid colors, and an inability to judge distance. In his account of this first LSD experience, included in his book *LSD: My Problem Child,* Hofmann wrote: "A demon had invaded me, had taken possession of my body, mind, and soul."

Suspecting that the new drug might be a useful tool in the advancement of PSYCHOTHERAPY, Sandoz Laboratories produced it as Delysid. According to Edward M. Brecher in *The Consumers Union Report on Licit and Illicit Drugs,* the company supplied Delysid in "experimental quantities" to psychiatrists at the University of Zurich in Switzerland. These psychiatrists soon determined that even MICROGRAMS of the drug prompted extreme reactions. Brecher noted that "an amount of LSD weighing as little as the aspirin in a five-grain tablet is enough to produce effects in 3,000 people."

LSD Comes to America

Hofmann and his fellow experimenters published their initial findings on LSD in 1947. Two years later, doctors at the Boston Psychopathic Hospital (which became the Massachusetts Mental Health Center) learned about LSD from the Austrian physician Otto Kauders. The American doctors obtained some of the drug from Sandoz Laboratories and undertook their own experiments. For the next several years in the United States, LSD was largely restricted to the scientific and medical communities. It showed promise as a breakthrough in the treatment of psychological disorders. "This was an extraordinary substance," wrote Antonio Escohotado in *A Brief History of Drugs: From the Stone Age to the Stoned Age.*

psychotherapy: the treatment of emotional problems by a trained therapist using a variety of techniques to improve a patient's outlook on life

microgram: a millionth of a gram; there are 28 grams in 1 ounce

In the early 1960s, before LSD became an illegal drug, various scientists conducted experiments with volunteers. Here, a homemaker experiences the effects of LSD while others observe her. *Photo by John Loengard/ Time Life Pictures/Getty Images.*

By 1951 news of LSD had reached the Central Intelligence Agency (CIA), an organization responsible for American security. Agency officials wanted to investigate the use of LSD as a truth serum and, possibly, a form of nonviolent warfare that would incapacitate the enemy. The CIA began a government-funded research program to examine the effects of the drug. Initially, the operation was centered at Boston Psychopathic Hospital. There, LSD was administered to students and soldiers to test its effects. But experimentation led to disaster when one of the test subjects jumped out of a window and fell to his death.

LSD Experimentation Studies

Even though LSD was discovered in the late 1930s, its use was most widespread in the 1960s. At that time, it was viewed by members of the COUNTERCULTURE as a way to alter and intensify virtually all experiences. Many people used it to stimulate the creative process.

counterculture: a group of people who challenge the values of established society

The 1960s: The LSD Era

LSD use was high in the 1960s—a time of political and social turmoil in the United States. The quest for social justice was one of the key concerns among young Americans during the era. Antiwar sentiment had grown in the United States against the war in Vietnam (1954–1975). Protests against America's role in the conflict marked the decade.

The era was also an important time for civil rights in the United States. However, the civil rights movement was dealt a major blow with the assassination of Dr. Martin Luther King Jr. (1929–1968), the leader of the peaceful protest movement, in the late 1960s. Presidential hopeful Robert Kennedy (1925–1968), the brother of murdered U.S. president John F. Kennedy (1917–1963), was also assassinated. In the midst of America's grief and social upheaval, other causes started gaining momentum. Notable among these were the call for women's rights and a more responsible attitude toward the environment.

As youth around the country rallied together in support of these causes, many took an anti-establishment attitude. This means that they wanted to do things differently than their parents had. Many rejected mainstream society's ideas and instead experimented with new ways of doing things, such as living together and wearing bell-bottoms and tie-dyed t-shirts with psychedelic colors. They also started experimenting with drugs, such as LSD. For some, the dangers of such experimentation were soon revealed.

The use of LSD and other drugs eventually influenced the arts. One of the people who experimented with LSD was Ken Kesey (1935–2001). He first tried the drug in the early 1960s when he volunteered to be observed under the effects of the drug at Boston Psychopathic Hospital. Kesey enjoyed the sensory experience he received taking LSD. He later worked at the hospital as a psychiatric aide. He used his experiences and observations for his first novel, *One Flew Over the Cuckoo's Nest*. Released as a film in 1975, the story won many Academy Awards that year.

LSD also influenced various musicians. Songs by The Grateful Dead, The Jefferson Airplane, and The Beatles are reportedly inspired by the acid culture. In fact, The Beatles' song "Lucy in the Sky with Diamonds" has become a street name for the drug LSD.

The drug influenced everything from the tie-dyed clothing styles to the art, music, and motion pictures of the era.

The reputation of LSD as a mind-altering drug caught the interest of psychiatrists and researchers at various universities. Soon such institutions began sponsoring widespread studies of the drug. They even paid college students and others to take the drug and be observed under its effects.

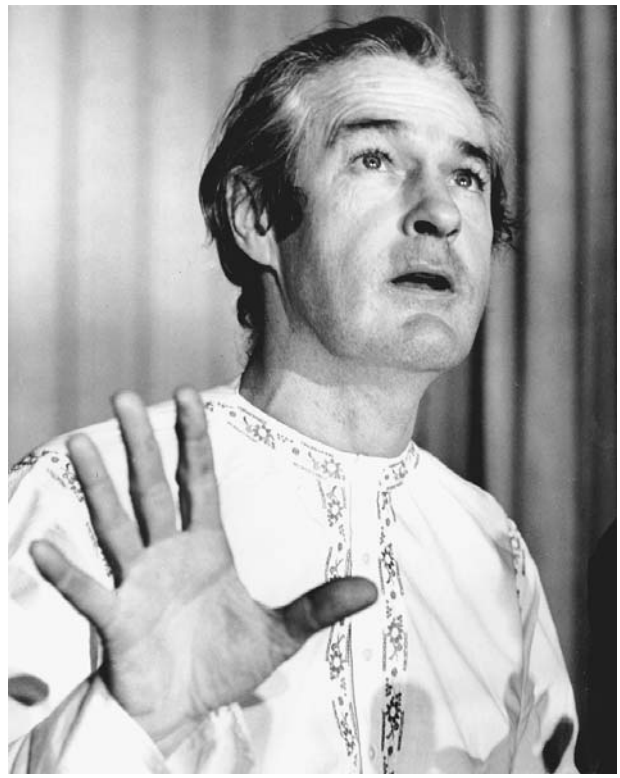
The Influence of Timothy Leary

The rate of LSD experimentation was particularly high at Harvard University, located in Cambridge, Massachusetts. It drew the attention

of Timothy Leary (1920–1996), a psychologist who had joined the university's faculty in 1960. Leary had already experimented with other hallucinogenic substances and soon became a key promoter of LSD use.

"By this time we had become aware of an international network of scientists and scholars experimenting with psychedelic drugs like psilocybin, LSD, and mescaline," Leary wrote in his autobiography *Flashbacks* (1983). "They varied widely in age and temperament and held widely differing ideas about how the drugs should be used. One powerful [idea] was common to all: these plants and drugs, as expanders of human consciousness, could revolutionize psychology and philosophy."

With the encouragement of novelist Aldous Huxley (1894–1963), Leary launched a public campaign recommending LSD as a liberating and mind-expanding drug. Huxley had gained fame decades earlier with his futuristic novel *Brave New World* (1932), and he championed psychedelic drug use in a later work called *The Doors of Perception* (1954). Word of LSD's hallucinogenic properties rapidly spread across the country. By the mid-1960s, the drug had become an undeniable part of American culture.



Timothy Leary believed that LSD was a liberating and mind-expanding drug. He became famous for telling people to use LSD to "turn on, tune in, [and] drop out." *AP / Wide World Photos.*

However, Leary's experiments with and ideas about LSD were controversial, especially at Harvard. Parents of many of his students were upset to hear that their children were using drugs, no matter if the drugs were being administered in a clinic setting. These parents were concerned because they had sent their children to Harvard to get an education and become leaders, not become drug users. Ultimately Leary was fired from Harvard in 1963 amid the controversy. He went on to conduct experiments elsewhere and sometimes ran into legal trouble. Nevertheless, he gave lectures throughout the country urging people to "turn on, tune in, [and] drop out."

Psychedelics, Flower Power, and the City of Love

Augustus Owsley Stanley III, more commonly known as Owsley, supplied much of the LSD that circulated in the United States in the

Timothy Leary

Timothy Leary died at his Beverly Hills, California, home on May 31, 1996. The last word he spoke was reported to have been "Beautiful." Leary's body was cremated according to his wishes. The February after his death, a portion of his ashes was launched into space.

late 1960s. His lab was located in San Francisco, California—the center of America's acid culture. The Haight-Ashbury district within the city became a gathering place for young men and women arriving from around the country.

Soon, San Francisco gained a reputation as the "City of Love." Its radical residents were termed "hippies." Their philosophy of peace, love, drugs, rock 'n' roll, and psychedelic experiences gave birth to the "flower power" movement. However, the movement in San Francisco lasted only a few years. By 1969, the end of the era was evident when violence erupted near the city at a free concert given by the Rolling Stones and other bands. One fan was stabbed to death and several others died at the event. The chaos of the music festival is chronicled in the documentary film *Gimme Shelter.*

After the Sixties

LSD was made illegal in the United States in 1967. By the early 1970s, LSD use had declined in the nation. Owsley and Leary had both been arrested, and the drug seemed to lose its appeal. Then, in the late 1980s, the rave culture hit the United States. A new generation of young American drug users was firmly established by the mid-1990s. LSD was one of the drugs they began taking.

Most of the LSD distributed in the United States and Europe from 1996 to 2000 was made in illegal labs operated by two California men, William Leonard Pickard and Clyde Apperson. The pair had set up labs in California, Oregon, New Mexico, and Kansas, where they manufactured nearly $100 million worth of LSD each month. Both men were arrested in November of 2000. Over the next two years, the availability of the ILLICIT drug decreased by 95 percent in the United States. In 2003, three years after their arrests, Pickard and Apperson were found guilty of conspiracy to manufacture and distribute LSD. Pickard was sentenced to life in prison without parole. Apperson received a thirty-year sentence in prison without parole. According to a DEA press release, "this was the single largest seizure of an operable LSD lab in the history of the Drug Enforcement Administration."

illicit: unlawful

Combining drugs and dancing is not a new trend that began with raves. The combination was popular back in the 1960s when many people experimented with hallucinogenic drugs such as LSD. *© Ted Streshinsky/Corbis.*

What Is It Made Of?

LSD is a colorless, odorless drug with a bitter taste. It is made from ergot, a brown, toxic (poisonous) mold that grows on rye and other grains. The chemical formula for LSD is $C_{20}H_{25}N_30$. LSD is a

Putting LSD on blotter papers is a common way to dispense a dose. Torn from perforated sheets of paper, they are smaller than a postage stamp, square in shape, and decorated with colorful graphics. The papers are soaked in LSD and sold separately, in sheets, or in books. *Sinclair Stammers / Photo Researchers, Inc.*

very difficult drug to synthesize. A DEA publication titled "An Overview of Club Drugs: Drug Intelligence Brief," describes the drug's manufacture as "a time-consuming, complex chemical process" that requires "a solid background in chemistry." It is hard to obtain the ingredients needed to make the drug. Most of the LSD in the United States is manufactured in the city of San Francisco, California. Because it is made in illegal labs, there is no guarantee of the drug's purity or safety.

The DEA reports that a typical dose of LSD is not as strong as it used to be. In the late 1960s, at the height of its use, the dosage ranged from 100 micrograms to 200 micrograms. As of 2005, doses were in the 20 microgram to 80 microgram range. An average dose costs about $5 to $10.

How Is It Taken?

LSD is usually taken by mouth. Pure LSD is a crystalline powder, but it is usually dissolved and diluted before being readied for sale. A microscopic amount of LSD is dropped on sugar cubes, blotter

paper, or mushrooms, which are then ingested. Blotter papers are perforated sheets of paper—smaller than a postage stamp, square in shape, and decorated with colorful graphics. They are soaked in LSD and sold separately, in sheets, or in books. Sometimes LSD is put on the back of a postage stamp, which is then licked. LSD is also produced in a tablet form called a microdot.

In addition, some users absorb LSD into their systems through their eyes. Thin squares of LSD-laced gelatin, nicknamed "windowpanes" and "contact lenses," are used for this method of intake.

Are There Any Medical Reasons for Taking This Substance?

LSD is still under study as a means of treating various psychological disorders. Sandra Blakeslee, writing in the *New York Times,* reported as recently as 2001 that a psychiatry professor at Harvard University was preparing "to see whether LSD can alleviate fear and anxiety in dying patients." Blakeslee concluded her article by quoting psychiatrist George Greer, who cautioned: "If hallucinogens ever find their way into mainstream medicine . . . they will never be handed out like [the antidepressant] Prozac. People will need guidance. These are not drugs you administer every day."

Usage Trends

The use of LSD peaked in the late 1960s, when psychedelic music reached the height of its popularity. By the mid-1970s and throughout the 1980s, LSD use declined. Reports of bad trips turned off many RECREATIONAL USERS, and the media gave widespread coverage to tragic stories of lives shattered by the drug's effects. The term "bad trip" is used to describe a negative LSD experience, which is characterized by anxiety, panic, and despair. Such trips can be extremely traumatic.

After RAVES began in the late 1980s and early 1990s, other drugs—most notably ecstasy—became far more popular among drug users than LSD. However, a small group of ravers did rediscover LSD, which is said to enhance the sights and sounds of the rave experience. This new generation's interest in the hallucinogenic effects of LSD accounted for the spike in use that appeared around 1997.

recreational users: people who use drugs solely to achieve a high, not to treat a medical condition

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

The Language of LSD

Certain terms are used to describe different aspects of the LSD experience. A sampling of LSD lingo follows.

- *acid head*: an LSD user
- *coming down*: the experience of the drug wearing off
- *coming home*: the end of an LSD trip
- *drop*: a common term used to describe the taking of LSD, as in "dropping acid"
- *hit*: a dose of LSD
- *talk down*: the process by which someone helps users high on LSD reconnect with reality by calmly explaining that their hallucinations are not real; reassuring them of their safety; and reminding them that the effects are only temporary
- *ten packs*: 1,000 dosage units of LSD
- *trails*: visual distortions produced by LSD that make moving objects seem to leave multiple images behind them
- *travel agent*: an LSD supplier
- *trippin' or trippin' out*: getting high on a psychedelic drug such as LSD

Tracking LSD into the Twenty-first Century

According to the "National Survey on Drug Use and Health (NSDUH)," conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), approximately 1 million Americans were using hallucinogenic drugs in 2003. That number is similar to the estimate for 2002. One percent of youths age twelve to seventeen took hallucinogens in 2003. About 1.7 percent of young adults age eighteen to twenty-five reported hallucinogen use that year.

The results of the 2004 Monitoring the Future (MTF) study were released to the public on December 21, 2004. Conducted by the University of Michigan (U of M), it was sponsored by research grants from NIDA. Since 1991, U of M has tracked patterns of drug use and attitudes toward drugs among students in the eighth, tenth, and twelfth grades. (Prior to that, from 1975 to 1990, the MTF survey was limited to twelfth graders.)

MTF researchers reported that the use of hallucinogens such as LSD "remained stable among all grades from 2003 to 2004." In 2004, 4.6 percent of twelfth graders admitted using LSD at least once in their lives, as did 2.8 percent of tenth graders and 1.8 percent of eighth graders. Those percentages were down significantly from the 1990s. In 1997, for example, 13.6 percent of twelfth graders, 9.5 percent of tenth graders, and 4.7 percent of eighth graders had reported using LSD during their lifetimes.

Despite the downward trend in actual use of LSD, MTF researchers noted a negative change in attitude toward the drug among the youngest students surveyed (the eighth graders). "A significant decrease occurred in the percentage of eighth graders who disapprove of taking LSD regularly," wrote the authors of the 2004 MTF report. If this attitude remains the same over the next few years, these students may be more likely to use LSD by the time they reach their senior year of high school.

LSD Hawkers

"Pulse Check," a report available on the *Office of National Drug Control Policy* Web site, indicated that as of January 2004, most LSD was being sold at raves by ecstasy dealers. These dealers are commonly called "hawkers" because they walk through nightclubs announcing that they have drugs such as LSD and ecstasy for sale. The "Pulse Check" report also noted that LSD and ecstasy are frequently taken together. The street term for mixing these two drugs is "candy flipping."

Usage Drops Off with Time

According to the authors of "An Overview of Club Drugs" (2000): "Most users of LSD voluntarily decrease or stop using it over time, since it does not produce the same compulsive, drug-induced behavior of cocaine and heroin."

The Drug Abuse Warning Network (DAWN) tracks hospital emergency department (ED) visits caused by drug use. The latest statistics published as of mid-2005 were from the last two quarters of 2003. During those six months, 656 ED visits were reported for LSD poisoning. Nearly 94 percent of the individuals involved in LSD-related ED visits were male, and about 85 percent were white. The majority of patients were under the age of thirty-five.

Effects on the Body

LSD is believed to act on the SEROTONIN receptors in the brain. Serotonin is an important NEUROTRANSMITTER that regulates mood, appetite, sensory perception, and other nervous system functions. When LSD attaches to these brain receptors, serotonin cannot. The nerves in the brain become confused without a supply of this neurotransmitter and send out false signals that result in an LSD trip. A trip is an intense and very visual experience that occurs after taking the drug.

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

Trippin' on LSD

The authors of the DEA publication "Drugs of Abuse" state that an oral dose of "25 micrograms [of LSD], equal in weight to a couple of grains of salt . . . is capable of producing rich and vivid hallucinations."

The effects of the drug usually begin to appear about a half an hour to an hour after it is taken. They last for about twelve hours.

In pregnant women, LSD use brings on contractions of the uterus that can cause a miscarriage. In all users, LSD raises blood pressure, heart rate, and body temperature. Sweating and dry mouth are other common side effects. But, the authors of "NIDA InfoFacts: LSD" note that "sensations and feelings change much more dramatically than the physical signs." Many users report that the drug expands the mind and helps them discover their inner selves. Furthermore, they claim to be able to bond and empathize with, relate to, or understand others like never before. Some users have described the insights they obtain on LSD as a truly mystical experience.

All sensations are intensified by LSD, but the most bizarre effects are usually visual. Hallucinations are common. Objects become distorted, colors appear to glow, and images seem to melt into each other, forming flowing patterns and kaleidoscopic designs. A peculiar blending of the senses known as synesthesia (pronounced sinn-ess-THEE-zhee-uh) may also occur. Synesthesia is a mixing of sensations, often due to the use of hallucinogens, that makes users believe they can hear colors and see sounds.

Unpredictable Results

In their book *From Chocolate to Morphine,* Andrew Weil and Winifred Rosen commented: "From the very first . . . it was apparent that not everyone who takes LSD has a good time. Some people had bad trips: they became anxious and panicky, afraid they were losing their minds and would be unable to return to ordinary reality. . . . Some of them remained depressed and anxious for days afterward, and a few had lasting psychological problems."

LSD use can prompt a range of disturbing psychological reactions. These include feelings of disconnection; anxiety; confusion; depression (a mood disorder); extreme fear; and even paranoia (abnormal feelings of suspicion and fear). Users may also experience sudden psychedelic symptoms even when they are not high on the drug. These episodes are called flashbacks and may occur days, months, or even years after someone last used the drug. Flashbacks occur when someone re-experiences the effects of LSD after he or she has stopped taking it. The medical term for a flashback is "hallucinogen persisting perception disorder," commonly called HPPD.

The *Partnership for a Drug-Free America* Web site points out that the effects of LSD "depend on the amount taken, the user's

Users report that LSD use heightens the visual experience, making colors glow or melt into each other. Here, author Ken Kesey stands beside his infamous "Acid Bus" in 1997. The bus is painted in bright psychedelic colors like those seen by people on LSD or "dropping acid." During the 1960s, Kesey and a group of other LSD users toured the country in the bus and became the subject of Tom Wolfe's book *The Electric Kool-Aid Acid Test*. *AP/Wide World Photos.*

personality, mood, and expectations, and the surroundings in which the drug is used." Many users report extreme mood swings while under the influence of LSD. They may also feel stuck to a particular spot or even stuck in time. The distorted perceptions and reduced INHIBITIONS caused by the drug greatly increase the likelihood of an accident.

Serious injury and death may occur during an LSD trip because the user's judgment is so severely impaired. Stories have been told of people jumping out of windows, not because they wanted to commit suicide, but because they believed they could fly. Violent behavior is a possibility as well, since individuals on a bad trip may mistakenly believe that other people are a threat to their safety.

inhibitions: inner thoughts that keep people from engaging in certain activities

Reactions with Other Drugs or Substances

Very few studies have been conducted on the interaction of LSD with other drugs. It is known that antidepressants may alter the effects of LSD. Marijuana, a drug that causes paranoia in some users, also makes for a bad mix with LSD. Smoking marijuana while taking LSD can increase the risk of a bad trip or a psychotic reaction. (Entries on antidepressants and marijuana are also available in this encyclopedia.)

Treatment for Habitual Users

Drug experts generally agree that LSD is not an addictive substance. According to NIDA, "There is no evidence that LSD produces physical withdrawal" symptoms. However, it does cause psychological dependence, which is the belief that a person needs to take a certain substance in order to function. It also leads to tolerance, a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced. The tolerance does not last long. Typically, it disappears altogether if the user stops taking the drug for about a week. At that point, the full LSD experience will occur when another dose is taken.

While LSD may not cause physical withdrawal, use of the drug may result in lasting psychological effects—especially among people who have experienced emotional problems in the past. Individuals who showed signs of psychological instability prior to taking LSD are especially likely to have a bad trip with long-lasting negative consequences. Some users are overwhelmed by serious psychological trauma after taking the drug just once.

Use of LSD may contribute to outbreaks of psychosis (pronounced sy-KOH-sis), a severe mental disorder that makes it difficult for people to distinguish what is real from what is imagined. It can also lead to schizophrenia, another severe mental disorder. Schizophrenia makes it difficult for people to behave normally and function adequately in their everyday lives. "These effects may last for years," according to the NIDA research report "Hallucinogens and Dissociative Drugs." They can even "affect people who have no history or other symptoms of psychological disorder." Intensive psychotherapy and even hospitalization may be required in these cases.

A more common complaint from LSD users involves flashbacks. The cause of these sudden and persistent replays of an earlier trip has not yet been determined. As of 2005, there was no known treatment for them.

A Grateful Dead fan, known as a "Deadhead," carries a mass of balloons through the stands at a concert as he experiences the effects of LSD.

Consequences

LSD completely disrupts the ability to concentrate and communicate, thus increasing the risk among users of failure at school or work. Even bathing and getting dressed may be perceived as tasks too difficult to accomplish when under the influence of LSD. The drug also interferes with sleep, so users are often exhausted after its effects wear off.

People coming down from bad LSD trips need others to reassure them that everything will be fine. Users often need to rest in a quiet room with a trusted person in attendance at all times. In *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger explained that the trusted person should not leave the user "even for a few minutes, since the time distortion

of LSD can make it seem like an eternity of abandonment." Stimuli such as bright lights, bustling movement, or loud voices may frighten the user as the negative aspects of the experience continue.

The authors of the NIDA research report caution that users' moods sometimes shift so rapidly that they "may seem to experience several emotions simultaneously." This mental confusion and loss of control can make users so frightened that they become dangerous to themselves and others. Gahlinger noted, "Most injuries and a few fatalities have occurred [from LSD] when users found themselves overwhelmed by DELUSIONS and were injured either by accident or by intent."

The Law

LSD became illegal in the United States in 1967. Three years later, it was classified as a dangerous Schedule I drug under the Controlled Substances Act. This means it has a high potential for abuse and is not used medically. Prior to its ban, however, LSD was available as a prescription drug for use in treating psychological disorders. But as a Schedule I substance, LSD is illegal to possess, sell, or consume.

In the United States, LSD-related prison sentences range from five years to life, and fines can run from $2 million to $8 million. In the United Kingdom, LSD is considered a Class A drug under the 1973 Misuse of Drugs Act. Its use there carries penalties as severe as those in place in the United States.

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See also: Designer Drugs; Dimethyltryptamine; Ecstasy (MDMA); GHB; Mescaline; PCP (Phencyclidine); Psilocybin

Marijuana

Official Drug Name: *Cannabis sativa;* hashish; hemp; marijuana
Also Known As: More than 200 street names, including A-bomb, Acapulco gold, ace, African black, Aunt Mary, bhang, blunt, blanche, boo, boom, bush, charas, chronic, dagga, dope, fry (laced with embalming fluid), fry sticks (laced with embalming fluid), gangster, ganja, grass, hash, hash oil, herb, joint, kef, kief, kif, Mary Jane, nickel, oil, old man, pot, reefer, roach, sinsemilla, sensi, skunk, smoke, splif, tar, Thai sticks, weed
Drug Classifications: Schedule I, hallucinogen; Schedule III, prescription synthetic THC, dronabinol (brand name Marinol)

What Kind of Drug Is It?

Marijuana is the most widely used illegal controlled substance in the world. Although the drug has been illegal in the United States since the 1930s, an estimated 40.6 percent of the U.S. population over twelve years of age (forty out of every one hundred people) has tried it at least once. As recently as 2003, 25.2 million people—basically one in ten Americans—reported using the drug at least once that year, as reported by the Office of National Drug Control Policy.

Marijuana, or the plant *Cannabis sativa,* has been used as a medicine, as a part of religious ceremonies, and even as a fiber for making clothing, rope, and paper for many thousands of years. It has also been used RECREATIONALLY in many cultures, both ancient and modern. Still, its effects on the brain and body are not yet completely understood. Scientists differ on how to classify the drug: Is it a hallucinogen like LSD (lysergic acid diethylamide), a narcotic like opium, or does it belong in a class by itself? (Entries on LSD and opium are included in this encyclopedia.) To further confuse matters, some scientists call marijuana a *stimulant,* or a substance that makes the brain and body more active, and some call it a *depressant,* or a substance that slows down brain and body processes. Whatever its properties, ORGANIC—or plant-derived—marijuana is illegal to possess or sell as a recreational substance.

The controversy over marijuana's role as a medicine for certain illnesses highlights the drug's strange history in American society. A small minority of Americans wants the drug to be made legal and sold under controlled circumstances, similar to the sale of alcohol. The U.S. government has made no move to legalize marijuana possession and, in fact, has tightened laws against it since the 1980s. People who buy, sell, or use marijuana for recreational purposes face many penalties if caught, including a permanent criminal record.

Overview

The earliest archeological evidence of marijuana comes from China. Twelve thousand years ago the plant was CULTIVATED there for many uses. Its fibers, known as HEMP, could be woven into

recreationally: to get high, not to treat a medical condition

organic: a term used to describe chemical compounds that contain carbon

cultivated: planted and tended with the intention of harvesting

hemp: cannabis plant matter used to make fibers

Marijuana, or the plant *Cannabis sativa,* has been used as a medicine, as a part of religious ceremonies, and even as a fiber for making clothing, rope, and paper for many thousands of years. *AP/Wide World Photos.*

sturdy clothing or rope, or even processed as paper. The Chinese also used the plant as a medicine for anxiety and physical pain. From China the use of the plant spread to India, where by 2000 BCE it had become part of religious ceremonies. The *Vedas,* a series of Indian religious writings, credits the god Shiva with introducing cannabis to humankind, to help relieve the soul from suffering. To this day, a mild marijuana preparation called *bhang* is used during holidays in India, just like Americans might toast in the New Year with champagne.

An Ancient History

In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger noted that Europeans had discovered and were using cannabis by the fifth century BCE. By the time Venetian traveler Marco Polo (c. 1254–1324) made his famous expedition to the Far East in the late thirteenth century, the drug was widespread throughout the Middle East, Asia, Europe, and Africa.

Different cultures used it in varied ways even then. Marco Polo records the legend of the "Old Man of the Mountain," a Muslim Middle Easterner said to have recruited assassins by intoxicating them with HASHISH, which is the solidified form of the drug. (The very word "assassin" is said to have roots in "hashish," but the story Marco Polo reports has never been verified.) In Europe as early as the Middle Ages (c. 500–c. 1500), hemp was planted for use as clothing and rope, and cannabis was used as medicine for illnesses as varied as menstrual cramps, labor pains, and headaches. Its recreational uses were understood as well, and in 1484 Pope Innocent VIII (1432–1492) said that hashish consumption was linked to Satanic rituals.

Grown on Plantations

As cannabis fell out of favor as a recreational drug, it grew in importance as a plant fiber. The era of exploring the world by sailing ship had dawned, and demand for canvas—another word derived from cannabis—grew rapidly. In 1533, King Henry VIII (1491–1547) commanded all English farmers to set aside part of their holdings to grow hemp. The plant was exported to the Americas, where it was first grown in Canada in 1606 and in Virginia in 1611. In the United States, it was used for making canvas and rope. However, written documents note that George Washington (1732–1799), the first U.S. president, not only grew cannabis but also used it to soothe his toothaches. According to the 1850 U.S. Census, the plant was grown on 8,327 plantations in the nation.

The renewed interest in recreational use of cannabis dates to the 1840s, when Egyptian hashish spread among the artistic communities in France and England as a drug of enlightenment (enhanced intelligence). At the same time, the medical community in Europe renewed its interest in the substance, recommending it for a wide variety of ailments from asthma and depression to EPILEPSY. Cannabis was also recommended to the mentally ill and to alcoholics and people with opium addiction. In the heyday of "cure-all" medicines during the early 1900s, marijuana extracts could be found in many over-the-counter remedies, sometimes mixed with opiates like morphine. (An entry for morphine is available in this encyclopedia.)

hashish: concentrated, solidified cannabis resin

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

The Tide Turns

In time, the tide of American opinion turned against marijuana. Some historians credit business tycoon William Randolph Hearst (1863–1951) with launching this crusade. Hearst, who

Marijuana Chronology

2737 BCE The emperor Shen-Nung of China composes an herbal encyclopedia, recommending cannabis as a painkiller.

2000-1400 BCE Indian priests compile the *Vedas,* a series of writings that detail the use of marijuana in religious ceremonies.

c. 500 BCE A funeral urn of this date, found in Germany by archeologists, contains cannabis seeds.

1307 CE In *The Book of Marco Polo,* Venetian traveler Marco Polo describes hashish use among religious sects in the Middle East.

1533 King Henry VIII of England commands his subjects to grow hemp (cannabis) for use in making ropes and canvas.

1611 Cannabis is first cultivated in Virginia.

1776 The U.S. Declaration of Independence is published on paper made from hemp.

1900 Cannabis extracts are available in more than thirty over-the-counter medications, used as painkillers, cough suppressants, and to soothe babies.

1936 The film *Reefer Madness* is released, showing teenagers becoming violent criminals under the influence of marijuana.

1937 The Marijuana Tax Act effectively ends legal production of hemp in the United States.

1970 The Controlled Substances Act places marijuana, hashish, and hash oil on the Schedule I list of controlled substances.

1985 Chemists create dronabinol, a synthetic version of the most powerful chemical in marijuana. Pill forms of dronabinol are sold as Marinol.

2004 Ten U.S. states have passed "medical marijuana" laws, allowing certain patients to possess small amounts of marijuana for relief of medical symptoms. Use of "medical marijuana" is challenged by the federal government in a case that reaches the U.S. Supreme Court.

2005 The U.S. Supreme Court, in the case of *Gonzalez v. Raich*, rules 6-3 that Congress has the authority to prohibit the possession of medical marijuana.

owned many major newspapers, also owned many thousands of acres of trees that he planned to turn into paper. As late as the 1880s, almost all American paper was made from hemp, and a great deal of hemp was still grown in the United States. (The U.S. Declaration of Independence was published on hemp paper.) Hearst capitalized on anti-Mexican prejudice and, through his newspapers, linked marijuana use to Mexican immigrants, crime, violent behavior, and poor job performance. It was the Hearst newspaper chain that changed the spelling of marijuana from its older form, marihuana. During this time, use of the word *cannabis* faded as well.

According to Hugh Downs, in a commentary for *ABC News* in 1990: "Nobody was afraid of hemp—it had been cultivated and processed into usable goods, and consumed as medicine, and burned

in oil lamps, for hundreds of years. But after a campaign to discredit hemp in the Hearst newspapers, Americans became afraid of something called marijuana." Downs also noted that the crusade against hemp "misled the public into thinking that marijuana and hemp were different plants."

Hearst's campaign was one of many waged against marijuana in the 1930s. Another important figure who changed American attitudes toward the drug was Harry Anslinger (1892–1975), head of the Commission of Narcotics during the Great Depression (1929–1941). Bolstered by scientific studies published in credible journals, Anslinger was able to convince state governments that marijuana use caused an increase in crime and violence, that it was addictive, and that its attraction to young people could lead to a lifetime of trouble. Hollywood seemed to support this view, issuing a series of hour-long dramas about marijuana, of which *Reefer Madness* (1936) is the best known. In *Reefer Madness* and other similar films, young, innocent people become violent, dishonest—or at least rather hysterical—victims of the "devil weed."

Following a series of congressional hearings, the U.S. government passed the Marijuana Tax Act of 1937. The act did not outlaw marijuana outright, but "created a tax structure around the cultivation, distribution, sale, and purchase of cannabis products, which made it virtually impossible to have anything to do with the drug without breaking some part of the tax law," wrote Cynthia Kuhn and her coauthors in *Buzzed: The Straight Facts about the Most Used and Abused Drugs from Alcohol to Ecstasy*. In other words, the 1937 law made it impossible to reap a legal profit from growing cannabis.

Illegal Experimentation

After World War II (1939–1945), a new generation of young people began to frequent urban jazz clubs, where the musicians often used marijuana and other drugs. Interest in recreational marijuana increased. As the teenagers of the 1960s and 1970s began using the drug in record numbers, they showed that many of the "scientific" claims made against marijuana in the 1930s were untrue. Marijuana, it appeared, did not cause violence or hysterical behavior. It was not particularly addictive, and it appeared to have few lasting effects on the user in the days and weeks following a dose. This finding led various people to mistakenly doubt *all* information they had received about illegal drugs, based on their own experiences with marijuana. This created a climate of illegal drug experimentation that has lasted into the twenty-first century.

Illegal marijuana is smuggled into the country in cars, trucks, trains, boats, and planes. This plane, used for smuggling marijuana from Jamaica, crashed into a swamp in Florida as it was being pursued by U.S. Customs and DEA officials. Some 800 pounds of the drug were onboard.

Such experimentation led to drugs flooding the BLACK MARKET and being sold illegally on the street.

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

Federal Government Labels Marijuana a Hazard

In 1970, the U.S. Controlled Substances Act named marijuana and its by-products, hashish and hash oil, as Schedule I controlled substances. This is the highest level of control, indicating a substance with a high probability of abuse and no medical benefit. Even in 1970 some members of the medical and scientific community felt that marijuana should not have been placed in the same category as drugs such as LSD and heroin. (Separate entries on LSD and heroin are available in this encyclopedia.)

By the end of the twentieth century, several medical uses for cannabis had been documented with full research evidence. These include being an appetite-enhancer in cancer and ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS) patients; a pain reliever in GLAUCOMA patients; and a muscle relaxant for those suffering from MULTIPLE SCLEROSIS, a degenerative disease of the central nervous system.

Chemists developed a synthetic (laboratory-made) tablet, dronabinol (manufactured as Marinol), that contains one of the chemicals found in marijuana. Dronabinol was introduced in 1985 as a Schedule II substance and has since been placed in the Schedule III category, making it as easy to prescribe as codeine. (An entry on codeine is available in this encyclopedia.) Still, some patients found that the dronabinol pills did not work as well as smoking cannabis.

Gonzalez v. Raich. By 2005, ten states had passed "medicinal marijuana" bills, allowing people with certain illnesses to grow or obtain enough marijuana for their own use. But these state laws for medical marijuana conflict with the federal laws against its possession. Late in 2004, two California women brought their petition for medical marijuana to the U.S. Supreme Court.

The Supreme Court case that concerned state laws on medical marijuana use, called *Gonzalez v. Raich,* was decided on June 6, 2005. The Supreme Court ruled 6-3 that Congress has the authority to prohibit the local cultivation of marijuana, even if it is used for medical marijuana, under federal interstate commerce laws. Under federal law, people in states that permit medical marijuana use will not be able to buy the plant form of marijuana or to grow it for their own consumption legally.

After the ruling on June 6, Oregon stopped issuing medical marijuana cards, given to patients with a doctor's prescription through the Oregon Medical Marijuana Program. However, the state continued to process applications. On June 17, 2005, Oregon's attorney general, Hardy Myers, stated that the program would begin issuing the medical marijuana cards again because the Supreme Court ruling did not affect the state's program. Myers did make it clear that though people using medical marijuana through Oregon's program will not be violating state laws, users could still be arrested and prosecuted by the federal government. In addition, Myers said that the state cannot protect patients' caregivers and those growing medical marijuana plants should the federal government decide to prosecute them.

acquired immunodeficiency syndrome (AIDS): an infectious disease that destroys the body's immune system, leading to illness and death

glaucoma: an eye disease that causes increased pressure within the eyeball and can lead to blindness

multiple sclerosis: a progressive illness that affects muscle tissue, leading to pain and inability to move

A medical marijuana patient joins other protesters in California outside the state's capitol in 2002. The group is protesting raids and arrests that have occurred in state-approved and licensed medical marijuana dispensaries.

What Is It Made Of?

Marijuana comes from two plants that are so closely related they are probably the same species. The plants are *Cannabis sativa* (marijuana/hemp), and *Cannabis indica,* a bushier variety grown simply for its psychoactive (brain-altering) qualities. Cannabis produces male and female plants, and both of them contain delta-9-tetrahydrocannabinol or THC, the main mind-altering chemical in marijuana. Female plants, especially those that are not

THC: the main active ingredient in cannabis

allowed to pollinate, or fertilize another plant, contain the highest concentrations of THC.

Marijuana smoke contains sixty-one different chemical compounds, called CANNABINOIDS, that are unique to the plant. Scientists are not sure exactly how these compounds interact with THC to produce the effects associated with a marijuana high. They do know that the most important mind-altering compound in cannabis is THC.

The cannabinoid compounds in marijuana can be found throughout the plant—in the leaves and stems, for instance. But the strongest concentrations of THC and other cannabinoids are found in the buds and flowering tops of the female plants. The time of harvest determines the amount of THC in the buds. Female plants that are kept away from male plants will not pollinate and produce seeds. Instead they keep producing flowers that contain a powerful resin—the plant's signal that it wants to pollinate. These resinous buds are the strongest form of marijuana, called SINSEMILLA (the Spanish term for "without seeds").

Purchased on the street, marijuana and sinsemilla are green or brown buds, leaves, or stems. The leaves and stems do not contain the concentrations of THC found in the buds and flowers, but people smoke them to get high.

Hashish is another product of the cannabis plant. It consists of the dried resin from the flower buds and is also very high in THC content. The resin is gathered by hand from the cannabis buds and rolled into gummy balls. Once a quantity of the balls has been collected, they are pressed together into larger cakes or sheets that resemble dark-colored dough. A highly powerful product, hash oil, is produced by boiling hashish or marijuana in a liquid that absorbs THC, such as alcohol, gasoline, or kerosene. The remaining plant material is filtered out, leaving behind thick oil. The color varies from clear to black, with yellows and browns in between. Hash oil contains the highest concentrations of THC. Just a drop or two on an ordinary tobacco cigarette will have an effect similar to smoking a whole dose of marijuana.

Chemicals in Cannabis

Cannabis contains 421 chemical compounds. Sixty-one of these are unique to the cannabis plant. When smoked, these chemicals work together in ways that scientists do not completely understand. The most important compound is delta-9-tetrahydrocannabinol (THC). A marijuana cigarette also contains tar, carbon monoxide, and cyanide—similar to a tobacco cigarette.

cannabinoids: chemical compounds found in cannabis plants and in small amounts in the brains of humans and animals

sinsemilla: literally, "without seeds"; buds from female marijuana plants carrying the highest concentration of THC

Marijuana Growers

Marijuana is grown throughout the United States, even though it is illegal. It is rare to find a state forest or national park anywhere

Members of the U.S. Navy and Marines inspect a small boat in the North Arabian Sea near the Persian Gulf in 2004. The military discovered more than 2,800 pounds of narcotics, including hashish, onboard. The raid was planned and carried out by U.S. and coalition forces during the war in Iraq. *AP/Wide World Photos.*

that has not been put to use by anonymous growers. Still, the bulk of the marijuana bought on America's streets comes from Mexico and—increasingly—Canada, where it is grown indoors under ideal conditions.

Hashish also arrives in the United States from Pakistan, Nepal, Afghanistan, and the Middle East. Since it is a federal crime to bring these drugs across U.S. borders, smugglers find many alternative ways to deliver the product into dealers' hands. Most of the Mexican marijuana that arrives in America comes by car or truck, hidden among legal products or even within the upholstery of a vehicle. One group of smugglers got caught trying to bring marijuana into Texas inside coffins.

How Is It Taken?

In order to produce psychoactive effects, marijuana must be heated. People cannot get high just by eating the raw plant material, unless they eat hashish or buds with the highest concentration of THC. Even so, the high produced will be lessened and will establish itself slowly, over a period of hours. Marijuana does not dissolve in water or other room-temperature solvents, so it cannot be injected.

The most common way to use marijuana is to smoke it. Small amounts of marijuana are rolled into cigarette papers and smoked. These are called "spliffs" or "joints." Pipes are also used, both the conventional sort that are made for tobacco and special ones just for marijuana or hashish. More elaborate pipes, called "bongs," pass the smoke through water as the user inhales. Bongs work with tobacco as well as marijuana, but vendors who sell them still run the risk of getting arrested for peddling drug paraphernalia (items used to deliver drugs into the system). Users also hollow out cigars and replace the tobacco with marijuana. These are called "blunts."

Marijuana, or more often hashish, is also baked into food, such as "hash brownies." The cooking process releases the same chemicals that are released while smoking. When eaten, baked hashish products can provide the strongest—and most unpredictable—high. Some users brew marijuana as a tea as well.

Are There Any Medical Reasons for Taking This Substance?

The U.S. government lists marijuana and its by-products as Schedule I substances, indicating that cannabis has no medical value. However, since the 1970s, marijuana has been used as a medicine for several specific conditions, although the legality of this use remains under debate.

Cancer patients who receive CHEMOTHERAPY, the use of chemicals to prevent or treat the disease, often suffer the side effects of nausea, vomiting, and loss of appetite. This can cause people who are already sick to lose weight and become more prone to secondary illnesses. Marijuana stimulates the appetite. Chemotherapy patients who use it are more likely to maintain body weight and suffer less from nausea.

The scientific evidence for these claims has led chemists to create a synthetic form of THC, taken as a pill called Marinol. However, the pills seem to have less effect than smoking the drug. Perhaps this is due to the fact that the pills have to be swallowed and digested, and this can be a problem for cancer sufferers. (Some cancer patients take

chemotherapy: a treatment for cancer that causes nausea, vomiting, and other side effects

A variety of medical marijuana products were offered for sale to those with prescriptions from doctors. Here, medical marijuana is shown in various formats, including cakes and cookies. *© Jeff Albertson/Corbis.*

Marinol pills prior to chemotherapy.) Also, the pills contain THC, but not the other cannabinoids. Most scientists believe that THC alone does not account for the appetite-enhancing qualities of marijuana.

Marijuana—and Marinol—are also used to enhance the appetite in patients suffering from acquired immunodeficiency syndrome (AIDS). People with AIDS sometimes "waste away" from lack of appetite. Maintaining nutrition can help them stay strong to fight infection. Again, doctors can prescribe Marinol, but the Schedule III drug is not as effective as smoked marijuana.

Evidence suggests that marijuana eases the pain and the symptoms of multiple sclerosis, a progressive disease that affects the muscles. It is also used for a disease of the eyes called glaucoma, where it helps to relieve painful pressure in the eye tissue.

Although it is not prescribed or indicated for use in depression or anxiety, marijuana has been used as a medication for those illnesses in the past. It is unlikely to be re-introduced for this use, however, given the number of modern prescription medications that exist for depression and anxiety.

Montel Williams on Medical Marijuana

Talk show host Montel Williams spoke on April 11, 2005, about how medical marijuana helps him cope with the symptoms of multiple sclerosis. "Patients struggling for their lives against such illnesses as [multiple sclerosis], cancer and AIDS should not be treated as criminals. We need to get beyond politics. We need more research into marijuana's medicinal effects, and we should heed the research already available." Williams added: "Because of medical marijuana, I am still alive—and leading a far more fruitful life than before." Shortly after making these remarks, Williams testified before Congress on May 5, 2005. One month later, the U.S. Supreme Court decided that medical marijuana use is illegal under federal law.

State vs. Federal Government

The several uses for marijuana as medicine have led some states to pass "medical marijuana" laws. Such laws allow patients with proven medical conditions to possess a small amount of marijuana without facing criminal penalties. These state laws openly contradict the federal law that makes possession of marijuana for any use a crime.

In 2005, a case based on this contradiction was heard by the U.S. Supreme Court. The federal government gained a limited victory in this case on June 6, 2005. The court decided that the federal government could prosecute patients for personal possession and cultivation of marijuana despite state medical marijuana laws. Yet the court did not overturn state medical marijuana laws. This means that although it is a federal crime to possess or grow marijuana, it is not a state crime in those states where medical marijuana has been made legal. According to *CNN.com,* "along with California, nine [other] states have passed laws permitting marijuana use by patients with a doctor's approval: Alaska, Colorado, Hawaii, Maine, Montana, Nevada, Oregon, Vermont and Washington. Arizona also has a similar law, but no formal program in place to administer prescription pot."

Chemists and pharmaceutical companies continue to research delivery systems for marijuana that will be considered legal (if covered by a prescription), including inhalers similar to those used by people suffering from asthma.

Usage Trends

Four in ten Americans have used marijuana at least once in their lifetimes. One in ten Americans reports using the drug at least once in the past year, and six in every one hundred Americans report using the drug at least once in the past month. These statistics come from the "2003 National Survey on Drug Use and Health (NSDUH)." According to the NSDUH report, 96.6 *million* Americans have tried marijuana at least once.

The 1999 "National Household Survey on Drug Abuse" reported that the age group *least* likely to have tried marijuana is people over seventy. The group *most* likely to have tried it is eighteen- to twenty-five-year-olds. A Youth Risk Behavior Surveillance System survey conducted in 2001 indicated that 23.9 percent, or just over two in ten people between the ages of ten and twenty-four, had used marijuana in the month before the survey took place. The 2001 survey reported that males were more likely to smoke marijuana than females, but the 2003 NSDUH report said that 53 percent of first-time marijuana users were female. The only large group showing less first-time use of marijuana was Asian Americans. Otherwise the drug is equally popular among African Americans, Caucasians, Native Americans, and Hispanic Americans.

In the 2004 *Monitoring the Future* study, 16.3 percent of eighth graders, 35.1 percent of tenth graders, and 45.7 percent of twelfth graders reported using marijuana at least once. And despite major efforts to find and punish dealers, 73.3 percent of tenth graders and 85.8 percent of twelfth graders noted that marijuana is "fairly easy" or "very easy" to obtain. Clearly, it is nearly impossible to pass through high school without meeting at least one person who uses or sells marijuana.

Although the U.S. government has maintained a policy of strong opposition to marijuana use, the drug has found an appeal across generations. People attending high school in the early part of the twenty-first century are more likely to have parents who tried marijuana than people who attended high school in the 1950s or 1960s. This translates to a more tolerant attitude among *some* parents toward marijuana use in their children. Nevertheless, the 2003 NSDUH survey did find that lifetime use of marijuana is declining among teens.

Effects on the Body

The human brain contains RECEPTORS, specifically for cannabinoids. The brain also produces its own natural cannabinoids, called anandamide (uh-NANN-duh-myd) and 2-arachidonylglycerol (AH-ruh-kid-ON-uhl-GLISS-uh-rol). These two compounds have been found in the brains of animals as well.

receptors: group of cells that receive stimuli

The most common way of using marijuana is to smoke it. Some users roll small amounts of the drug into cigarette papers. These marijuana cigarettes are called spliffs or joints. *Photo by Jim Pozarik/Getty Images.*

What Happens in the Brain

All of the cannabinoid receptors are located in the brain. There are no cannabinoid receptors in the spinal column, so using marijuana does not affect a person's ability to breathe or the function of other organs in the body.

When marijuana is smoked, THC and the other cannabinoids flow to the brain from the lungs, where the compounds are transferred into the bloodstream. The effects begin within minutes, generally with a feeling of light-headedness and euphoria (intense happiness). The user may become less inhibited, more outgoing, and laugh easily. At the same time, the user can experience a loss of motor control and difficulty concentrating. Since most of the cannabinoid receptors are located in the HIPPOCAMPUS, the center of memory and learning, people high on marijuana have difficulty learning new things or remembering what is happening at the moment. Marijuana does not destroy memories that already exist before the user gets high.

The typical marijuana experience is one of euphoria, heightened sensations of music and light, relaxation, and increased appetite.

hippocampus: a part of the brain that is involved in learning and memory

Sometimes, however, even the most experienced users will react differently. The drug can heighten anxiety and create PARANOIA—an uncomfortable feeling of danger or distress. When that happens, the user can do little but ride out the unpleasant experience, which usually happens within two to three hours.

The marijuana high gradually changes to a period of diminished physical activity and communication. The term "stoned" was coined to describe this period. In two to six hours the cannabinoid overload begins to exit the brain, usually causing a spike in appetite along the way. When users get hungry, they are said to have "the munchies."

It is not possible to smoke a fatal dose of marijuana. It *is* possible to consume too much THC by eating baked goods with hashish in them. Still this does not lead to death, but rather to a possibly unpleasant "trip" with paranoid or psychotic (extremely frightening) episodes. Again, no antidote to cannabis exists except trying to get the victim to vomit the undigested portion of the baked goods.

Effects on Judgment, Memory, and Learning

There is no such thing as a safe recreational drug. A person high on marijuana has the same lack of judgment, poor coordination, and diminished sense of fear as a person drunk on whiskey. The leading cause of death for young people is automobile crashes—and sometimes those fatal crashes are caused by marijuana, or a combination of marijuana and other drugs or alcohol. Marijuana impairs the ability to drive, operate machinery, or judge dangerous situations. As such, it can be deadly.

Because marijuana affects memory and learning, daily use can undermine a student's ability in school or a worker's capability on the job. Although scientists have debunked the old caution that marijuana affects motivation, the drug does affect short-term memory and the brain's ability to process new material. People who smoke marijuana regularly almost always experience declines in grades and difficulties in the classroom related to the drug use.

THC, the most active component of marijuana, remains in the body long after the psychoactive effects have worn off. The body stores THC in its fat cells. After one use, a person will test positive for THC for as many as three days. With regular use, a person can test positive for THC even after abstaining from marijuana for four weeks. The drug tests available at the turn of the twenty-first century were sophisticated enough that they do not yield a positive result for "passive" marijuana smoking (just being around other people who

paranoia: abnormal feelings of suspicion and fear

In late 2004 Australian police began stopping motorists randomly to conduct saliva tests. The test checks salivia for various illegal drugs, including marijuana and amphetamines. *Photograph by Trevor Pinder/Newspix/Getty Images.*

are using the drug). Thus, law enforcement officers will not accept that as a defense. As Paul M. Gahlinger stated in his book, "If the drug test is positive for marijuana, the only legitimate excuse is either the use of dronabinol or, if allowed, the use of medically prescribed marijuana."

What Happens in the Lungs

Marijuana smoke contains the same cancer-causing compounds as tobacco, including tar, benzanthrene (ben-ZANN-threen), and benzpyrene (benz-PIE-reen). Since marijuana smokers inhale more deeply—and because joints, pipes, and blunts do not contain filters—the user exposes the lungs to more of the cancer-causing agents. Smoking marijuana daily or even occasionally for a period of years increases the risk of lung cancer. Smoking both marijuana *and* tobacco greatly increases that risk.

Link to Mental Illness?

A study released in 2005 by the Office of National Drug Control Policy found that people who begin smoking marijuana at a young age—between ten and fourteen—run a high risk of mental problems later in life. The study found that between 8 and 9 percent of the general population develop serious mental illnesses in adulthood. For people who begin using marijuana before the age of twelve, the chances of developing mental illness leap to 21 percent. Two reasons could account for this. First, marijuana could have a bad effect on the developing brain. Second, someone tempted to use marijuana at such a young age might already be predisposed to have emotional or psychological problems. Also, a significant percentage of heavy marijuana users may be "self-medicating" to treat a variety of mental conditions. These conditions include anxiety, phobias, or depression.

Withdrawal from marijuana is not terribly difficult, even after heavy use. The symptoms of marijuana withdrawal include insomnia, anxiety, decreased appetite, and irritability. Usually these symptoms go away within a few weeks if the user does not return to the drug.

A "Gateway Drug"?

For several decades marijuana has been described as a "gateway drug"—one that leads users to experiment with more dangerous, more addictive substances. That theory has been dismissed, however. Most people use marijuana and then stop taking *any* illegal drugs. Far fewer progress to other substances. So it could just as easily be said that marijuana is an "end stage" drug. Again, the individual person's mental makeup determines whether or not marijuana use will lead to harder drugs. People with family histories of mental problems, alcoholism, anxiety, or depression should try to avoid *every* psychoactive substance, including legal ones like alcohol and nicotine. (Entries for alcohol and nicotine are available in this encyclopedia.) For anxious or depressed people, better treatments exist than marijuana use.

Reactions with Other Drugs or Substances

One of the biggest problems with any illegal substance is the variation in quality. Some sources say that marijuana produced in the twenty-first century is far stronger than that smoked in previous decades. Others say the doses are about the same. Whatever the case, each purchase of illegal marijuana carries dangers related to the

strength of the product, the possible by-products, and the methods of preparation. Outdoor-grown marijuana might have been sprayed with pesticides that still linger on the leaves and buds. The plants might also have fungus or even bacteria from the unclean hands that picked or packed them.

Dealers sell marijuana joints containing PCP, a hallucinogen, or crack cocaine. FRY STICKS are joints dipped in formaldehyde, a chemical compound used as a preservative and disinfectant. All of these combinations have proven fatal in users. In November of 2004, the Newark *Star-Ledger* reported the death of a seventeen-year-old who ran naked across a busy highway and hurled himself through a glass window after smoking a fry stick. The young man died of the injuries he sustained from crashing through the glass.

Mixing marijuana and alcohol heightens the effects of each substance and can lead to reckless behavior. Mixing marijuana with amphetamines or even tobacco can increase the heart rate, possibly causing heart damage or stroke.

Treatment for Habitual Users

More people are treated in rehabilitation programs for marijuana use than for any other drug. This is partly because more people are arrested for marijuana possession and ordered into treatment by the courts. Whatever the case, marijuana users—even heavy marijuana users—can usually free themselves of the drug fairly easily if they have no history of other drug or alcohol abuse. The situation becomes more complicated when marijuana has been combined with other powerful drugs such as cocaine or an opiate, like heroin or morphine.

Some people do become physically addicted to marijuana and experience withdrawal symptoms when they stop using it. For most people, use is a psychological habit and is sometimes a form of self-treatment for anxiety, depression, phobias, panic attacks, or other serious mental illnesses. When people find themselves spending more time buying, smoking, and becoming stoned on the drug than they do studying, socializing with friends and family, or working, they should seriously consider getting professional help to stop their marijuana use. Such help includes examination by a medical doctor and therapy with a psychologist or psychiatrist who can help find the root causes and proper treatment for the drug abuse. Self-help twelve-step programs such as Narcotics Anonymous also provide opportunities to beat the drug with the help of others who have experienced similar addiction problems.

fry sticks: marijuana cigarettes laced with formaldehyde, a chemical used to keep dead tissue from decaying

Consequences

Buying, selling, and using recreational marijuana is illegal. Penalties for marijuana possession vary from state to state and from country to country. The penalties are often based on the amount of marijuana found; whether the person intended to sell the marijuana; and whether the person was intoxicated at the time of the arrest. However, even first-time marijuana convictions can wreck a life. For instance, someone convicted of marijuana possession will lose any federal financial aid they might be receiving to attend college. (In contrast, theft conviction—perhaps of a laptop—does not automatically result in loss of financial aid.) In some states, employers are notified when someone is caught with marijuana. Almost half the states in the nation suspend the driver's license of anyone convicted of marijuana possession, though the length of the suspension varies from state to state and depends on the circumstances and number of offenses.

Judges usually sentence marijuana users to high fines, community service, and drug tests for up to a year, just with a first conviction. Second convictions, or possession with intent to sell, can land a person in jail. Judges can also order marijuana users into treatment programs. Whatever the penalties, the marijuana user has earned a criminal record that will impact future job opportunities, the ability to drive legally, and educational choices.

Legal consequences aside, long-term users of marijuana will find that it affects their ability to learn, remember, and concentrate. THC stays in the body long after the high has worn off, and it can continue to impact the brain. Additionally, some of the ingredients in a marijuana cigarette are known CARCINOGENS, or cancer-causing agents. People who smoke marijuana run a higher risk of lung cancer than those who do not.

Habitual use of marijuana can either mask or aggravate symptoms of mental illness. People prone to PSYCHOSIS, a severe mental disorder, can have bad reactions to a marijuana high. People who are depressed or anxious may lean on the drug to ease their symptoms, rather than find the professional help they need for their illnesses.

carcinogens: chemicals that can cause cancer in the body

psychosis: pronounced sy-KOH-sis; a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined

The Law

By the end of 2004, ten American states had passed "medical marijuana" laws. The details of these laws vary from state to state, but they usually require a doctor's written prescription for marijuana use and documentation of the illness for which the marijuana is

In the News: Marijuana Lollipops and a Secret Tunnel

In the summer of 2005, two marijuana-related stories made the headlines. The first involved manufacturers of marijuana-flavored lollipops. Sold under names such as Chronic Candy, Pot Suckers, and Purple Haze, these lollipops are flavored with hemp oil. The oil makes the candies taste like pot, but it does not bring on a high when consumed. Even though the products are considered legal, some convenience stores throughout the United States reportedly agreed to stop selling them. This action came after the city of Chicago banned them in mid-July.

Around the same time, a 360-foot-long tunnel used for transporting marijuana between Canada and the United States was shut down. The secret tunnel led from a hut on Canadian land to an opening underneath a house in Lynden, Washington, a town very close to the border separating the two countries. Canadian authorities knew about the tunnel's construction for several months and tipped off U.S. officials, who monitored activity in the area throughout the spring and early summer.

U.S. agents moved in and sealed off the tunnel after capturing evidence on tape of its use as a drug-smuggling passageway. Three men from British Columbia were arrested for importing marijuana into the United States. Two other individuals in the state of Washington were also arrested after being caught with approximately 100 pounds of marijuana from the tunnel in their vehicles.

recommended. In some states, patients carry cards that identify them as medical marijuana users. These users must either grow their own plants or find a state-sanctioned grower who can prove that the marijuana is only grown for medical use, and only distributed within the boundaries of that state. Doctors who misidentify patients and permit medical marijuana use where it does not apply face criminal penalties.

On June 6, 2005, the U.S. Supreme Court ruled that under federal law, even in states where "medical marijuana" laws existed, all use of medical marijuana was illegal. Yet later that month, Hardy Myers, Oregon's attorney general, said that under Oregon state law, medical marijuana cultivation and medical use was still legal. This meant that the state would not prosecute growers and users of medical marijuana, but that the federal government could, and the state could not offer protection against the federal laws.

All other use of marijuana in all states is considered a crime. Some states have very stiff penalties even for first-time users. Other states allow first-time users to pay fines and undergo drug testing and counseling. In New Jersey, for instance, the 2003 penalty for a first arrest on marijuana possession was $1,000 and a year of drug

testing. Students caught with marijuana lose any federal financial aid they might be receiving for college. If still in high school, the student will not qualify for federal financial aid.

Because marijuana is such a popular recreational drug, federal and state prisons are full of people who have been caught dealing it. Sometimes these dealers face longer jail terms than people convicted of armed robbery or manslaughter. Repeat offenders can be sent to jail for life.

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See also: Nicotine

Melatonin

Official Drug Name: Melatonin, 5-methoxy-N-acetyltryptamine
Also Known As: Mel, Melliquid, mellow tonin, MLT, somniset
Drug Classifications: Not scheduled

What Kind of Drug Is It?

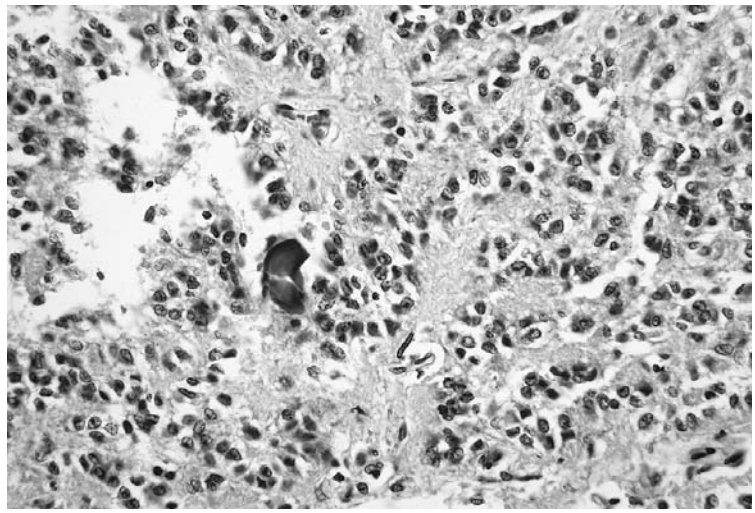
Melatonin is a dietary supplement sold without a prescription at U.S. health stores or through Web sites. It is sold primarily as a sleep aid because it induces sleep. Researchers have studied melatonin's potential benefits for certain conditions, such as insomnia (difficulty sleeping); jet lag; and even cancer (the uncontrolled, abnormal growth of cells that can lead to serious illness and death).

However, taking melatonin supplements has not been proven by scientific studies to be effective for any condition. Much more research needs to be done to prove the positive claims of melatonin use. Also, because it is considered a dietary supplement, it is not regulated by the U.S. Food and Drug Administration (FDA). This means that the supplements are not produced under the strict guidelines of the FDA, so their side effects and long-term effects are not clearly known.

Melatonin is a hormone—a substance created by the body to control certain bodily functions. It is found naturally in humans and other animals. It is secreted by the pineal (PY-nee-uhl) gland, which is located in the middle of the brain. Melatonin helps to regulate when animals, including humans, fall asleep and when they wake up. This sleep/wake cycle is known as the circadian rhythm (sir-KAY-dee-in RIH-thum), the twenty-four-hour sleep/wake cycle in humans and other animals. Some people believe that taking melatonin supplements can help alleviate problems that can occur when this cycle is disrupted.

Overview

Sleeping is a part of life. It allows the body to rest and repair itself after physical activity. Ruth Winter, writing in *The Anti-Aging Hormones: That Can Help You Beat the Clock,* stated that "most people need at least seven and a half hours [of sleep] to function adequately and be fully alert the next day, but some may need as little as five while others need nine to ten hours." Lack of sleep can cause a host of problems such as fatigue and poor mood. Thus, it is important to have a normal sleep/wake cycle for good health.



Melatonin is secreted by the pineal gland (shown here), which is located in the middle of the brain.

Melatonin plays an active role in maintaining a regular schedule for sleeping and waking. It induces sleep when it is secreted into the bloodstream by the pineal gland, a pea-sized gland that is part of the ENDOCRINE SYSTEM. Darkness stimulates its secretion, while light, both natural and artificial, inhibits it.

The Dracula of Hormones

Melatonin has been called the "Dracula of hormones" because, like the vampire Dracula, it only comes out at night. Usually around 9 P.M., after daylight fades away and darkness arrives, the pineal gland begins releasing melatonin, causing sleepiness and initiating a decline in body temperature. The hormone is continually released throughout the night as the body sleeps until about 9 A.M. the next morning, when it is light again. Peak production occurs approximately between 2 A.M. and 4 A.M.

In the morning, when light hits the RETINA, messages are sent to the HYPOTHALAMUS in the brain. In the hypothalamus, the messages find the suprachiasmatic (SOO-pruh-ky-uhz-MAH-tik) nucleus (SCN), prompting the SCN to send signals to the glands that control hormones, including the pineal gland. When the pineal gland receives a message from the SCN, it slows down the release of melatonin until darkness comes and it is time to sleep again. Daytime melatonin levels are so small they are usually undetectable. The decrease of melatonin in the morning signals the body temperature to rise, and the body feels awake and alert.

endocrine system: the bodily system made of glands that secrete hormones into the bloodstream to control certain bodily functions

retina: a sensory membrane in the eye

hypothalamus: a region of the brain that secretes hormones

Discovering Melatonin

For centuries, the function of the pineal gland was unknown. This was partly due to the fact that melatonin is created in very small amounts, smaller than any other hormone, and is hard to detect. In the 1950s, Yale University dermatologist Dr. Aaron Lerner was conducting research on skin pigmentation, or color. Thinking the pineal gland may be involved in skin pigmentation, he began the process of trying to isolate a molecule from this gland that he believed may be responsible for lightening skin. In 1958, Lerner was finally successful in isolating a molecule from the pineal gland.

Because the molecule is chemically related to melanin (skin pigment) and SEROTONIN, Lerner named his discovery melatonin. Though melatonin lightened the skin of frogs, it did not affect the color of the skin of humans. In the end, Lerner did not find a molecule that would help his research, but he did help answer the mystery of the pineal gland. He discovered a very powerful hormone that has helped researchers understand more about the human sleep/wake cycle.

After Lerner's discovery, other scientists began testing melatonin to see what benefits it may have. They found that injecting synthetic (human-made) melatonin into people could cause a tranquilizing effect and induce sleep. From there, more studies were done, and eventually melatonin was made into a dietary supplement that could be self-administered.

The Melatonin Craze

In the mid-1990s, when melatonin supplements became available without a prescription, a frenzy over the possible benefits of taking these supplements occurred. Some called it a "miracle" or "wonder" drug. Many praised it as an immune-booster, a youth serum, a cancer-fighter, and a cure for insomnia.

Various books were written about the wonders of melatonin. The craze eventually died down, and, as of the early twenty-first century, research has not been able to prove or disprove the benefits of melatonin. In 2000, University of Surrey's Josephine Arendt discussed the supplement. As quoted by Elizabeth Cohen in "Study Bolsters Melatonin Sleep Claims" on *CNN.com,* Arendt stated that "the hype and claims of the so-called miraculous powers of melatonin several years ago did a great disservice to a scientific field of real importance."

Melatonin as a Supplement

In 1994 melatonin became available over the counter as a dietary supplement. Manufacturers claimed melatonin could bring on sleep, ease jet lag, and more. Studies have been conducted and books written on the potential benefits of melatonin, but no one has been able to prove or disprove these claims. Most research suggests that melatonin can help regulate the sleep/wake cycle for conditions such as insomnia and jet lag, as well as problems from shift work (people working at night and sleeping during the day). It has also been regarded as an ANTIOXIDANT and an immune-booster. Some people believe it also combats aging.

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

antioxidant: a chemical that neutralizes free radicals (chemicals with an unpaired electron) that can damage other cells

The Trouble with L-tryptophan

Tryptophan is an essential amino acid from which melatonin is made in the body. It was once available as a dietary supplement, known as L-tryptophan. Much like melatonin, it was marketed as a sleep aid. However, in 1989, a batch of L-tryptophan pills (all made in Japan) was contaminated and caused 1,500 people to contract the disease eosinophilia-myalgia syndrome (EMS; pronounced ee-oh-sin-oh-FIH-lee-uh my-AL-jee-uh). EMS causes weakness, severe muscle and joint pain, headaches, fever, and shortness of breath. More than thirty people died from the disease in the United States. The FDA banned L-tryptophan, and from that point on Americans had to get tryptophan from food sources.

Some foods that contain tryptophan include the following:

- Almonds
- Bananas
- Chicken
- Cottage Cheese
- Eggs
- Ice Cream
- Milk
- Peanuts
- Shrimp
- Soy Nuts
- Tofu
- Tuna
- Turkey
- Yogurt

What Is It Made Of?

Melatonin is a hormone found naturally in the human body, in other animals, in certain plants, and even in some foods. It is made from tryptophan (TRIP-tuh-fan), an ESSENTIAL AMINO ACID. When tryptophan is ingested, the body turns it into serotonin that is then made into melatonin. The pineal gland is the primary location for melatonin production but the retina and intestines make small amounts as well.

Melatonin supplements are either synthetic (human-made) or natural (contain animal products). They are chemically identical to the melatonin that is produced by the human body. Some people think that using the natural melatonin, typically made from the pineal glands of animals such as sheep, run a greater risk of being contaminated by a virus. Therefore, the synthetic version is the most recommended and most popular form of melatonin. However, since the FDA does not regulate it, one can never be sure of the effectiveness, purity, or safety of the supplement.

As a supplement, melatonin consists of much higher amounts of the hormone than are naturally secreted at any one time in the body. A single dose is usually 500 micrograms to 5 milligrams per dose, more than 10 times higher than what is normal in the human body.

essential amino acid: an amino acid that is only found in food; amino acids make up proteins

A scientist wears a protective suit as he makes up a batch of melatonin in a laboratory in the United Kingdom.

Studies have not shown the high doses cause greater benefit or greater risk to the body. However, a doctor should be consulted before taking any supplement.

Age Factors

Before reaching puberty, children create the largest amounts of melatonin, with the highest levels between the ages of four and seven. At puberty, melatonin production begins to slow down and gradually decreases to an average of about 30 micrograms per day. Some researchers suggest that the decrease in the level of melatonin at puberty may be related to the fact that the child is maturing sexually.

Research findings have been inconsistent about whether or not melatonin continues to diminish with age. A number of scientists believe that melatonin production decreases as the body ages, which might explain why elderly people have greater sleep problems. However, a study by Dr. J. B. Fourtillan, published in the January 2001 issue

of *American Journal of Physiology,* indicated that the levels of melatonin did not differ between a group of 34 healthy adults over age 65 and a group of 101 healthy adults under age 30.

How Is It Taken?

Melatonin is sold over the counter as a dietary supplement. It is available in pill form (tablets or capsules), as a cream or tea, or as a lozenge that can be dissolved under the tongue. Time-release capsules are also sold. Such capsules release the melatonin slowly over time after the dose is ingested. Manufacturers provide a range of doses. A person should consult a physician about the proper dose and how long to take the supplement as results can vary for each individual. Typical doses fall in the range of 0.1 milligram to 10 milligrams. However, a noticeable difference in effectiveness usually is not seen in doses over 5 milligrams. A person normally takes melatonin only a few days at a time.

The time of day that the supplement is taken also plays an important role in melatonin's effectiveness. Usually, melatonin is taken right before bedtime. Taking melatonin during the day has minimal effect other than drowsiness. In the treatment of jet lag, it is recommended that melatonin be taken on the day of travel and then for a few days after arrival at the destination.

Are There Any Medical Reasons for Taking This Substance?

Many studies suggest that taking melatonin may have positive effects on a number of human ailments, especially sleep-related conditions. However, such studies have not shown that taking melatonin supplements will result in healing or prevention of these ailments. More research needs to be completed in order to really know what melatonin supplements can do for the human body.

Helping the Blind

As reported by Elizabeth Cohen on *CNN.com,* a study on the blind was conducted by scientists at Oregon Health Sciences University. The blind tend to suffer sleep problems due to their inability to detect the daily light and dark cycles. The study revealed that the blind had more regular sleep cycles after taking melatonin. The scientists concluded that melatonin could help the sleep patterns of those who can see as well. However, one of the scientists, Dr. Al Lewy, pointed out the importance of knowing when, how, and why to take melatonin.

"The concern I have," the doctor remarked, "is that people have been taking melatonin at the wrong time at the wrong dose for the wrong reasons."

Usage Trends

According to the Agency for Healthcare Research and Quality in "Melatonin for Treatment of Sleep Disorders," "Studies suggest that sleep disorders affect 50 to 70 million Americans, representing 20 percent of the population." Since naturally occurring melatonin induces sleep, many people take melatonin supplements to help combat these sleep disorders. Cohen claimed that in the year 2000 more than 20 million Americans took melatonin supplements to help regulate their sleep. In addition to taking melatonin for sleep-related problems, people may also be taking melatonin for its supposed benefits for a number of other conditions.

Insomnia

Insomnia is a sleep disorder in which a person has difficulty falling or staying asleep. As reported in "Melatonin for Treatment of Sleep Disorders," insomnia affects 6 to 12 percent of adults. Medical treatment for insomnia can include taking sleep aids, like benzodiazepines, in order to help the patient fall asleep. (A separate entry on benzodiazepine is available in this encyclopedia.) Relaxation techniques are also used. Some researchers believe that melatonin supplements can be used in the treatment of insomnia as well. However, other researchers have not found melatonin to have much effect at all on those suffering from insomnia.

There is some promising news for those who suffer from a form of insomnia called delayed sleep phase syndrome (DSPS). People with this condition have a sleep/wake cycle that has them set to fall asleep much later in the night, like 4 A.M., and rise much later the following day, like noon. According to "Melatonin for Treatment of Sleep Disorders," when taking melatonin supplements, the time it takes to fall asleep "decreased greatly in people with delayed sleep phase syndrome." This finding was considered "clinically significant." However, the time it takes to fall asleep only "decreased marginally in patients with insomnia," which was considered "clinically insignificant."

Jet Lag

People need to adjust their watches to the local time when they travel through time zones. But humans also need their body clocks, or sleep/wake cycles, to adjust to the local time as well. Being out of

Stanford University students are shown taking part in a research study on jet lag. They had their temperature and heart rate monitored after a flight from California to Tokyo. Jet lag—or being out of synch with the time zone—can result in feeling tired, being awake, or being hungry at odd hours of the day. *© Louie Psihoyos/Corbis.*

synch with the new time zone can result in feeling tired or awake or hungry at all the wrong times. An out-of-synch body clock, coupled with a lack of sleep during a flight that has crossed multiple time zones, can result in "jet lag." Symptoms of jet lag can include:

- Constipation or diarrhea
- Disorientation
- Dry cough, eyes, and skin
- Earache
- Fatigue
- Headache
- Impaired concentration, coordination, or vision
- Insomnia
- Irritability

- Loss of appetite
- Low mood
- Memory loss
- Nausea
- Sore throat
- Swollen feet

Melatonin supplements are thought to help reduce jet lag by helping the body clock more rapidly adjust to the new time zone.

Shift Work

A large number of people work during the hours that most people sleep. Having to be awake and alert during the time when the body normally should be sleeping can cause problems in a person's sleep/wake cycle. Melanie Johns Cupp in *American Family Physician* pointed out that in a "trial involving 27 shift workers, melatonin was found capable of 'resetting' sleep patterns to match the change in schedule in approximately one half of the patients tested."

Melatonin and Jet Lag

To help combat jet lag, according to *Health Services at Columbia: Go Ask Alice!,* it is suggested that a person take melatonin at the start of and during a trip at specific times in order to achieve the best results. If traveling east, a person, on the day of travel, should take one dose of melatonin between 6 and 7 P.M. of his or her normal time zone. At the destination, the person should take one dose of melatonin during the first five days at bedtime (between 9 and 10 P.M.) of the local time.

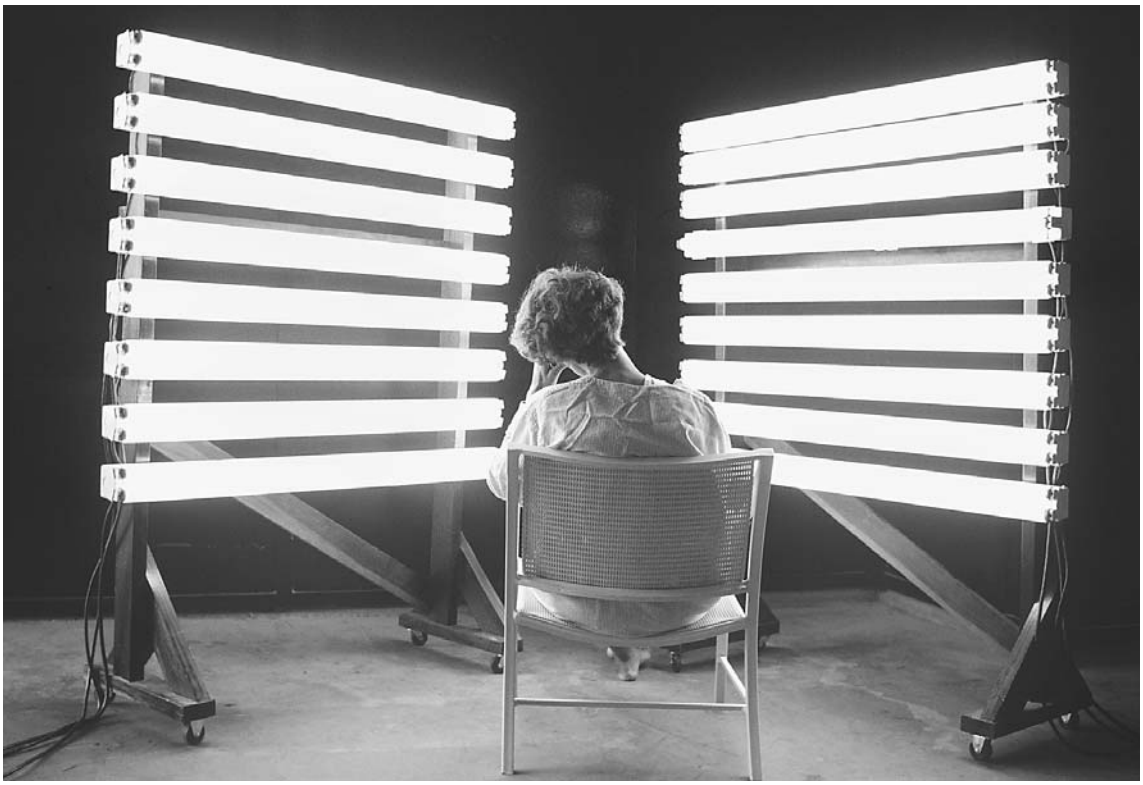
When traveling west, a person should take one dose of melatonin at the local bedtime after arriving at the destination, and continue to do so for the next four days. Melatonin has not been proven to help when traveling less than five time zones to the west.

Seasonal Affective Disorder (SAD)

Seasonal affective disorder, or SAD, is a mood disorder that causes depression in the winter months when the days are shorter and less light is available. Symptoms include low mood, irritability, fatigue, weight gain, and cravings for carbohydrates—like pasta, potatoes, or bread. Some researchers suggest that SAD is caused by elevated melatonin levels at the wrong times (i.e., not at bedtime) and that taking melatonin supplements may help regulate its production. Other studies have found melatonin does not help curb the symptoms of SAD and may actually make the symptoms worse. Light therapy (going outside in natural light or looking at artificial light) is another form of treatment for SAD sufferers.

Cancer

Researchers have studied a number of ways that melatonin may be helpful in fighting cancer. Some evidence suggests that melatonin may help regulate other hormones. Therefore, it may be helpful with cancers that are triggered by hormones like estrogen, such as breast cancer, or testosterone, such as prostate



Whether melatonin does or does not help curb the symptoms of seasonal affective disorder (SAD) is still debated. Light therapy (going outside in natural light or looking at artificial light) is also used to treat SAD. A mood disorder, SAD causes depression during the wintertime when there is less sunshine. *© Louie Psihoyos/Corbis.*

cancer. Melatonin has also been described as an immune-booster and antioxidant. Having a stronger immune system and a greater ability to fight off cancer-causing free radicals can aid in fighting cancer.

According to the University of Maryland Medical Center, other conditions thought to be improved by melatonin (although with limited or no research support), include: 1) osteoporosis—fragile bones; 2) menopause—a period in a woman's life in which menstruation ends; 3) eating disorders; 4) epilepsy—a disorder causing seizures; 5) heart disease; 6) inflammatory diseases; 7) attention-deficit/hyperactivity disorder (ADHD); and 8) sunburn. Others claim that melatonin can improve life span, aid a person trying to stop smoking, and help with benzodiazepine withdrawal.

Effects on the Body

Because research has not been able to prove or disprove the benefits of supplemental melatonin, it is difficult to pinpoint all of the effects it has on the body. If taken at the proper time, usually bedtime, melatonin has been shown to help regulate sleep. However, using too much melatonin or not using it according to directions could hinder instead of help the body's sleep/wake cycle.

Though found naturally in the human body, melatonin, if taken as a supplement, can have certain side effects. These include sleepiness, headache and dizziness, nausea, stomach cramps, irritability, and depression. Users claim it causes more intense dreams, even nightmares. Melatonin has also been found to prevent OVULATION. Some women have even used it to avoid getting pregnant. Overall, no serious side effects have been reported, and no long-term effects, negative or positive, have been proven.

The Fountain of Youth?

Some researchers believe that melatonin holds the key to a longer life. Walter Pierpaoli, William Regelson, and Carol Colman reported in their book *The Melatonin Miracle: Nature's Age-Reversing, Disease-Fighting, Sex-Enhancing Hormone,* that "melatonin is a potent age-reversing compound." They added that "we are confident that melatonin's primary benefit is in its ability to prevent disease by preventing the downward spiral that leads to illness." Their beliefs stem from research with mice, including studies that revealed mice that had improved health and longer lives as a result of taking melatonin. They also cited studies that showed older mice live longer when given pineal glands from younger mice and that the younger mice with the older pineal glands die at an earlier age. However, no studies on humans have been done that conclude that melatonin helps diminish the aging process.

Reactions with Other Drugs or Substances

Melatonin is not recommended for users who are taking antidepressants, corticosteroids (steroids used to counteract inflammation), blood pressure medication, or drugs that suppress the immune system, as it may reduce the other medicine's effects. Taking melatonin along with other sleep aids should be avoided although melatonin may be helpful in getting through withdrawal from the highly addictive benzodiazepines.

ovulation: the release of an egg from an ovary

Melatonin is a dietary supplement sold without a prescription at U.S. health stores or through Web sites. Its main use is as a sleep aid. © *James Leynse/Corbis.*

Withdrawal is the process of gradually cutting back on the amount of a drug being taken until it can be stopped entirely.

Melatonin has also been suggested as an aid in quitting smoking. In addition, certain drugs and substances have been found to lower the level of melatonin in the body. These include alcohol, caffeine, tobacco, some high blood pressure medications including beta-blockers, and anti-inflammatories such as ibuprofen. Amphetamines and cocaine may raise the level of melatonin in the body.

Treatment for Habitual Users

There is no treatment available for habitual users of melatonin. This supplement has not been proven to be an addictive substance, nor have any studies been conducted on whether or not a person can build up a tolerance to it or suffer any withdrawal symptoms when stopping its use. Tolerance is a condition in which higher and higher doses of a drug are needed to produce the original effect.

Consequences

Hormones are very powerful. They control the functions of many parts of the body naturally. Even though melatonin is considered a dietary supplement and is available without a prescription, it is important to consult with a physician before taking any hormones. A press release by Robert Sanders in *UCBerkeleyNews* notes that George E. Bentley, an assistant professor of integrative biology, has conducted research on melatonin and its effects in the brain. According to Bentley: "It really amazes me that melatonin is available in any pharmacy." He continued, "It is a powerful hormone, and yet people don't realize that it's as 'powerful' as any steroid. I'm sure that many people who take it wouldn't take steroids so glibly." Bentley noted that melatonin could have many unknown effects, but few data are available about how "it interacts with other hormone systems." (A separate entry on steroids is available in this encyclopedia.)

Research has shown some benefits in taking melatonin as a supplement, primarily for sleep disorders, but its long-term effects are unknown. Therefore, people who take melatonin do not know what it may do to their bodies over time.

Melatonin is not recommended for some people. Healthy children produce large amounts of melatonin, so they should not take melatonin as a supplement. Nor is it recommended for women who are trying to become pregnant because melatonin can inhibit ovulation. Also, since the effects of melatonin on babies are not known, melatonin should not be used by pregnant or nursing mothers. People with certain immune-system conditions, like the disease leukemia, should not take melatonin either.

Because melatonin is a dietary supplement, it is not regulated by the FDA. Since the manufacturers do not have to follow strict guidelines, they can be more relaxed about ensuring a high quality product. This puts the user at risk of ingesting substances not listed on the bottle label or taking an amount of melatonin that is not reflected accurately on the label.

The Law

Melatonin is neither an illegal drug nor is it monitored by the U.S. government. It is illegal to use it without a prescription in other countries. Under the U.S. Dietary Supplement Health and Education Act (DSHEA) of 1994, it is legal to sell melatonin as a dietary supplement in the United States. According to this Act, a dietary supplement:

- is a product (other than tobacco) that is intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance for use by people to supplement their diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients.
- is intended for ingestion in pill, capsule, tablet, or liquid form.
- is not represented for use as a conventional food or as the sole item of a meal or diet.
- is labeled as a "dietary supplement."
- includes products such as an approved new drug, certified antibiotic, or licensed biologic that was marketed as a dietary supplement or food before approval, certification, or license (unless the Secretary of Health and Human Services waives this provision).

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See also: Benzodiazepine; Herbal Drugs

Meperidine

Official Drug Name: Meperidine (meh-PER-ih-deen), meperidine hydrochloride, Demerol, Pethidine (PETH-ih-deen)
Also Known As: Demmies
Drug Classifications: Schedule II, synthetic opioid

What Kind of Drug Is It?

Meperidine (meh-PER-ih-deen) is best known by its brand name, Demerol. It is a synthetic opioid, meaning that it is a drug created by chemists to imitate certain medicinal qualities of opium, a drug made from flowers called opium poppies. Opioids are NARCOTIC drugs that cause drowsiness and mood changes by interacting with the nerve cells in a person's brain. They can cause physical addiction with extended use. Physical addiction occurs when the body becomes dependent on a particular chemical substance or a combination of chemicals.

Opioids are controlled substances. This means they are available only with a doctor's prescription. Meperidine is a narcotic analgesic, or pain reliever. It is most commonly used in hospitals for patients who have just had surgery.

An analgesic is any chemical substance that has the ability to control or relieve pain. Many familiar analgesics, including acetaminophen (Tylenol), aspirin, and ibuprofen (Advil; Motrin), are sold in drugstores without a doctor's prescription. These over-the-counter (OTC) drugs must be taken with care to avoid unpleasant or dangerous side effects, but they do not have the power to create physical or PSYCHOLOGICAL ADDICTION.

By contrast, meperidine and other narcotic analgesics are highly addictive substances. They are legal but controlled substances. The only people who are supposed to have access to them are those whose doctors have prescribed the medications to treat specific medical conditions. Some other well-known prescription analgesics include hydrocodone (brand name, Vicodin) and oxycodone (brand names, OxyContin, Percocet, and Percodan). (An entry on oxycodone is also available in this encyclopedia.)

As of 2005, drug treatment counselors and law enforcement officials were alarmed at the increasing use of prescription-only opioids such as hydrocodone, meperidine, and oxycodone for illegal, nonmedical purposes. Among those most likely to abuse drugs like OxyContin, Demerol, and Vicodin are teens and young adults who engage in RECREATIONAL DRUG USE, to experience the mood-altering effects of the drugs. Other abusers of prescription drugs include

narcotic: a painkiller that may become habit-forming; in a broader sense, any illegally purchased drug

psychological addiction: the belief that a person needs to take a certain substance in order to function

recreational drug use: using a drug solely to achieve a high, not to treat a medical condition

Prescription Drug Abuse by Teens

The abuse of prescription drugs by teens has increased dramatically in the twenty-first century. Did you know that:

- Nearly one out of five teenagers has taken Vicodin to get high.
- In 2004, teens were more likely to use a prescription drug than a so-called "street" drug to get high.
- Some middle and high school students falsely believe that prescription painkillers are safe to use as recreational drugs.
- These same students also believe that using prescription drugs to get high is not illegal.
- Some students misuse prescription drugs in an attempt to enhance their athletic performance.
- Hundreds of Internet sites offer prescription drugs to anyone with a credit card; 90 percent do not always verify the age of the buyer.
- Prescription drug sales have climbed 400 percent since 1990, in part due to "doctor shopping."
- "Doctor shopping" is the practice of finding a doctor who will write illegal prescriptions, or of getting prescriptions for a particular drug from more than one doctor at a time.

individuals who have become physically addicted to an opioid after using it to treat a legitimate medical condition.

Overview

Narcotic analgesics are prescribed by doctors to treat moderate to severe pain. The first narcotics were opiates, which are any drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy. Opiates tend to decrease restlessness, bring on sleep, and relieve pain. Opium is a plant-based, chemically complex drug that has been used for thousands of years as medicine and as a recreational drug. Although it does block pain, it is highly addictive. The intensity of its effects is difficult to regulate from one use to the next, which makes it impractical as a pharmaceutical drug.

One of the chemical components of opium is morphine, an addictive opiate that is used to kill pain and bring on relaxation and sleep. In 1806, German chemist Friedrich Sertürner (1783–1841) was finally able to isolate pure morphine from opium. This resulted in the first pure, highly effective analgesic (painkilling) drug for medical use. In 1832, codeine, the other major chemical in opium, was isolated and used as medicine. Both drugs are still in use, individually and in combination with other drugs, because they are very effective pain relievers. However, both are also highly addictive. That is why researchers have continued to try

to develop better opiate-like drugs—that is, drugs that possess the pain-relieving power of morphine and codeine, but with fewer negative effects.

One of the first wholly synthesized opioids—or opiate-like drugs—was meperidine. It was first created in the 1930s. It was produced from human-made chemicals, rather than from any part of the opium poppy. Meperidine is still in medical use today.

More About Opioids

Semi-synthetic opioids are drugs that are synthesized with one of the natural opiates, morphine or codeine. Examples of these are hydrocodone (Vicodin) and oxycodone (OxyContin). Both the synthesized and semi-synthesized opioids are drugs specifically created to produce effects similar to opium. They each have particular benefits and drawbacks. Morphine and codeine are still used, however, because researchers still have not found anything that works quite as well as the natural opiates themselves. In addition to their pain-relieving characteristics, opiates and opioids also have something else in common: They are all physically and psychologically addictive to one degree or another. Scientists are still working to try to find a chemical compound that will function as effectively as an opiate-like substance without the dangers of addiction.

What Is It Made Of?

Meperidine hydrochloride (the drug's full name) is a synthetic opioid. It is created through the reaction of two chemicals: *dichlorodiethyl methylamine* (pronounced di-KLO-ro-di-eh-thyl meh-thyl-A-mine) and *benzyl cyanide*, an oily, colorless liquid. The chemical name for the resulting white crystalline substance is *ethyl 1-methyl-4-phenyl-isonipecotate hydrochloride*.

Meperidine is synthesized exclusively from laboratory-made chemicals, and not from any part of the opium poppy. That is why it is called a totally synthetic opioid. By contrast, other well-known narcotics that imitate the effects of opium are said to be semi-synthetic opioids. These drugs are produced with one of the naturally occurring opiates as a starting material. Natural opiates include codeine and morphine. A chemical modification of codeine, another opiate, results in hydrocodone, a highly addictive but effective painkilling drug. By contrast, a chemical alteration of morphine results in heroin, a dangerous and highly addictive narcotic that has no legal use and none of the benefits of narcotic medications.

How Is It Taken?

Meperidine is taken orally or injected. The oral forms of the drug include tablets and syrup. Tablet sizes range from 25 milligrams to 100 milligrams per tablet. The syrup form contains 50 milligrams of meperidine per 5 milliliters of liquid. A typical oral dosage of meperidine is 50 milligrams to 150 milligrams every three to four hours.

The body responds to meperidine more quickly when it is injected, so those dosages are usually about half that of the oral forms of the drug. Injections may be given in the muscle, under the skin, or directly into the bloodstream. Doses are usually given every three to four hours, although an INTRAVENOUS (IV) administration of meperidine is often maintained at a low, continual therapeutic dose.

Hospitalized patients receiving meperidine for pain control after surgery sometimes use a system called patient controlled anesthesia (PCA). A PCA machine allows a specific amount of meperidine to be administered intravenously each hour. However, the patient has control over when the medicine is dispensed. This reduces the need for a nurse to give the patient an injection every three to four hours, and it keeps the drug at a more constant level in the body for better pain relief. The PCA machine is programmed so that it cannot give the patient too much of the drug. This prevents the potential for an overdose.

Meperidine is abused by people used to taking nonprescription street drugs. Sometimes they crush the meperidine tablets and then chew, snort, or dissolve the drug in a liquid and inject it. Misusing meperidine can dangerously affect the way the body processes the drug.

Are There Any Medical Reasons for Taking This Substance?

Demerol, the brand name for meperidine, is one of the most commonly used narcotic analgesics in U.S. hospitals. It is used to treat moderate to severe pain, especially immediately after surgery. It is sometimes used together with anesthesia before and during operations. Meperidine is also frequently given to pregnant women during labor and delivery. It is not recommended for treating pain in infants and small children or the elderly.

For several reasons, meperidine is used in hospitals more than it is prescribed for at-home use. First, it is more effective in treating the acute (immediate, short-term) pain that follows surgery than the chronic (longer-lasting, ongoing) pain that a patient might experience during recovery at home. It is also eliminated from the body quicker than other opioids, which means that it must be taken more often than other narcotic drugs in order to maintain pain relief. This rapid

intravenous: injected into a vein

Designer Meperidine

In the early 1980s, a new drug was created that imitated the chemistry and effects of meperidine. This so-called "designer" meperidine was known as MPPP. It was manufactured in illegal drug labs where mistakes and unreliable conditions sometimes led to unintended results. One such consequence was the contamination of MPPP with a poisonous chemical by-product called MPTP. This is a toxin that can destroy nerve cells in certain parts of the brain.

When people ingested the MPPP that had been tainted with MPTP, they suffered neurological symptoms that mimicked Parkinson's disease. Their muscles became rigid and they exhibited uncontrollable twitching. The damage was permanent.

The dangerous "designer" meperidine was one of many drugs called "analogs," which means they were created specifically to be similar to, but not exactly like, other drugs. Why was this done? Because illegal drug labs could sometimes avoid Drug Enforcement Administration (DEA) consequences by making drugs whose specific chemical formulas were not listed on the Schedule of Controlled Substances. Illegal drug manufacturers could get away with making a drug that acted like a highly controlled substance, but had a slightly different chemical structure than the regulated drug. For a time this was not illegal.

In 1986, however, legislation was passed to stop this practice and make the manufacture of analog drugs illegal. It was finally against the law to create a drug that was designed to produce effects similar to any drug already listed as a controlled substance.

elimination of the drug also means that its pain-relieving effects are not as consistent as those of other opioids.

Usage Trends

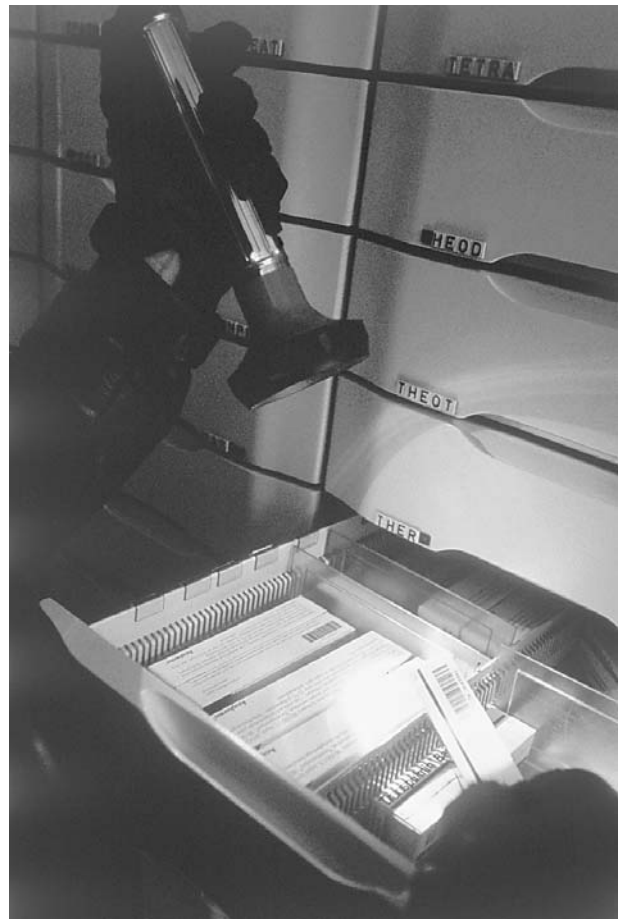
Meperidine is a prescription drug with both legal and illegal usage trends. Meperidine was, and is, particularly useful for the treatment of acute pain, but it is not as effective in controlling chronic pain. Newer synthetic and semi-synthetic opioids include chemical compounds that relieve pain for longer periods of time, but many of the side effects are similar.

Although meperidine is still used in hospitals and emergency treatment settings, Drug Enforcement Administration (DEA) figures show that between 1990 and 1996, the legitimate medical use of meperidine in the United States decreased by 35 percent. Worldwide, the legitimate use of meperidine dropped 20 percent between the early 1980s and 1999. The decline in usage of meperidine is

related to the development of newer opioids that are safer and longer lasting than meperidine.

Street usage of meperidine became a law enforcement issue during the 1980s, when it was frequently used as a substitute for heroin. In particular, two meperidine analogs, or imitation drugs, became popular: MPPP and PEPAP. Heroin users like MPPP because it produces a heroin-like EUPHORIA when it is injected. The creation of these analogs is now completely illegal. This occurred, in part, because during the 1980s street drug labs produced an analog that contained MPTP, a poison that caused serious and irreversible neurological damage in users.

Among opioids, Demerol (brand name of meperidine) is not as frequently prescribed outside hospital settings as Vicodin and OxyContin, so its abuse is not as widespread or well-publicized as the abuse of these other drugs. Demerol is more readily available to medical professionals—doctors, nurses, pharmacists or others who work in a hospital or emergency care clinic—than to others. It is sometimes stolen from ambulances or stand-alone emergency care facilities through street robberies or "inside" thefts perpetrated by employees.



Demerol and other drugs are sometimes stolen from hospitals or emergency care clinics, ambulances, or pharmacies. © *Pinto/Gulliver/Corbis.*

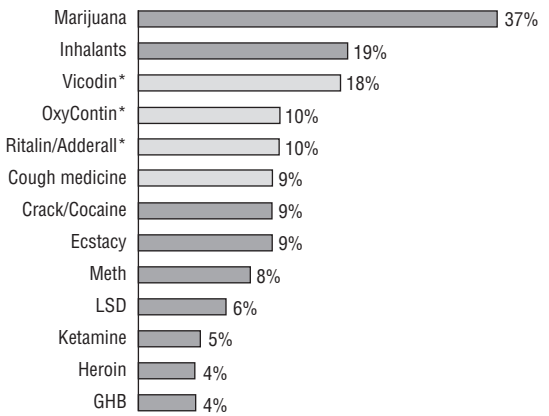
Prescription Drug Abuse Grows

The illegal use of prescription drugs, including opioids like meperidine, is a large and growing segment of the complete drug abuse picture. Several nationwide studies track the use of both legal substances (prescription medications and over-the-counter, or OTC, drugs) and illegal drugs such as marijuana and cocaine. The National Household Survey on Drug Abuse (NHSDA), which is conducted by the U.S. Department of Health and Human Services, collects yearly statistical data on five drug groups. These include: 1) marijuana and hashish; 2) psychotherapeutic drugs, which are generally prescription drugs that can be used illegally to get high; 3) cocaine and crack; 4) hallucinogens, which are substances that bring on hallucinations, which alter the user's

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

New trends in substance abuse, 2004

Percentage of teens who have ever tried



*That a doctor did not prescribe them
Note: Light gray graphs indicate the new category of drugs (Rx and OTC medications) that teens are using increasingly to get high.

SOURCE: Table 1, "Generation Rx: National Study Reveals New Category of Substance Abuse Emerging: Teens Abusing Rx and OTC Medications Intentionally to Get High," *The Partnership for a Drug-Free America Web site,* New York, NY [Online] http://www.drugfree.org/Portal/About/NewsReleases/Generation_Rx_Teens_Abusing_Rx_and_OTC_Medications [accessed May 25, 2005].

perception of reality; and 5) inhalants. Psychotherapeutic drugs include stimulants, sedatives, TRANQUILIZERS, and pain relievers. Meperidine and other opioids make up the majority of the pain relievers in that group.

In 2003, the NHSDA found that 4 percent of all people between twelve and seventeen reported that they had used some kind of psychotherapeutic medication during the previous month for a nonmedical—illegal—purpose. More than 9.2 percent in that age group reported such use at any time during the year. In 2003, 6 percent of individuals between eighteen and twenty-five reported nonmedical use of prescription drugs in the month prior to the date on which they were surveyed. That was up from 3.6 percent in 2000 and just 1.6 percent in 1994.

According to the NHSDA's 2000 study, approximately 1.6 million Americans used prescription pain relievers nonmedically for the first time in 1998. During the 1980s, there were generally fewer than 500,000 first-time users per year. The trend shows steadily rising numbers of people using prescription drugs for nonmedical use.

New Generation of Abusers

Another yearly study is conducted by the Partnership for a Drug-Free America. In April 2005, the Partnership released the results of its seventeenth annual national study of teen drug abuse. The 2004 Partnership Attitude Tracking Study (PATS) reported that one of every five teenagers has used a prescription painkiller as a recreational drug. The most frequently abused brand-name opioids were Vicodin (reported by 18 percent of respondents) and OxyContin (reported by 10 percent of respondents). These are narcotic analgesics whose nonmedical effects on users are similar to those of meperidine (brand name Demerol). Overall, teen misuse and abuse of prescription drugs, including opioids, is growing rapidly. As a result, teens were given the nickname "Generation Rx."(See chart on this page.)

Teens are drawn to the use of prescription drugs for a variety of reasons, including ease of availability, relatively low cost, and a perception that the pills are harmless because they are legal.

tranquilizers: drugs such as Valium and Librium that treat anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens)

Generation Rx

"Rx" is a traditional abbreviation for the word "prescription." "Generation Rx" is a term coined in 2005 to reflect the soaring popularity of prescription drugs among teens. This nonmedical, and illegal, use of drugs such as Ritalin, Vicodin, OxyContin, Xanax, and Valium is sometimes called "pharming" by drug counselors and by teens themselves.

The phenomenon is not limited to teens, however. Well-known public figures including actors Matthew Perry and Melanie Griffith and athletes Brett Favre and Darryl Strawberry have publicly battled addictions to the prescription painkiller Vicodin. In October 2003, radio personality and former ESPN sports analyst Rush Limbaugh entered a treatment center to deal with his addiction to OxyContin.

While adults often become addicted to pain pills after using them for a legitimate medical reason, teen use of the drugs is typically more recreational. If there is no legitimate medical need to get a prescription from the family doctor, some teens resort to stealing pills from medicine cabinets at home or order them from Internet pharmacy sites.

Teens mistakenly believe that because these are brand-name drugs, manufactured by legal pharmaceutical companies, they are safe. Teens often do not realize how dangerous it is to mix prescription drugs with alcohol, or to combine different drugs "to see what happens." Even adults frequently are not aware that large quantities of the over-the-counter medicine acetaminophen—commonly known as Tylenol—can cause liver damage. This is important to know because one of the main ingredients in Vicodin is acetaminophen.

Students often do not realize, either, that the nonmedical use of prescription medicines is against the law. "Generation Rx" teens who commit crimes related to the abuse of prescription drugs not only risk addiction or other physical consequences, they also face job loss, jail time, or being denied access to scholarships and other financial aid to further their post-high school education.

According to Carol Falkowski, a drug researcher at Hazelden, a well-known substance abuse treatment center in Minnesota, young drug users often prefer prescription drugs because they believe they are "cleaner, safer and less illegal." Teens also admit that they find prescription drugs more attractive than other substances because they are not as likely to leave signs of use, such as the visible disorientation of being drunk or the odor that results from smoking marijuana.

Effects on the Body

Physical pain occurs when illness or injury causes pain signals to be transmitted to the brain through nerve cells in the body. The pain-relieving effect of an opioid like meperidine is produced when

Some schools and communities seek to prevent young people from turning to drugs, alcohol, and tobacco. They offer life skills training programs so students can build self-esteem and confidence, set goals, and learn how to cope with peer pressure and avoid addiction. *© Mark Peterson/Corbis.*

the drug blocks these signals by interacting with proteins called opioid receptors that exist on the surface of nerve cells. The chemical relationship is something like keys and locks. The narcotic drug fits into the receptor proteins and opens a pathway for chemical changes that reduce the ability of the nerve cell to transmit pain signals. When this happens, fewer pain signals are received by the brain, which means that the person taking the drug feels less pain.

If opioids are used when one is not in pain, the chemical changes in the nerve cells and the brain can produce feelings of euphoria, or a state of extreme happiness and well-being. When this occurs over a period of time, the nerve cells become tolerant of the effect, which means that more of the chemical substance is needed to produce the same sensation. Over the course of time, the body also becomes

addicted to the basic chemical action of the drug. Thus, if the drug is discontinued, the user experiences unpleasant physical symptoms of drug WITHDRAWAL.

Addiction Problems

Opioids can also cause psychological addiction or dependence. This is present when a person craves a drug and feels a compulsive need to take it, no matter what the consequences may be. This is what drives many people to commit crimes ranging from fraud to robbery in order to acquire the prescription drugs on which they are dependent. They become psychologically addicted to the emotional sensations that accompany the physical effects of the drug. Psychological addiction generally does not occur when people use prescription opioids for long-term, chronic pain. However, it is possible for legitimate use to turn into abuse in individuals who have developed physical dependence when their doctors decide that prescription narcotics are no longer appropriate as treatment. This is what has happened to many people who have become hooked on these painkilling drugs that were prescribed for them for long-term use after surgery or an injury of some kind.

Meperidine is generally used to treat acute pain, so medical use does not usually lead to either physical dependence or tolerance. Prescription users of meperidine do not need more and more of the drug to get the needed level of pain relief. However, when the drug is used specifically to get high, users typically develop both physical tolerance and addiction and psychological addiction. This means they not only crave the drug and physically need more of the drug just to get high, they also need to keep taking the drug to avoid the discomfort of chemical withdrawal.

When a person who is addicted to the physical aspects of a drug suddenly stops taking that drug, withdrawal symptoms occur. Opioid withdrawal is not life threatening, as is sometimes the case with the physical withdrawal from some heavily used substances, such as alcohol and barbiturates. It is unpleasant, however. Short-term withdrawal symptoms include anxiety, yawning, sweating, abdominal cramps and diarrhea, chills and "goose bumps," and a runny nose. Symptoms begin to appear about four or five hours after the last dose. They are at their most intense between thirty-six and seventy-two hours later, and are generally over within a week or ten days. Complete detoxification and recovery from physical addiction can take six months or more.

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

Side Effects of Meperidine Use

Even when meperidine and other opioids are taken under medical supervision, side effects can occur. Opioids relieve pain by temporarily altering the function of nerve cells. In addition to reducing one's pain, this may also cause mental confusion, drowsiness, dizziness and/or nausea, constipation, sweating, low blood pressure, or a slow heartbeat. More serious effects include convulsions and respiratory distress. These most frequently occur if the drug's dosage is too high, or if a patient combines meperidine with alcohol or other drugs.

Patients with kidney or liver disease may be at risk of nervous system damage if they use meperidine for a significant length of time. A by-product of meperidine called normeperidine is broken down in the liver and excreted by the kidneys. Someone with impaired function of either organ may develop high levels of normeperidine, which can be toxic (poisonous) to the nervous system.

People with a history of seizures, or those who have experienced recent head trauma, which puts them at risk of a first seizure, should avoid the use of meperidine. This is because meperidine presents a higher risk for seizures than other opioids. Other serious, but rare, neurological side effects include delirium, hallucinations, and tremors. Allergic reactions to meperidine are unusual, but severe cases can cause symptoms such as cold, clammy skin, generalized weakness, respiratory arrest, and unconsciousness or coma.

Reactions with Other Drugs or Substances

Because meperidine acts as a central nervous system depressant, no other similarly acting substance should be taken with meperidine, unless it is under the close supervision of a physician. Alcohol is a prime example of this. So are drugs known as sedatives, which are used to treat anxiety and calm people down. A large enough dose of any opioid, including meperidine, can stop a person's breathing completely, resulting in death. In combination with alcohol or sedatives, this reaction can occur at much lower doses.

Drugs to be avoided while taking meperidine include most ANTIHISTAMINES, sleeping pills, and any drugs that are in the same classification as Valium. Several types of antidepressants should be used with great caution or not at all in combination with meperidine. These include tricyclics (brand name examples include Elavil and Aventyl); SSRIs (selective serotonin reuptake inhibitors; some name brand examples include Prozac, Zoloft, and Paxil); and MAOIs (monoamine oxidase inhibitors; examples include Marplan and Nardil). Even moderate therapeutic doses of meperidine

antihistamines: drugs that block *histamine,* a chemical that causes nasal congestion related to allergies

administered up to two weeks after a patient has used an MAOI-class drug can result in unpredictable and severe reactions, including coma and death.

Treatment for Habitual Users

Meperidine is a highly addictive, Schedule II opioid narcotic. A high potential for addiction usually means that long-term use is risky. Long-term use may be measured as years of continual use, or as a repeating cycle of periods of use interrupted by times when the drug is not being used. The longer a narcotic drug is used, the more likely it is that a person may need help to quit using it. People who become addicted to drugs like meperidine or other prescription painkillers are less likely than users of street drugs to seek assistance in withdrawing from taking the drug.

When an opioid is suddenly discontinued after a long period of use, serious and uncomfortable withdrawal symptoms generally occur. Most people who manage to overcome an addiction to meperidine do it on their own, but many cases require professional help. Symptoms of physical withdrawal from meperidine may include restlessness, pain in bones and muscles, insomnia, diarrhea, a runny nose, chills with goose bumps, and involuntary leg movements. Symptoms of psychological addiction include becoming severely depressed and having an almost uncontrollable craving or desire for the drug.

For a chronic addiction, meaning drug use and addiction that has lasted more than a year, methadone may be used in a medically supervised withdrawal process. (An entry on methadone is also available in this encyclopedia.) Methadone is another opioid. It is used in progressively smaller doses to help users break free of addictions to more powerful drugs. Methadone helps reduce withdrawal symptoms, including the craving of another opioid, and it has fewer side effects than other opioids.

An Alternative Treatment

Since 2002, drug treatment specialists have experimented with a new drug called buprenorphine (BYOO-preh-NOR-feen). One day it might replace the use of methadone to treat withdrawal symptoms. Early results are promising, but access to the drug is still strictly limited by government control.

Researchers are hopeful that buprenorphine can help people break free of addiction to opiates such as heroin and codeine, and to opioid pain pills like Demerol, Vicodin, and OxyContin. Also known by the names Suboxen and Subutex, the drug has similar

effects on the body as methadone but it is not as addicting as other opiate or opioid-like drugs. Controlled doses of buprenorphine help people withdraw from their addiction to drugs like heroin and Vicodin without some of the complications of methadone treatment. Doctors who have used buprenorphine consider it a successful treatment option and they wish more patients could benefit from it.

According to federal law, only doctors who earn special certification from the Drug Enforcement Administration (DEA) are allowed to prescribe buprenorphine. In addition, the law specifies that each certified doctor or group practice is limited to treating thirty patients at a time with the drug. By early 2005, only 4,850 of 600,000 U.S. doctors—fewer than 1 percent—had earned certification to dispense the drug. Of those, only 1,500 had treated patients with it.

Cost of Abuse

At between $300 and $350 per month for treatment, buprenorphine is expensive, and many insurance companies will not pay for it. However, people with pain pill addictions often spend more than $300 every month to support their habits. Plus, the true cost of addiction can include the breakup of a marriage or family, the loss of a job, and a criminal record.

What is the best balance between controlling access to the drug and making it available to all who need it in a treatment setting? The DEA wants to maintain close restrictions on the use of buprenorphine to prevent a possible new drug abuse "epidemic." Doctors who use it to treat patients with opioid addictions want to be able to help more people, and sooner, rather than later. While the waiting lists grow, doctors and other addiction treatment professionals will have to work with federal lawmakers to figure out how to best use this resource.

Consequences

Meperidine and other opioids offer specific benefits when they are used appropriately. However, the benefits of the drugs must be weighed against the possibility of abuse or addiction. An established addiction is costly to maintain—financially, emotionally, and physically. Sufferers admit that a serious opioid addiction consumes all their energy. Everything in their lives eventually revolves around obtaining more of the drug. When the drug becomes the focus of life, they lose friends, alienate family members, and often find themselves unable to hold a job.

Those who are caught committing crimes to maintain their addiction may end up serving jail or prison time. The ultimate

Healer or Dealer?

On April 14, 2005, Dr. William E. Hurwitz, a well-known pain doctor from McLean, Virginia, was sentenced to twenty-five years in prison. He was convicted in December 2004 of narcotics trafficking and running a drug conspiracy. The doctor was held responsible in the death of one patient and the serious injury of two others.

The case was watched closely because it reflected the ongoing debate over whether doctors should be allowed to prescribe large quantities of narcotic medications to patients who are in chronic pain. Critics of Dr. Hurwitz said that he continued providing patients with massive doses of highly addictive drugs, even when he knew that some of them were misusing or abusing their medications or selling them to others. The doctor's supporters said that he was a dedicated and caring medical professional. They believed he was determined to provide chronic pain sufferers with the relief they needed, despite intense government scrutiny of his drug prescription activity.

How the outcome of this case will affect the prescribing activity of doctors who specialize in pain control remains to be seen. However, the United States has an aging population that is living longer. With more people living more years with chronic conditions that cause pain, the "access vs. control" debate over pain relief drugs will continue.

consequence may be the loss of life that can result from the abuse of a prescription drug—whether it is from the physical effects of an overdose or through violence that occurs as a result of the addiction.

When meperidine is used exclusively as a recreational drug, consequences include the very real possibility of overdose or severe interactions with other substances. According to the Partnership for a Drug-Free America, nearly half of all teens believe that the recreational use of prescription drugs is safer than the use of ILLICIT street drugs. About one-third of teens do not realize that narcotic painkillers are addictive.

Unexpected Outcomes

Teens are drawn to the use of prescription drugs for a variety of reasons, including ease of availability, relatively low cost, and a perception that the pills are harmless because they are legally obtainable by prescription. This lack of knowledge about the physical effects of narcotics, as well as the consequences of using them illegally, can result in unexpected and tragic outcomes.

The misuse of meperidine and other opioids affects people who live with chronic pain, because doctors become reluctant to write prescriptions that are needed for adequate pain relief. Members of

illicit: unlawful

the medical community agree that more education is needed by both doctors and patients to help prevent abuse and addiction. They want to ensure that patients truly in need are not denied access to meperidine and other narcotics based on misperceptions and fear. The benefits for individuals and society are great when pain is treated safely and effectively.

The Law

Meperidine is classified as a Schedule II controlled substance, which means that it is strictly regulated by both United States and international laws and agencies. In the United States, the Food and Drug Administration (FDA) and the Drug Enforcement Administration (DEA) control the manufacture and distribution of meperidine. International control is coordinated by the International Narcotic Control Board (INCB).

A Schedule II drug is available by prescription only. It is illegal to write a prescription or an order for meperidine without a valid medical license. Medical doctors, osteopathic doctors, podiatrists, dentists, and veterinarians are the only professionals allowed to legally prescribe meperidine and other Schedule II drugs. Medical professionals who intentionally write multiple prescriptions for patients without a valid medical reason may end up in prison. It is an even more serious crime to write and fill phony prescriptions for profit.

Doctor Shopping and Other Illegal Methods

It is illegal for individuals to obtain prescriptions for meperidine and other opioids by lying about their symptoms. Another dishonest way that people try to get drugs for illegal use is by going to several different doctors within the same time period and receiving prescriptions from each of them. Then they pay cash to buy each prescription at a different pharmacy to avoid being tracked by pharmacy or insurance records. This practice has been given the name "doctor shopping." As of 2004, at least nineteen states had laws against doctor shopping. Prescription Monitoring Programs (PMPs) are used on a state-by-state basis to track this activity.

Sometimes people try to acquire Schedule II drugs illegally by stealing prescription pads from doctors' offices, or by printing up phony prescription forms. Then they use those to write false prescriptions with forged signatures. These tactics are rarely successful over the course of time. Pharmacists often verify the validity of prescriptions for opioids by contacting the doctor listed as the prescribing physician. Bogus prescriptions can be stopped at this

point. Pharmacists are also among the first to notice high numbers of Schedule II prescriptions being written by particular doctors. One unintended effect of this kind of monitoring is that many doctors have become reluctant to prescribe enough effective medication for patients who experience chronic pain.

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See also: Codeine; Designer Drugs; Fentanyl; Heroin; Hydromorphone; Methadone; Morphine; Opium; Oxycodone

Mescaline

Official Drug Name: Mescaline (MES-cuh-leen or MES-cuh-lin), peyote (pay-OH-tee)
Also Known As: Big chief, blue cap, buttons, cactus buttons, cactus head, chief, mesc, mescal, moon, topi
Drug Classifications: Schedule I, hallucinogen

What Kind of Drug Is It?

Mescaline is a hallucinogen, which is a substance that produces hallucinations. Such hallucinations cause the user to experience strange sights, sounds, or other perceptions of things that are not actually present. Mescaline is a naturally occurring ALKALOID that is produced by certain types of cactus plants. The best known of these plants is the peyote cactus. The natural ingredients that cause hallucinations in people can also be produced artificially in a laboratory.

For many thousands of years, various Native American groups (in the present United States and Mexico) have consumed peyote in religious rituals. In fact, some native peoples still do. They believe that the hallucinations they experience are visions, or messages from spirits who can help them understand themselves and their place in the world. During the twentieth century, mescaline was studied as a possible treatment for mental illness, but no medical use was found for it.

Some abuse of mescaline as a recreational drug occurred during the last half of the twentieth century, but not in any widespread way. (Recreational users are those who take a drug for the high it produces, not for any medical reason.) Peyote use is not widespread because both natural and artificial forms of it are expensive and hard to find. Much of what may be sold on the street as "mescaline" is actually some other substance that is probably more dangerous than the real thing.

Overview

Mescaline is considered the oldest known hallucinogenic drug. Its strange qualities were most likely discovered accidentally, by ancient people who were experimenting to find out which plants made good food. Mescaline was not a good food. In fact, it usually causes people to have intense stomachaches if they eat it.

The History of an Ancient Plant

Despite causing pain and vomiting, however, mescaline-containing plants rarely cause death. Intense, colorful, often terrifying

alkaloid: nitrogen-containing substances found in plants

The peyote cactus is by far the best-known of the mescaline plants, so much so that the word *peyote* is often used to mean any type of mescaline. Peyote plants grow mainly in Texas and Mexico. *AP/Wide World Photos.*

hallucinations follow consumption, lasting for many hours. These vivid pictures and sounds, which exist only in the user's mind, appear to be completely real to the mescaline user. The people who lived in regions where mescaline-producing plants grew believed that the hallucinations were messages from spirits and gods, so the plants became very important in their culture.

ARCHAEOLOGISTS have discovered evidence suggesting that peyote was used in sacred rituals some 3,000 years ago. Archaeologists in Coahuila, Mexico, found a skeleton with a beaded necklace of dried peyote buttons that dates back 1,000 years. In Peru, a carving of a peyote cactus on a stone tablet dates back to 1300 BCE. One archaeological dig in Shumla Cave in Texas uncovered dried, mescaline-containing plant matter that appeared to date back to 5,000 BCE.

archaeologists: scientists who dig up and study the remains of ancient cultures

The earliest written information about mescaline use comes from Fray Bernardino Sahagun (1499–1590), a Spanish missionary who lived among the Indians of Mexico and studied their culture. He stated that the buttons of the peyote plant were sometimes eaten when fighting was likely, because it took away sensations of hunger, thirst, and fear. Dr. Francisco Hernandez, the personal doctor to King Phillip II of Spain, was the first to describe the peyote plant itself. He noted that in addition to peyote buttons being used for spiritual purposes, the root of the plant could be ground up and applied as a paste for the relief of pain in the joints.

When the Spanish began to take control of Mexico in the 1500s, they tried to stamp out the use of peyote and other mescaline-producing plants. Most Spanish people of that era were devout Catholics and regarded mescaline use as a pagan ritual. Paganism is used to describe non-Christian religions that worship many gods. The Spanish did not accept paganism and believed that those native peoples who used peyote and related plants were calling on evil spirits. By 1720, a law had been passed in Mexico outlawing the use of peyote. Still, followers of the peyote cults continued to conduct their ceremonies in secret.

Nineteenth-Century Uses

As European settlements spread across North America, so did the use of mescaline-producing cacti. The first recorded use of peyote in the United States was in 1760. By the time of the American Civil War (1861–1865), some Native American tribes were very familiar with the plants and had developed rituals around their use. The Kiowa and Comanche Indians drew attention for their peyote ceremonies around the year 1880. They had probably learned about peyote when they carried out raids on the Mescalero Indians of northern Mexico.

The Kiowa and Comanche Indians may have embraced the peyote rituals because such practices seemed to offer them some hope of holding on to their traditional way of life. During this era, the Indians' lifestyle was being drastically changed as the U.S. government began forcing the native peoples on to reservations. Quahadi Comanche chief Quanah Parker (c. 1845-1911) was one of the first people to mix elements of the Christian religion with traditional peyote ceremonies. Parker was the son of a Comanche man and a white woman who had been captured by the Indians as a child.

In 1918, the Native American Church (NAC) was founded, giving an official framework to the ritual use of peyote in religious ceremonies. At the same time, a long debate began about whether

Quanah Parker, chief of the Quahadi Comanches, was one of the first people to mix elements of Christianity with traditional peyote ceremonies. Such practices continue in the NAC.

or not it should be legal for certain churches to use substances that are normally illegal. The debate continues to unfold. For Native Americans, the issue is one of religious freedom.

During the late nineteenth century, the Western world began to take a scientific interest in hallucinogenic substances. In 1897, German chemist Arthur Heffter (1859–1925) became the first person to identify mescaline as the essential chemical in peyote that caused hallucinations. It was the first hallucinogenic compound to be synthesized, or removed from its parent plant in that way.

From Native Cultures to Modern Use

Shamans, or medicine men, in native cultures had long used peyote and other mescaline-producing plants to treat a variety of ailments, both physical and spiritual. Since the effects of these substances seemed to create states similar to insanity, Western scientists

hoped that they might be somehow useful in treating mental illness. They also thought they might get a better understanding of mental illness if they could learn more about the ways in which hallucinogenic substances alter the brain's activity. For many years, serious research was done on mescaline and other hallucinogens, both natural and human-made. Even as research went on, some states passed laws to make the use of peyote and related substances illegal. In 1927, New Mexico was the first state to do so.

Mescaline was rarely used outside of native cultures until the mid-twentieth century, when British novelist Aldous Huxley (1894–1963) wrote a book called *The Doors of Perception,* which described his personal experiments with peyote. Huxley's book, published in 1953, was popular reading during the 1960s and 1970s, a period when experimentation with drugs was widespread. Timothy Leary (1920–1996), a professor at Harvard University, also undertook many personal experiments with mescaline and LSD (lysergic acid diethylamide), a human-made hallucinogen. Leary's writings further promoted interest in hallucinogens, especially on college campuses. Street use of these substances became more common at that time.

Many people believed that research on hallucinogenic drugs, or PSYCHEDELICS as they were also called, had gone on for long enough, and that no helpful information had been learned. However, the abuse of psychedelics was spreading, with dangerous results. Often users had what were called "bad trips," or experiences that were depressing or terrifying. It was also reported that users might have "flashbacks," or recurrences of their drug experiences even when they were not taking the drug. Organizations concerned with public health and safety warned that heavy use of hallucinogens, including any form of mescaline, could result in damage to blood vessels, convulsions, and permanent brain damage.

Laws Ban Hallucinogens

In 1967, the U.S. government passed a law that made hallucinogens illegal throughout the country. In 1970, the Comprehensive Drug Abuse Prevention and Control Act defined peyote, mescaline, and every other hallucinogen as a Schedule I drug, meaning that they have no known medical use. At that time, legal research on mescaline came to an end. Street use of peyote and other forms of mescaline declined sharply and was virtually nonexistent at the end of the twentieth century. Whether peyote and other hallucinogenic plants can be used legally as part of the religious ceremonies of Native Americans is still hotly debated.

psychedelics: drugs that can cause hallucinations

The Native American Church (NAC)

The Ghost Dance religious movement began in 1869 but quickly died out. It was revived in 1889 by Wovoka (c. 1858–1932), a Piute medicine man, who had a vision. In his dream, Jesus Christ came to help Native Americans save their way of life, which was rapidly being destroyed by white settlers and the U.S. government. The dance was supposed to bring back the dead, hence the name Ghost Dance. Leaders from many tribes were interested in learning about the religious movement. Its rituals included five nights of dancing and intense shaking. Those taking part in the dance would enter a trance-like state. Dancers soon began wearing specially made shirts that they believed would protect them from the white man's bullets.

Representatives of the U.S. government were concerned that the Ghost Dance movement would lead to uprisings and tried to outlaw it. In 1890, in a tragic incident at Wounded Knee, South Dakota, the U.S. Army massacred more than 200 Sioux, including men, women, and children. The Ghost Dance shirts offered no protection against the army's guns. After the incident, the Ghost Dance movement faded.

Forced to live on reservations, many Native Americans experienced poverty and depression. Some turned to alcoholism. In 1918 the Native American Church (NAC) was established in an effort to pull together the scattered remains of the native cultures. Following in the tradition of earlier Native American leaders such as Quanah Parker, John Wilson, and John Rave, the NAC combined Christian beliefs with traditional rituals. The establishment of the NAC was also strongly supported by James Mooney, an anthropologist from the Smithsonian Institution. In 1920 NAC membership was made up of 13,000 members from 30 tribes. By 2005 it had grown to 300,000 members, including some people who are not of Native American ancestry.

Peyote rituals differ from one chapter of the church to another, but they are usually very structured. A typical service might be held in a tepee, constructed over an altar made of clay. Often there is ritual purification and confession of sins, and a period of silence. After the peyote is consumed, there may be a prolonged period of chanting and dancing. Sometimes, this period is so long that the people involved become exhausted when the effects of the peyote wear off. Ceremonies may be held for special occasions or on a monthly basis. A person called the Roadman leads them. The ritual itself is sometimes called the Peyote Road.

What Is It Made Of?

Mescaline-producing plants grow in only a few areas of the world. The word "mescaline" refers to the active ingredient in the plants that causes the hallucinogenic effects. However, it is often used as a name for the plants as a whole, or for the parts of the plants that are eaten, in whatever way they may be prepared. The two main sources of mescaline are both members of the plant family Cactaceae. They are the peyote cactus (*Lophophora williamsii*) and the San Pedro cactus (*Trichocereus pachanoi*). The

peyote cactus is by far the best known of the mescaline plants, so much so that the word *peyote* is often used to mean any type of mescaline.

The true peyote cactus is a gray-green or blue-green plant. It grows close to the ground and looks something like a small cushion divided up into sections that are called *podarea.* The podarea are arranged around a center piece that has a woolly look to it, as it is made up of tufted hairs called *trichomes.* Unlike other cacti, it does not have sharp, prickly spines to protect itself.

The peyote cactus grows naturally in an area stretching from southern Texas to southern Mexico. There are a few variations of *Lophophora williamsii,* including *Echinocactus williamsii* and *Lophophora echinata var. diffusa.* A close relative of peyote, the cactus *Lophophora diffusa* grows only in the dry region of Queretaro, Mexico, in the central part of the country. It is yellow-green in color, has a fleshier body than the peyote cactus, and lacks the well-defined podarea.

Slow Growing

The peyote is one of the slowest-growing of all cacti. A plant is not considered mature until it is about thirteen years old. If it reaches the age of thirty, it will still be only about the size of a baseball. The Native Americans call a plant of this size and age "Father Peyote" or "Grandfather Peyote." Usually, a peyote cactus must grow for at least four years before it will produce even one "button," or dime-sized section on its top. It is the button that is cut off and eaten for the hallucinogenic effects. The name of the plant is thought to come from either a Nahuatl word, *pi-youtl,* which means "silk cocoon" or "caterpillar cocoon," or from the Mexican word *piule,* which simply means "hallucinogenic plant."

The San Pedro cactus looks quite different from the peyote. It does have prickly spines, and it grows in tall columns, sometimes reaching as high as twenty feet. It originated in the mountain regions of Peru and Ecuador, but has become widespread, because it is often sold as an ornamental plant. Like the peyote cactus, the San Pedro has some close relatives within its *Trichocereus* family that contain hallucinogenic compounds.

Numbers Declining

Although these PSYCHOACTIVE cacti all contain between forty to sixty alkaloids, or nitrogen-containing compounds, mescaline is the only alkaloid among them that is known to cause hallucinations. The

psychoactive: mind-altering; a psychoactive substance alters the user's mental state or changes one's behavior

The Chihuahuan Desert, mainly in Texas and Mexico, is home to many cacti, including the peyote plant.

amount of mescaline in a cactus depends on the maturity of the plant. On average, a peyote cactus might contain about 4 percent mescaline. It can be extracted from the plant, and in its pure form, it is crystalline.

Mescaline can also be artificially produced in a laboratory. Pure mescaline, either extracted or manufactured, is extremely rare, however, because it is very expensive to produce. Therefore, almost all mescaline used is in the form of peyote buttons, or material from one of the other mescaline-producing plants. The number of peyote cacti is declining, in part because of the development of roads and buildings in the places where the plants grow naturally.

How Is It Taken?

Usually, dried buttons from the peyote cactus are chewed up and swallowed in order to get the mescaline into the body. Users eat from twelve to thirty of these pods at a time. Sometimes the buttons are brewed in hot water, which is then consumed as a tea. Dried peyote buttons are sometimes ground into a powdered form, which can be put in capsules. According to the Drug Enforcement Administration (DEA), it takes a dose of about 0.3–0.5 grams of mescaline to produce hallucinations. That would be the amount contained in approximately 5 grams of dried peyote. It takes about 0.5 grams of synthetic mescaline to produce hallucinations, but the cost of producing this substance is so high that it would cost between $50 and $100 for each use.

Therefore, mescaline is almost nonexistent in the world of illegal drugs, as there is very little market for it. Authorities report that most tablets or capsules sold as "synthetic mescaline" have a very small amount of real mescaline in them. Usually they have been mixed with another substance, often phencyclidine (PCP), LSD, or ecstasy (MDMA). All of these drugs can be much more dangerous than true mescaline.

Are There Any Medical Reasons for Taking This Substance?

Native peoples believed that physical illness was a reflection of a spiritual problem. Their shamans, or medicine men, treated the body and spirit together in ways that blended spiritual beliefs and practices with herbal remedies. Those who came from the peyote cultures considered peyote to be a powerful medicine. It was used in a variety of ways, from grinding the root to make a paste for sore joints, to using the buttons to help combat depression and alcoholism. The use of alcohol became a serious problem for many Native Americans after their way of life was disrupted by white settlers, who forced them off their lands and on to reservations. The alcohol brought by white settlers was also new to native peoples, so their bodies were unaccustomed and more susceptible to the effects of alcohol.

Western researchers became interested in the possible uses of mescaline as soon as they became aware of it. By the late 1800s, people were already working to find ways that mescaline and other hallucinogens might be useful in understanding and treating insanity. By the 1960s, interest in the possible beneficial uses of mind-altering drugs was at its peak. It was hoped that mescaline, along with human-made hallucinogens such as LSD, might be able to treat depression, autism, obsessive-compulsive behavior, and other mental illnesses. Yet, no

Peyote is a part of religious rituals for some Native Americans. Once consumed in tepees (like those shown here), the practice dates back many years. The hallucinations caused by peyote consumption are said to be visions or messages from spirits who would help users understand themselves and their place in the world. © *Corbis.*

definite use for them was ever found, and all legal research came to a halt in 1970 when the Comprehensive Drug Abuse Prevention and Control Act ruled that such substances have no known use in medicine. Nevertheless, during the 1990s there was some renewed interest in studying the effects of peyote after testimony was given before the U.S. Congress. At that time, advocates of peyote talked about its use in treating alcoholism among the Native American population.

The Huichol and Tarahumara Indians of Mexico still use peyote in religious ceremonies. Here, a group of Tarahumara Indians participates in traditional games and dances.

Usage Trends

The use of peyote was well established among the Aztecs and other native peoples in the New World long before the arrival of the first Europeans. Spanish authorities in Mexico outlawed peyote in 1720, but its use continued to be widespread, although the rituals were conducted in secret. Use of peyote extended northward during the 1800s. It increased dramatically when Native Americans were being removed from their traditional lands and resettled on government reservations. Shortly after the start of the twentieth century, the NAC was founded, which incorporated peyote use with Christian and other religious beliefs. It remains active to this day. In modern times, the Huichol and Tarahumara Indians in Mexico still use peyote in traditional ceremonies.

Experimentation and Research on Mescaline

Outside of Native American religious ceremonies, there was little use of mescaline by anyone for many years, except for those involved in research. However, that situation changed during the mid-twentieth century. The writings of novelist Aldous Huxley, Harvard professor Timothy Leary, and anthropologist Carlos Castaneda (c. 1925–1998), all of whom experimented with peyote and related substances, sparked a wider interest in these drugs and the vivid visions they cause. Castaneda wrote several books supposedly describing his experiences with a Mexican medicine man, who introduced him to an otherworldly being called "Mescalito." Mescalito was said to give insight to those seeking his guidance through peyote. Castaneda detailed many strange and terrifying visions, but in his later works, he downplayed the importance of using hallucinogens to gain greater spiritual awareness.

At the height of the drug subculture of the 1960s and 1970s, there was some street use of peyote and other forms of mescaline. However, much of what was sold as mescaline was probably something else since the natural and artificial forms of the drug have always been difficult to obtain and are quite expensive when they are available. Peyote is one of the slowest-growing plants. Plus, its natural habitat is being threatened due to continued development of land for building and cattle grazing. Therefore, it is unlikely to become more plentiful. In Texas, it is cultivated legally and protected under the supervision of Texas legal authorities for use within the NAC.

A report by the DEA revealed how little peyote and mescaline are used as street drugs. From 1980 to 1987, about 19.4 pounds (9 kilograms) of peyote were taken in drug raids. In contrast, 15 million pounds (7 million kilograms) of marijuana were confiscated during the same timeframe. Furthermore, no illegal trafficking of peyote was reported at all. After 1998, mescaline showed up infrequently on government reports, usually being included in a category such as "other hallucinogens," which refers to hallucinogens other than LSD. The "2003 National Survey on Drug Use and Health (NSDUH)" reported that overall hallucinogen use dropped from 4.7 million users in 2002 to 3.9 million users in 2003. The study showed that 1 percent of youths between the ages of twelve and seventeen abused hallucinogens, with .8 percent of adults above the age of twenty-six abusing them.

Effects on the Body

Peyote buttons taste very bitter and unpleasant, as do the teas and powders made from them and other psychoactive cacti. Frequently,

the human body's first response to them is intense stomach pain, nausea, and vomiting. Approximately thirty to sixty minutes after the substance is eaten, its effects on the brain begin to occur. Hallucinations are most intense for approximately two hours, but the effects of the drug may last for as long as ten to twelve hours. Mescaline's other effects can include trembling, sweating, dizziness, numbness, high blood pressure, increased heart rate, loss of appetite, sleeplessness, dilated pupils, and anxiety. It can cause contractions of the intestines and the uterus, which could be dangerous for pregnant women taking the drug.

Seeing Sounds and Hearing Colors

Users of hallucinogens report that they "see sounds" or "hear colors." This phenomenon of blended sensory experiences is called synesthesia (sinn-ess-THEE-zhuh). Although other hallucinogens may play strange tricks with the appearance of reality, mescaline seems to have the strongest tendency to conjure up vividly colored visions that have little or nothing to do with the user's actual environment.

Much of what is known about how hallucinogens, including mescaline, work on the brain was learned during research done on LSD in the 1960s and 1970s. The chemical structure of these types of drugs is similar to that of serotonin, a naturally occurring substance within the body. Serotonin is a NEUROTRANSMITTER, or chemical that passes signals from one nerve cell to another in order to relay messages to the brain. Serotonin is not the only neurotransmitter, but it is especially important because it regulates many of the others.

Playing with the Senses

Hallucinogens seem to disrupt the normal interaction between nerve cells and neurotransmitters within the brain. This causes the sight, smell, sound, and feel of things in the real world to become strangely warped. Emotions may also be wildly exaggerated or out-of-place due to the chemical changes being caused in the brain. Rapid mood swings are common, with users laughing for no apparent reason, only to become terrified the next moment. Emotions may seem to be layered or to come in waves. Someone who has taken a hallucinogen may feel a heightened awareness of all kinds of things, and senses may become confused.

The drug-induced state of any hallucinogen is commonly referred to as a TRIP. Trips can be good or bad. People have frequently reported trips that make them feel happy, stimulated, or more aware of themselves and their place in the world. This is one reason why researchers have thought that psychedelic drugs might have a valid medical use in treating mental and emotional illness.

But not every trip is good. For various reasons, which are not well-understood, people who take hallucinogens may instead

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

trip: an intense and usually very visual experience produced by an hallucinogenic drug

experience a "bad trip." In a bad trip situation, hallucinations can be extremely terrifying and realistic. Feelings of unbearable sadness and anxiety may consume the user. Users may feel completely out of control, that they are going insane, or that they are about to die. They may have false feelings of power and attempt to do things that are dangerous. Or, they may become fearful about the frightening hallucinations they see and then panic, endangering themselves trying to escape their visions.

Is It Really Mescaline?

It is important to realize that anything sold on the street as "mescaline" may in fact be mixed with other drugs or substances. Or, it may be completely made up of some other psychedelic drug or unknown substance. True mescaline is rare. Common additives to false mescaline tablets are LSD and PCP. Sometimes called "angel dust," PCP can cause extreme fear and aggressive behavior, as well as convulsions and coma. These types of side effects would rarely be caused by mescaline without the addition of another drug.

Some drugs are known as mescaline analogs. They are made in a laboratory and are similar in chemical structure to mescaline, but far more dangerous. These include the "designer drugs" MDA and MDMA, or ecstasy. Other dangerous amphetamines and methamphetamines are also classified as mescaline analogs. Any of these manufactured drugs may be added to or sold as genuine mescaline, but they are even more dangerous than the real substance would be. Side effects cannot be predicted or understood when additives are unknown. Plus, there is no way of really knowing what is in a tablet or capsule of something that is sold as "peyote" or "mescaline" on the street.

Lingering Problems in Users

A true overdose of genuine mescaline or peyote is rare, although even a low dose of the substance can leave users feeling very ill. It is not considered as addictive as many drugs are, including heroin and cocaine. If people develop a habit of using drugs like heroin or cocaine, their bodies will go through withdrawal symptoms if they try to stop. That means they will feel very ill because their bodies have developed a physical need for the drug. This is not the case with mescaline, but that does not mean there are no consequences for using it.

When a mescaline trip ends, there is a dip in serotonin activity in the brain. This may lead to a condition called dysphoria, or a general feeling of restlessness, anxiety, and depression. When people use

hallucinogens frequently, they will develop a tolerance, meaning that they need larger and larger doses to get the same effect. This tolerance carries over from one psychedelic drug to another. In other words, a heavy user of mescaline would also have a high tolerance to LSD. The body's level of tolerance to the substance will revert to normal levels, however, if use is discontinued.

Psychedelic use can potentially lead to two long-term mental health problems. One is known as hallucinogen-persisting perception disorder (HPPD), more commonly known as flashbacks. In a flashback, the user enters hallucinogenic states even though he or she has not taken a recent dose of the drug. Long-term use of hallucinogens can also lead to a condition called persistent or drug-induced PSYCHOSIS. This occurs when former users fall into long-lasting states similar to psychosis. They may be severely depressed, experience mood swings, and have distorted visions and other hallucinations. These symptoms can go on for years, and may occur in people who have no previous history of mental illness.

Reactions with Other Drugs or Substances

Drug users sometimes combine drugs to obtain different or more intense effects. "Love flipping" or taking a "love trip" is the practice of taking mescaline and ecstasy at the same time. Ecstasy is a mescaline analog, or an artificially produced drug with chemical similarities to mescaline. It has very dangerous side effects, which could be made even more extreme by taking it at the same time as mescaline.

Treatment for Habitual Users

There are no formally recognized treatments for hallucinogen-persisting perception disorder (HPPD) and drug-induced psychosis. People experiencing flashbacks may become confused and fearful about the renewed hallucinations. They often feel they have suffered brain damage and are losing their minds. PSYCHOTHERAPY may help these patients to deal with the episodes. Antidepressants may also be useful for those suffering from HPPD and drug-induced psychosis. Users should consult their doctors to determine the best course of treatment.

psychosis: pronounced sy-KOH-sis; a severe mental disorder that often causes hallucinations and makes it difficult for people to distinguish what is real from what is imagined

psychotherapy: the treatment of emotional problems by a trained therapist using a variety of techniques to improve a patient's outlook on life

Consequences

Mescaline can have serious long-term effects on users. HPPD and drug-induced psychosis can require extended treatment. This can affect job performance and personal relationships. People

Linda and James "Flaming Eagle" Mooney appeared in court to learn whether it is illegal for them to distribute peyote to members of the Native American Church. The case went before the Utah Supreme Court, which ruled in 2004 that the Mooneys were within their legal rights. In mid-2005, the Mooneys were arrested again, this time on federal charges. The debate over religious peyote use continues. *AP/Wide World Photos.*

who had psychological problems before taking mescaline may find those problems become worse after taking the drug. Normal social functioning is certainly made more difficult by the hallucinations, confusion, and strong emotions that users may experience. Anxiety and fear caused by a bad trip can lead to poor judgment and dangerous acts that could endanger the user or other people.

Even if a user does not experience a bad trip or have HPPD or drug-induced psychosis, there are still serious consequences that go along with using mescaline, peyote, and the other psychoactive cacti. This is because they are illegal. The DEA has defined peyote as a Schedule I hallucinogen, meaning it has a high potential for abuse and no medical value. Using any Schedule I substance, including

peyote or mescaline, can lead to a long prison sentence. Even members of the NAC can be prosecuted if they use peyote outside their religious ceremonies. Although the federal guidelines refer to the peyote cactus, *L. Williamsii,* the penalties are the same for anyone buying other psychoactive cacti with the intention of extracting or using their active ingredients.

Legal consequences can be even more severe for U.S. citizens if they travel to other countries. Using, buying, selling, or carrying any type of drug, including mescaline or peyote, outside of the United States could result in interrogation and imprisonment for weeks, months, and perhaps even for life. Every country has its own laws and punishments for drug trafficking and use. Some countries make no distinctions between a person carrying a small amount of an illegal substance for personal use and someone acting as a large-scale drug trafficker. In some countries, even the most minor drug offenses are punishable by death.

The Law

The legal history of mescaline and its primary source, peyote, is long and somewhat complicated. The ban on its use for recreational purposes is clear. It is classified as a Schedule I hallucinogen, meaning that there is no medical reason it may be possessed, sold, or used. Doing so may result in severe penalties, including imprisonment and heavy fines. However, peyote is a long-established part of the religious rituals of Native Americans. The founding of the NAC in the early twentieth century gave support to this practice by making peyote use part of an established religion, rather than just a cultural tradition. Declaring peyote use illegal in its religious setting puts the federal drug laws in opposition to First Amendment rights that guarantee freedom to practice one's religion. Because of these conflicts, the legal status of peyote use by Native Americans has changed several times since it first became an issue during the American Civil War era.

Religious Rights and Mescaline Regulations

New Mexico became the first state to outlaw the use of peyote, doing so in the 1920s. This law was changed in 1959 to allow Native Americans to use the substance during their religious ceremonies. Most states had no laws against peyote use or possession even into the 1950s and 1960s. At that time, dried buttons from the peyote cactus were available for purchase through mail-order catalogs. This sort of free marketing of the psychoactive cacti and their components slowed drastically after peyote was declared illegal throughout the

Peyote Law in Individual States

The role of peyote in the ancient religions of Native Americans makes for a confusing legal situation in modern times. Federal law allows the use of peyote in Native American religious ceremonies, but each state government has documented its own interpretation of the law. In Oregon and Arizona, the law exempts use with "sincere religious intent." Colorado, Minnesota, Nevada, and New Mexico require that users must be "members of a bona fide religious organization" in order to be exempt. Idaho, Texas, and Wyoming require that users be members of the NAC. Iowa, Idaho, Kansas, Oklahoma, South Dakota, and Wisconsin state that the peyote must be used "only within an NAC ceremony." Idaho and Texas require that in addition to NAC membership, users must be of Native American descent. In Kansas, the law adds that prisoners are not protected by the exemption, even if they are members of the NAC.

Texas requires people to be at least 25 percent Native American. This situation raises various issues, including the fact that some tribes are not recognized officially by both state and federal authorities. Also, there is a controversy about what percentage of Native American ancestry should be required or if any should be required at all. Such issues remind people of the so-called Jim Crow laws, now struck down, that once determined who was considered to be African American and who was not.

Another controversial issue is whether a non-native person can become a member of the NAC church. Some chapters of the NAC allow non-Native Americans to join, while others do not. Non-Native Americans who join the NAC are not protected from federal law even if state laws would allow them exemption. Both state and federal laws on this topic continue to be challenged, reconsidered, and changed. Cases involving the law and its exemptions often go all the way to the U.S. Supreme Court.

United States in 1967. This decision was strengthened by the Comprehensive Drug Abuse Prevention and Control Act in 1970. The passage of the act identified peyote as a Schedule I hallucinogen. At that point, buying, selling, or using it became a serious crime for anyone except a member of the NAC participating in a legitimate religious ceremony. Even members of the NAC could be held accountable to the law for using peyote in any other setting or distributing it to people outside the church.

In 1978 the American Indian Religious Freedom Act was adopted. It was intended to protect the religious traditions of Native Americans. However, almost from the start, there were many challenges to it. In 1990 the U.S. Supreme Court heard the case *Employment Division v. Smith.* Ultimately, the court ruled that religious use of peyote by Native Americans was not protected by the First Amendment. Many religious groups and civil liberties activists protested this decision.

Eventually, the ruling was contradicted by the Religious Freedom Restoration Act of 1993 and the American Indian Religious Freedom Act Amendments (AIRFA). AIRFA, which was amended again in 1996, protected the rights of American Indians to use peyote in traditional, ceremonial ways in all of the fifty states. It states that the "use, possession, or transportation of peyote by an Indian for bona fide traditional ceremonial purposes in connection with the practice of a traditional Indian religion is lawful, and shall not be prohibited by the United States or any State."

In Texas, where the peyote cactus grows, the state government supervises its CULTIVATION and hires a crew of experienced people, called *peyoteros,* to properly harvest, dry, and distribute the buttons to Native American churches. Many complex questions have come up about this conflict between enforcing drug laws and protecting freedom of religion. The various states continue to try to sort out these complexities, as they make their own laws and decisions about the transportation, possession, and use of peyote.

Penalties for Nonreligious Use

Aside from the exemptions made for members of the NAC, possession of peyote, mescaline, or any other Schedule I substance can result in a prison sentence ranging from one to twenty years, and fines ranging between one thousand to several thousand dollars. Selling peyote or mescaline, or possessing with the intent to sell, can result in fines ranging from $250,000 to several million dollars and prison sentences ranging from five years to life, depending on the circumstances. In Mexico, peyote is illegal even for use in religious ceremonies. In Canada, peyote and mescaline are restricted, and possession or use may lead to prison sentences of up to three years and fines of up to $4,000. Penalties for trafficking the drug are even more severe. The 1971 Convention on Psychotropic Substances declared an international ban on mescaline.

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cultivation: planting and tending with the intention of harvesting

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See also: 2C-B (Nexus); Benzylpiperazine/Trifluoro-methyl-phenylpiperazine; Designer Drugs; Dimethyltryptamine (DMT); Ecstasy (MDMA); Ketamine; LSD (Lysergic Acid Diethylamide); PCP (Phencyclidine); Psilocybin

Methadone

Official Drug Name: Methadone; Dolophine
Also Known As: Dolls, dollies, fizzies
Drug Classifications: Schedule II, opioid narcotic

What Kind of Drug Is It?

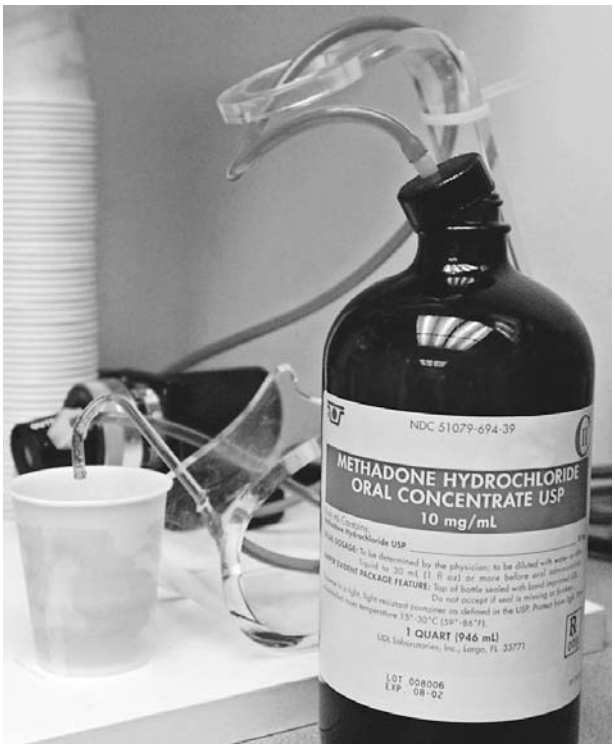
Methadone is a synthetic drug, meaning that it is made in a laboratory from chemicals. It behaves like an opiate drug in the brain. Opiates are drugs, derived from the opium poppy plant, that tend to decrease restlessness, bring on sleep, and relieve pain. The natural opiates—such as codeine, heroin, morphine, and opium—are known for their painkilling properties, but also for their addictive nature. Such substances encourage abuse because they induce euphoria, or feelings of extreme happiness or enhanced well-being.

Methadone works differently. Its slow onset and long-lasting impact lessen the chances that the user will get high from taking it. At the same time, it blocks the receptors in the brain that are stimulated by opiates, so those using methadone do not get high even if they take heroin or morphine too. (Entries on codeine, heroin, morphine, and opium are also available in this encyclopedia.) Methadone is best known as the medication prescribed to help opiate addicts end the destructive behavior associated with drug addiction.

People with opiate addictions often use drugs such as heroin and morphine more to avoid withdrawal symptoms than to achieve a high. Withdrawal is the process of gradually cutting back on the amount of a substance being taken until use can be discontinued entirely. Indeed, withdrawal from opiates—even prescription drugs such as OxyContin and Vicodin—can be difficult and challenging. Methadone eases all symptoms of opiate withdrawal, including anxiety and insomnia, a sleep disorder. Those who receive methadone treatment from trained, licensed doctors—and who follow the treatment schedule carefully—face little danger of overdose, infectious disease, or organ failure. When used properly, it is a medicine that helps users end their addictions and get on with their lives.

When Methadone Is Abused

When used illegally or improperly, though, methadone is one of the most dangerous drugs on the street. According to the Drug Abuse Warning Network (DAWN), emergency room visits related



Methadone is dispensed in sugary liquid. *AP/Wide World Photos.*

to methadone overdose tripled between 1997 and 2001. Since then, methadone-related deaths and hospitalizations have continued to rise. Two factors have contributed to the spike in methadone-related emergencies. First, doctors are prescribing the drug more often as a painkiller. In that form, methadone is dispensed by pharmacies as pills and taken into homes. Sometimes it is either used improperly by the patient or sold on the street or to drug dealers.

The second possibility for methadone ER visits involves multi-drug use. Numerous drug deaths have occurred when people combine methadone with other painkillers, opiates, cocaine, tranquilizers, or alcohol. (Separate entries on these drugs are available in this encyclopedia.) The presence of other substances increases the likelihood that methadone will cause COMA, breathing difficulties, and even death.

Since the beginning of the twenty-first century, drug enforcement agents have seized greater quantities of methadone that have been diverted or put into illegal use. Concern over this diversion has led to high-level government meetings and studies on how to keep this powerful pain reliever with many useful qualities out of the wrong hands.

Overview

Naturally occurring opiates are derived from the sticky sap of the opium poppy. Opium products have been used for many thousands of years, both for their pain-controlling properties and for the feelings of intense happiness and well-being they provide. From the ancient Egyptians to the celebrated British poets of the nineteenth century, opiate users have known of the plant's effects—and of its drawbacks. The latter includes addiction, TOLERANCE, and death by overdose. In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger noted that the famous ancient Roman general Hannibal kept a fatal dose of opium in a ring on his finger and actually used it to kill himself in 183 BCE.

coma: a state of unconsciousness from which a person cannot be aroused by noise or other stimuli

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

Beginning in the nineteenth century, scientists worked with opium products, trying to isolate the painkilling qualities from the habit-forming qualities. They met with little success. In fact, all natural and synthetic opiate and OPIOID products on the market in the twenty-first century are still known to be addictive. Methadone is no exception. Users develop a dependence, or a physical need for the drug in order to ward off withdrawal symptoms. And they suffer withdrawal symptoms if they do not follow a careful program of specific directions for use.

Usage Grows in the 1940s and 1950s

Methadone was developed in Nazi Germany in 1939 because of wartime shortages of morphine. The German scientists called it Amidon and used it as a painkiller. At the end of World War II (1939–1945), the American pharmaceutical company Eli Lilly began clinical trials of the substance. Lilly called it "methadone." The drug has also been marketed as Dolophine, leading to nicknames such as "dolls" and "dollies." Methadone was found to be an effective, long-lasting painkiller and cough suppressant.

According to a report issued by the Substance Abuse and Mental Health Services Administration (SAMHSA), in 1950 researchers began using methadone to treat the many symptoms of withdrawal associated with heroin dependence. Heroin addicts typically need two to three "FIXES" of the drug each day to ward off the wide range of symptoms that occur when the brain craves opiates. The desperate search to buy the illegal drug leads some addicts into criminal behavior, ranging from theft and burglary to prostitution and drug-dealing. People with opiate addictions feel trapped by their dependency. The desperation is sometimes described as a "monkey on the back."

Treating Addictions with Methadone

In 1964 a group of researchers discovered that heroin addicts could avoid the drug and live more normal lives if they received a daily dose of methadone. The methadone eased

Pharmacy Mix-ups

According to the *Knight Ridder/Tribune Business News,* several deaths have occurred in children because *methadone* has a name similar to *methylphenidate,* the generic name for Ritalin. (A separate entry on Ritalin and other methylphenidates is available in this encyclopedia.) In a few cases, children who were prescribed Ritalin to treat attention-deficit/hyperactivity disorder (ADHD) actually received methadone pills instead.

It is important to note that methadone is *never* prescribed for ADHD. Children should never be allowed to take Ritalin without having the tablets checked by a parent to be certain that the tablets are Ritalin, and not methadone. Anyone who has a prescription for Ritalin filled has the right to examine the product at the pharmacy counter and to double-check with the pharmacist that no one preparing the prescription has confused *methylphenidate* with *methadone.* Mistakes can be fatal.

opioid: a substance created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine

fixes: a slang term referring to doses of a drug that the user highly craves or desires

withdrawal symptoms and lessened cravings for heroin. Better yet, people taking methadone could not get high on heroin because methadone binds to the same brain receptors that heroin does.

Some problems remained. Methadone is itself an opioid, so it causes dependency too. Its side effects are identical to the natural opiates and include constipation, nausea, drowsiness, dry mouth, and the possibility of breathing problems. Researchers concluded that some people trying to wean themselves off heroin or other opiates by following a methadone treatment plan might have to take methadone for a very long time. The treatment was not foolproof, either. Many addicts returned to drug abuse, sometimes turning to cocaine to get high. Because methadone and cocaine work differently in the brain, methadone treatment does not help cocaine addicts stop using cocaine, nor does it block the effects of cocaine. (An entry on cocaine is available in this encyclopedia.)

Despite these drawbacks, methadone has remained the drug of choice for treatment of opiate dependency since the 1960s. It is not a "perfect cure," but it does provide a way for motivated people to straighten out their lives, hold jobs, and otherwise live more normally. The SAMHSA report stated: "Methadone is a medication valued for its effectiveness in reducing the mortality associated with opioid addiction as well as the various medical and behavioral morbidities associated with addictive disorders." In other words, even the U.S. government believes that methadone, when used properly, saves lives and cuts down on crime.

Methadone Clinics Open

In the late 1960s, the U.S. government began sponsoring methadone clinics in many parts of the country, especially the nation's largest cities. At methadone clinics, people line up to take their daily dose of the drug under the watchful eye of a nurse or other health care worker, and then leave. After a period of months, a patient who has followed the treatment program carefully might be allowed to carry one or two doses home. These doses are called "CARRIES." Most patients use their "carries" as carefully as the doses given to them at the clinics, but some turn the "carries" over to illegal use. In addition, the drug is being prescribed more by doctors. Some patients sell their medications to others. In these ways, some of the drug makes its way on to the street illegally.

carries: doses of methadone given to users to take home for another day

In some of the nation's largest cities, addicts go to clinics daily to receive their dose of methadone. They take it under the watchful eye of a nurse or other health care worker and then leave. *AP/Wide World Photos.*

What Is It Made Of?

Methadone is not derived from the opium poppy plant. It is synthetic, or made from chemicals in a laboratory. Pure methadone is an odorless white powder that dissolves easily in water, juice, or alcohol. Hospitals also have solutions of methadone that can be delivered by injection.

Methadone takes effect slowly and stays in the brain for a period of twenty-four to thirty-six hours. During that time the user—assuming he or she uses no other drugs—will function normally, perhaps feeling a bit sluggish or groggy. Sleep cycles will be normal, but appetite may be lessened. Constipation is a troublesome side effect.

How Is It Taken?

In most clinics, methadone is dispensed in sugary liquids and swallowed by the patient. The drug can also be taken as a biscuit ("diskette") or in pill form. Very rarely, in a hospital or

Methadone Chronology

1939 German scientists develop a synthetic opioid painkiller in response to wartime shortages of morphine. They call the new drug Amidon.

1947 American pharmaceutical company Eli Lilly begins trials of the painkiller. Lilly calls the drug methadone.

1950 Researchers begin using methadone to treat withdrawal symptoms in heroin addicts.

1964 Researchers in Lexington, Kentucky, conclude that a daily dose of methadone allows heroin users to avoid withdrawal symptoms while also being unable to experience a heroin high. The first methadone clinic opens in Lexington.

1970 The U.S. Controlled Substances Act places methadone on its list of Schedule II substances, recognizing that the drug has medical uses but also the potential for misuse and abuse.

2000 Prescriptions for the pill form of methadone rise sharply in response to abuse and illegal use of other opiate/opioid painkillers such as Vicodin and OxyContin.

2003 U.S. trials begin on the drug buprenorphine for use as an alternative to methadone.

clinical setting, the drug is injected into a muscle. Methadone is not commonly used in post-surgical settings because other drugs such as morphine and fentanyl work faster to relieve pain. (Separate entries on morphine and fentanyl are available in this encyclopedia.) Rather, methadone is used for long-lasting pain, such as that resulting from cancer, back injuries, or severe arthritis.

In 2000 the federal government relaxed rules on prescribing methadone in pill form. Doctors who complete an eight-hour training seminar become certified to dispense methadone pills that vary in strength from 20 to 120 milligrams.

The first week of methadone use for chronic pain can be difficult and dangerous. Doctors need to monitor patients carefully because the drug acts slowly on the pain and accumulates in the body. Patients must be watched for tolerance levels so that they are not given deadly doses. They must also be cautioned that methadone is not a "quick fix" for pain, and that taking an extra dose will not make the drug work any faster. Typically, patients will see little or no pain relief from methadone for the first twenty-four to forty-eight hours. After that, methadone works well for chronic pain, provided the user follows the directions and does not mix the medication with other drugs, except on the advice of a doctor.

Illegal Use

People also use methadone illegally as a recreational drug, which is a drug used solely to get high, not to treat a medical condition. People have been known to grind up methadone tablets and snort the powder or inject the drug. This can be extremely dangerous, even in the absence of other drugs or alcohol. Because methadone works so slowly, it does not provide the RUSH of euphoria that the user craves. This may entice the user to take more methadone, eventually leading to a deadly build-up of the drug in the body. It is often hours and sometimes even days before the poisonous effects of methadone become apparent, as the user first slips into a deep sleep, then into a coma, and then stops breathing.

Are There Any Medical Reasons for Taking This Substance?

Methadone is an effective means of taking control of an opiate habit. It lessens the withdrawal symptoms of opiate abuse and helps control—but does not eliminate—cravings for opiates. People driven to desperation in their search for illegal heroin or painkillers can resume a normal lifestyle if they follow a methadone treatment plan. Studies have shown that long-term use of methadone *in the absence of other drugs and alcohol* has no adverse effects on the heart or other internal organs.

Someone who stops using methadone suddenly will suffer the withdrawal symptoms typical of all opiates, including diarrhea, nausea, chills, muscle pains, anxiety, insomnia, sweating, and frequent yawning or sneezing. In order to quit using the drug without these symptoms, it is necessary to lower the dose slowly over a period of months. This allows the body to adjust its brain chemistry gradually. Again, patients must be highly motivated to stay with the program, as even small reductions in dosage can bring a mild onset of withdrawal symptoms.

An epidemic of illegal OxyContin abuse since 2000 has led more doctors to prescribe methadone for chronic pain. Methadone is very effective in this role, but patients must be aware that the full effects of the pain relief may take as much as a week to achieve. During that time, they must be careful to monitor sleep patterns and to be aware of how the drowsiness might affect them while driving or operating machinery. If the painful condition improves, patients must taper their use of methadone gradually to avoid withdrawal symptoms.

rush: a feeling of euphoria or extreme happiness and well-being

In 2004 a group of Russian doctors visited the University Health Center methadone clinic in Vermont to learn more about how to treat heroin addiction with methadone. Heroin use has increased dramatically in Russia in recent years. *AP/Wide World Photos.*

Drugs like methadone are not prescribed on an "as needed" basis. The kind of pain for which methadone is used is a crippling, ongoing, day-and-night pain that may never improve. For extremely sick cancer patients, methadone allows a quality of life that might be impossible otherwise. The drug does not cure the cancer or even slow its progress, but it can help patients manage the pain. The same holds true for other conditions such as chronic back pain and osteoarthritis.

Usage Trends

The amount of methadone dispensed in clinics for the treatment of opiate addiction has remained stable for decades. However, between 1999 and 2002, the number of doctor-generated prescriptions for methadone increased by 331 percent, according to a report by SAMHSA. Pills and biscuits account for almost all of this increase.

Researchers at SAMHSA acknowledged several reasons for the jump in prescriptions for methadone—and a related jump in methadone deaths. First, doctors began prescribing more methadone for pain, believing that its potential for abuse is less than that of oxycodone (OxyContin) and hydrocodone (Vicodin). Second, some

doctors began prescribing methadone to patients who are trying to recover from oxycodone or hydrocodone habits. The SAMHSA researchers also suggested that some opiate addicts do not want to be seen visiting a methadone clinic and may be turning to their personal doctors for help in kicking their habits. Getting a prescription from a doctor, and having it filled at the local pharmacy, is far more anonymous than arriving at a clinic every morning. Some communities even fight expensive legal battles to keep methadone clinics out of their neighborhoods.

Methadone on the Streets

The increase in methadone prescriptions has led to an increase of the drug being sold on the street. Seizures of illegal methadone by drug enforcement agents increased 133 percent between 2001 and 2002. Deaths associated with methadone have grown sharply since the early 1990s. SAMHSA used data to show that between 1993 and 2002, methadone-related fatalities jumped 200 percent in the state of Washington. The report declared: "While overdose mortality was declining among [clinic] patients, such fatalities were rising in the overall population." DAWN statistics are quite similar. Between 1994 and 2001, DAWN reported a 230-percent increase in the number of emergency room patients being seen for methadone-related problems or multi-drug problems with methadone in their systems.

According to the "Pulse Check" report in 2004, methadone addicts tend to be "white, middle-socioeconomic males older than 35." Florida, Pennsylvania, Ohio, Indiana, and Texas are among the states with the largest methadone problems. The availability of the drug in these states stems from patients in treatment centers who are saving their doses and selling them on the streets. "Pulse Check" authors noted that the cities of Tampa and St. Petersburg, Florida, in particular, have seen a "dramatic increase in emergency department episodes and deaths involving methadone."

Increased Abuse of Painkillers

The *Join Together* Web site published a survey by Kentucky's *Louisville Courier-Journal* that found 345 fatalities in that state from methadone overdoses between January of 2003 and May of 2004. In Kentucky during that same period, methadone surpassed OxyContin as "the most misused prescription drug in the region," according to the article.

The "2003 National Survey on Drug Use and Health" also determined that illegal use of methadone was on the rise among

Alternative to Methadone

Beginning in the early twenty-first century, the U.S. Food and Drug Administration (FDA) approved trials on a drug called buprenorphine (marketed as Buprenex, Subutex, and Suboxone). A painkiller used in Europe to treat opiate addiction, buprenorphine works the same way as methadone without some of the complications of methadone treatment. The drug has similar effects on the body as methadone but it is not as addicting as other opiate or opioid-like drugs. In its Suboxone form, it contains naloxone, a drug that rids the body of opiates. Scientists are optimistic about the possibilities of Suboxone because grinding it up and snorting or injecting it will simply release the naloxone and cause withdrawal symptoms rather than a high.

teenagers. The survey found that methadone use had increased 25 percent in just one year, part of a general increase in the abuse of prescription painkillers. Overall, methadone is becoming less associated with heroin addicts trying to go straight and more associated with the quiet epidemic of prescription painkiller use and abuse. The epidemic includes men and women of all races, ages, and economic levels.

Effects on the Body

Taken by mouth in pill, biscuit, or liquid form, methadone passes into the digestive system and from there is broken down in the liver. The liver releases the drug into the bloodstream, and it is carried to the brain and spinal cord, where it attaches to opiate receptors.

When no drugs are in the brain, opiate receptors take in ENDORPHINS and ENKEPHALINS, two brain chemicals that regulate feelings of well-being, overall motor coordination, breathing and coughing, and moods. Opiates replace these natural chemicals quickly and in such quantity that the user experiences a rush of pleasurable sensations and a calm drowsiness for hours afterward. This is the "high" that opiate users seek.

No "Rush" with Methadone

When methadone is introduced to the opiate receptors, it does not cause the rush of pleasure that other opiates and painkillers do. Its onset is slower, and it stays in the brain and body longer. Users may feel drowsy and relaxed. Any kind of pain will gradually cease, and it will not return as long as the user takes regular, carefully prescribed doses of the drug. As the dose of methadone leaves the brain and body—generally in about twenty-four to thirty-six hours—the user will begin to feel the discomfort of withdrawal unless a new dose is taken.

In other parts of the body, methadone causes the same symptoms as other opiates and opioids. It inhibits the muscles in the bowels, leading to constipation, and works as a cough suppressant. If taken improperly, it can also affect breathing and lead to asphyxiation—the inability to breathe, which results in death.

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

enkephalins: pronounced en-KEFF-uh-linz; naturally occurring brain chemicals that produce drowsiness and dull pain

Dr. Warren Bickel displays a sample of buprenorphine, a painkiller used to treat opiate addiction. Buprenorphine works the same way as methadone, but is not believed to pose the risk of an overdose. *Photo by Jordan Silverman/ Getty Images.*

Users may also experience nausea and loss of appetite, dry mouth that can lead to tooth decay and gum disease, and pinpoint pupils leading to sensitivity to light. Methadone may also lessen sexual function and desire.

At the end of methadone treatment, users must taper doses slowly to allow all the bodily systems to return to normal. A sudden end to methadone use brings on diarrhea, anxiety, insomnia, and flu-like symptoms.

Reactions with Other Drugs or Substances

Methadone becomes far more dangerous when combined with other drugs or alcohol. All types of tranquilizers, sedatives, antidepressants, and anti-anxiety drugs will increase the likelihood of breathing problems if taken along with methadone. The drug should

not be combined with other painkillers, even over-the-counter medications like acetaminophen (Tylenol) and ibuprofen (Advil), unless supervised by a doctor.

In a 2004 report, the National Drug Intelligence Center revealed that in 65 percent of all emergency room visits related to methadone use, another drug was also present. Frequently the second drug was alcohol. When used together, methadone and alcohol magnify each others' effects. Drinking while taking methadone can lead to very poor motor control, vomiting and breathing problems, coma, and asphyxiation.

Illegal users of methadone sometimes combine it with cocaine as well. Cocaine causes a different sort of high in the brain, one that is unaffected by methadone. Users of cocaine and methadone find themselves in the difficult position of being addicted to two different substances at the same time, with a host of side effects unique to each substance.

Methadone should not be combined with medications that increase metabolism time in the liver. These include medicines for tuberculosis, such as Rifampin, and medicines for seizures and EPILEPSY, including Dilantin. Some antibiotics, and even over-the-counter vitamins, can increase the level of methadone retained in the bloodstream. Methadone decreases the power of medicines prescribed for the human immunodeficiency virus (HIV), the virus that can lead to acquired immunodeficiency syndrome (AIDS). Methadone can worsen nausea, vomiting, and fatigue in patients with AIDS. Since people can be infected with HIV by sharing needles to inject heroin, some ill addicts might not be able to tolerate a methadone plan of treatment.

Treatment for Habitual Users

Habitual use of methadone is encouraged in people trying to kick an opiate habit. This is because proper use of methadone allows addicts to resume a normal life again. Studies from many countries show that heroin addicts who have lost jobs and contact with their families, and have fallen into criminal behavior, can turn their lives around as long as they adhere to a strictly supervised methadone plan. Sometimes recovering addicts take methadone for years. In other cases, the methadone doses are gradually decreased over a period of months until a full recovery is achieved.

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of communication

However, many addicts who start a methadone treatment program will have difficulties following the plan. Some quit and go back to hard drugs. Others falter here and there, or become dependent on

Ann Livingston, the director of the Vancouver Area Network of Drug Users, leans against a poster seeking volunteers to participate in an opiate study in 2005. The controversial program is designed to help hard-to-treat heroin addicts in Vancouver, British Columbia, Canada. Under the 12-month program, half of the participants are given prescription-grade heroin while the other half are treated with methadone. *Photo by Jeff Vinnick/Getty Images.*

another drug such as cocaine. Some combine methadone with other brain-altering drugs or alcohol. This greatly complicates the treatment process.

One researcher in a nationally published report by SAMHSA likened opiate addition to illnesses such as diabetes and extreme obesity. People with diabetes know that they have to manage their weight and watch what they eat. Some do, others do not. The ones who follow doctors' orders live longer than the ones who ignore the advice and carry on with their habits. The same holds true for obesity. People must be highly motivated to lose weight. Some are,

In the News

How many ways can methadone kill? Newspapers reveal personal stories of tragic deaths.

- In 1999, an eight-year-old boy died following a mix-up in his prescription, having taken methadone instead of Ritalin (methylphenidate). It was one of six documented cases of confusion over the similar names for the two drugs.
- In 2001, an eight-year user of prescription methadone, a father with a young child, died in Ontario, Canada, after doctors refused to place him on a liver-transplant list. The man died of liver failure unrelated to his methadone use. A physician admitted that the victim was discriminated against because he used methadone.
- In 2002, a Fort Lauderdale, Florida, woman died in her home at age forty-one of a multiple-drug overdose, including prescribed methadone. She was being treated for an intensely painful back deformity.
- In 2002, a two-year-old boy died of methadone overdose in Sheffield, England, after drinking the sweetened liquid containing methadone that his mother had brought home from a clinic. His mother was high on heroin at the time.
- In 2002, a fifteen-year-old Toronto girl lapsed into a coma and stopped breathing many hours after drinking a beverage laced with methadone. Someone had spiked her drink without her knowledge.
- In 2004, a Colorado State University student died a month before his twenty-first birthday from a combination of alcohol and methadone. He collapsed on a street near the campus.

some are not. The ones who make a commitment to change often live longer than the ones who do not change their lifestyles. Drug addicts are also suffering from a disease, and their willingness to fight the disease influences their ability to overcome it.

Most doctors realize that simply dispensing methadone tablets to people with a drug addiction will not end the cycle of abuse. Opiate addicts must also undergo talk therapy with counselors who are trained to offer strategies for combating drug use. Self-help groups such as Narcotics Anonymous can be helpful but might not be enough for those requiring methadone therapy. Most methadone clinics combine drug treatment with personal counseling.

Self-Healing on the Street

Studies are being conducted of methadone abuse on the streets to see how the drug is used recreationally. Some researchers suggest that ILLICIT methadone is used less for the high it produces and more as a self-treatment for withdrawal symptoms when other opiates are not available. Methadone is not a safe recreational drug. It is

illicit: unlawful

habit-forming. Anyone using it for any reason should be under the close supervision of a doctor.

Consequences

When used properly, methadone can literally save lives. Heroin users expose themselves to many deadly diseases, including HIV and hepatitis (a liver disease), when they share dirty needles. Heroin users are also prone to commit crimes or indulge in risky behavior. By stopping heroin use, the cycle of the desperate pursuit of the next "fix" ends. A thirty-one-year-old recovering heroin addict, quoted in the *York Daily Record,* said he rode a bus two hours each way from his home every day for his methadone treatments. Admitting he had been jailed "at least ten times," the man said that methadone "gives me the ability to get on with my day." While methadone treatment for drug abuse is not easy, quick, or always successful, it does offer hope to people who are harming themselves and others.

As a prescription painkiller, methadone use must be monitored very carefully for the potential of poisonous build-up in the body. Doctors prescribing it for pain need to be quite knowledgeable about how to adjust the doses and how to monitor patients for overdose. Patients must be aware that they need to take the medicine *exactly as prescribed* or face possibly fatal consequences. Doctors must be particularly careful when patients are taking any other medications, either prescription or over-the-counter drugs. When used as a prescription painkiller, methadone is typically a drug of last resort.

Any use of methadone with other drugs and alcohol in a recreational setting can be fatal. Failure to store the medicine properly can lead to poisoning in children. Crushing methadone pills and snorting or injecting them for recreational use can cause death, sometimes many hours or even a day or two after use. Methadone overdose generally causes the user to fall asleep, and the sleep then deepens into a coma that ends when the user's breathing stops.

Methadone is a habit-forming drug. Community leaders often fight against having methadone clinics in their neighborhoods because the clinics attract drug abusers who may have committed criminal acts. Anyone considering experimentation with methadone should keep in mind that those who really *need* the drug have very difficult lives with extremely challenging mental or physical illnesses.

The Law

Methadone is a Schedule II controlled substance, meaning that the U.S. government finds it to have some medical uses but also a high potential for abuse and addiction. Penalties for possession and sale of illegal methadone vary from state to state and can be quite harsh, since the drug carries so many potential dangers. Even a first conviction for possession or sale of illicit methadone can carry jail time. Second and third offenses can result in a lifetime in prison.

In 2000 the FDA relaxed some of the restrictions on the legal prescription of methadone. Still, doctors who prescribe the drug must attend training sessions to learn about methadone's profile, how to prescribe the drug safely, and how to monitor patients for life-threatening side effects. Doctors who finish the training are issued a special license to prescribe methadone. Needless to say, any doctor or pharmacist who issues methadone without the proper documentation can face prosecution as a criminal.

Methadone's dangerous side effects, its history as a substance used to help addicts, and its long-lasting effects on the body have all combined to bring its uses—both legal and illegal—under greater scrutiny.

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See also: Cocaine; Codeine; Fentanyl; Hydromorphone; Morphine; Opium; Oxycodone; Ritalin and Other Methylphenidates

Methamphetamine

Official Drug Name: Methamphetamine (METH-am-FETT-uh-meen), methamphetamine hydrochloride (Desoxyn [des-OK-sinn]); deoxyephedrine (dee-OK-see-ih-FEH-drinn; Methedrine)
Also Known As: Batu, chalk, crank, crystal, crystal meth, glass, ice, meth, poor man's cocaine, shabu, speed, tina, trash, ya ba, zip
Drug Classifications: Schedule II, stimulant

What Kind of Drug Is It?

Methamphetamine, commonly referred to as "meth," is a synthetic, or laboratory-made, stimulant. Stimulants increase alertness, endurance, and feelings of well-being in the user. Examples of other stimulant drugs include cocaine and caffeine. (Entries on both of these drugs are available in this encyclopedia.) Methamphetamine is considered an especially powerful and addictive substance—far more addictive even than cocaine—because of its powerful effect on the brain.

Methamphetamine was developed by a Japanese chemist in 1919 from amphetamine, another laboratory-made drug. Amphetamine increases energy, reduces appetite, and helps keep users awake. (An entry on amphetamines is also available in this encyclopedia.) The first amphetamine had been made by a German chemist in the late 1880s, but it was not used for medical purposes until decades later. In its earliest form, amphetamine was found to be an effective treatment for asthma (AZ-muh), a lung disorder that interferes with normal breathing. Because of its similar ability to unclog breathing passages, methamphetamine was originally used as a nasal decongestant.

As of 2005, the medical use of methamphetamine was extremely limited. However, illicit, or unlawful, use was quite high worldwide. Like other amphetamines, methamphetamine boosts energy levels and produces an intense rush or high in the user. These properties have made it popular with recreational drug users—those who use a drug solely to get high, not to treat a medical condition. The dangers of methamphetamine lie in its strength and its high potential for addiction. Few people can "try" methamphetamine once without wanting more. Experts in the medical, behavioral, and law enforcement fields considered meth abuse one of the most serious social threats of the early twenty-first century.

Overview

Methamphetamine is a highly addictive stimulant drug. It is closely related to amphetamine but has a longer lasting and more TOXIC effect on individuals who abuse it. Because of its potentially harmful side effects, methamphetamine is only prescribed by doctors when other

toxic: harmful, poisonous, or capable of causing death

Methamphetamine is made from ingredients that are readily available in homes and stores. (Some of the products used are displayed here.) Many of the chemicals used to make meth carry warning labels noting that they are toxic or harmful if consumed. *AP/Wide World Photos.*

medications have failed to help their patients. Methamphetamine has been used with some success in individuals with attention-deficit/hyperactivity disorder (ADHD). Children and adults who have been diagnosed with ADHD are typically impulsive, somewhat edgy, and have difficulty focusing and controlling their actions. These symptoms often interfere with their ability to function socially and academically. Methamphetamine is also approved for use in treating obesity as well as narcolepsy, a rare sleep disorder characterized by daytime tiredness and sudden attacks of sleep.

What is of great concern to drug-control authorities, however, is the increasingly widespread abuse of methamphetamine. During the 1990s and early 2000s, the illegal manufacture and distribution of the drug increased dramatically in the United States. According to the 2004 "National Synthetic Drugs Action Plan" prepared by the U.S. Office of National Drug Control Policy (ONDCP), the bulk of the methamphetamine sold in the United States is produced illegally in California. "Most of the large super labs in California are run by organizations with ties to Mexico," noted the authors of the "Action Plan." However, record numbers of smaller, independent

labs began popping up throughout the American Midwest beginning in 2003. Authorities considered the eastward movement of the methamphetamine problem and the "dramatic increase" in these Midwestern labs to be "particularly troubling."

The illegal use of methamphetamine had reached epidemic proportions in the United States as of 2005. According to the "2003 National Survey on Drug Use and Health (NSDUH)," 12.3 million Americans age twelve and older—more than 5 percent of the U.S. population— have tried methamphetamine at least once in their lives. The majority of users that year were between the ages of eighteen and thirty-four, and more than half of the new users were under eighteen.

Homemade Meth

Methamphetamine can be manufactured or "cooked" in home laboratories. *MSNBC.com* special reporter Jon Bonné noted in the online article "Meth's Deadly Buzz" that the drug "is easily manufactured domestically with common household items such as batteries and cold medicine." Meth "cooks" are usually untrained, and the chemicals they use are highly flammable, meaning they are capable of catching fire and burning quickly. This increases the likelihood of accidental explosions in meth labs. Despite the risks, drug traffickers set up their operations in small spaces such as bathrooms, sheds, basements, crawl spaces, motel rooms, and even suitcases. The business has become something of a family tradition in some cases, with parents passing recipes and production tips down to their children.

In order to avoid being caught, some meth cooks set up their equipment in mobile labs. These labs might be assembled in car trunks, vans, travel trailers, motor homes, and even trucks. But because meth production has a great potential for explosions, especially among inexperienced cooks, the mobile labs become toxic time bombs that present a very real threat to police and motorists. In addition to explosions, mobile labs have been known to leak hazardous materials, resulting in road closures while the cleanup work is being done. In many cases, both mobile and non-mobile labs have to be disassembled by hazardous materials (hazmat) crews or law enforcement officers dressed in protective gear.

Abusing Meth Equals Quick Addiction

Methamphetamine produces feelings of euphoria, which is a state of extreme happiness and enhanced well-being. It also increases energy by raising the levels of two NEUROTRANSMITTERS in the brain: 1) dopamine (DOPE-uh-meen), which is a combination

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

Narcotics task force agents are shown combing through the various chemicals used to make methamphetamine found on a truck in Kentucky. Some people make meth in vans, trucks, or trailers so they can move from place to place in order to dodge police. Moving meth labs contain toxic ingredients that can explode, causing injuries to motorists, highway closures, and thousands of dollars in damages and cleanup costs.
AP/ Wide World Photos.

of carbon, hydrogen, nitrogen, and oxygen; and 2) norepinephrine (nor-epp-ih-NEFF-run), which is a natural stimulant. The drug causes excessive amounts of these chemicals to be released, resulting in a spike, or sudden increase, in their concentration in the brain.

Methamphetamine's effect on dopamine levels can help treat patients with ADHD and narcolepsy. Dopamine plays a key role in regulating attention. It acts on the part of the brain

Children of Users Suffer Neglect

The growing abuse of methamphetamine has had an enormous impact on users' children. As of 2005, the child welfare issue was particularly problematic in rural areas of the United States. Oklahoma and Kentucky seem to have been hit especially hard. The number of neglected children in these areas has skyrocketed as more and more parents have begun using, making, and selling methamphetamine at home.

According to Kate Zernike in a July 2005 *New York Times* article, the problem is compounded by the fact that these rural areas lack the kind of social services needed to help youths who have been raised in a drug-using environment. Under such circumstances, children are forced to fend for themselves because their parents are often either high or sleeping off the effects of their last binge. When parents are arrested for their drug activity, their underage kids are typically placed in foster homes.

"Many of these neglected children struggle with emotional, developmental and abandonment issues," noted Zernike. "It has become harder to attract and keep foster parents because the children of methamphetamine arrive with so many behavioral problems; they may not get into their beds at night because they are so used to sleeping on the floor, and they may resist toilet training because they are used to wearing dirty diapers."

responsible for filtering incoming information, making choices, and deciding when and how to act. However, in users who do not have ADHD or narcolepsy, methamphetamine's effect on dopamine increases alertness, brings on a sense of happiness and contentment, and creates an urge for more and more of the drug. That is what makes it so dangerous. As Julia Sommerfeld explained in the article "Beating an Addiction to Meth" on *MSNBC.com*: "While high levels of dopamine in the brain usually cause feelings of pleasure, too much can produce aggressiveness, irritability, and schizophrenic-like behavior." Schizophrenic behavior refers to exhibiting the symptoms of schizophrenia, a severe mental disease characterized by a withdrawal from reality and other intellectual and emotional disturbances.

Methamphetamine addiction can occur easily. Users who want to lose weight take methamphetamine to decrease their appetites. Others might try it for the burst of energy it provides to cram for exams or work extra hours. But the effects of the drug are so intense that occasional users or even first-timers often find themselves craving more. *KCI: The Anti-Meth Site* posts stories of users who have been drawn into the world of addiction. Their accounts illustrate the drug's destructive effects.

"The Meth Epidemic in America"

In July of 2005, a report titled "The Meth Epidemic in America" was released by the National Association of Counties (NACo). Five hundred counties from forty-five states participated in the survey. About 87 percent of responding law enforcement agencies reported increases in meth-related arrests since 2002. In addition, 40 percent of child welfare officials surveyed reported an increase in children needing out-of-home placements due to methamphetamine-related activities.

NACo president Angelo D. Kyle wrote in his executive summary of the survey: "The methamphetamine epidemic in the United States, which began in the West and is moving East, is having a devastating effect on our country. The increasingly widespread production, distribution and use of meth are now affecting urban, suburban and rural communities nationwide."

Impact on the Environment

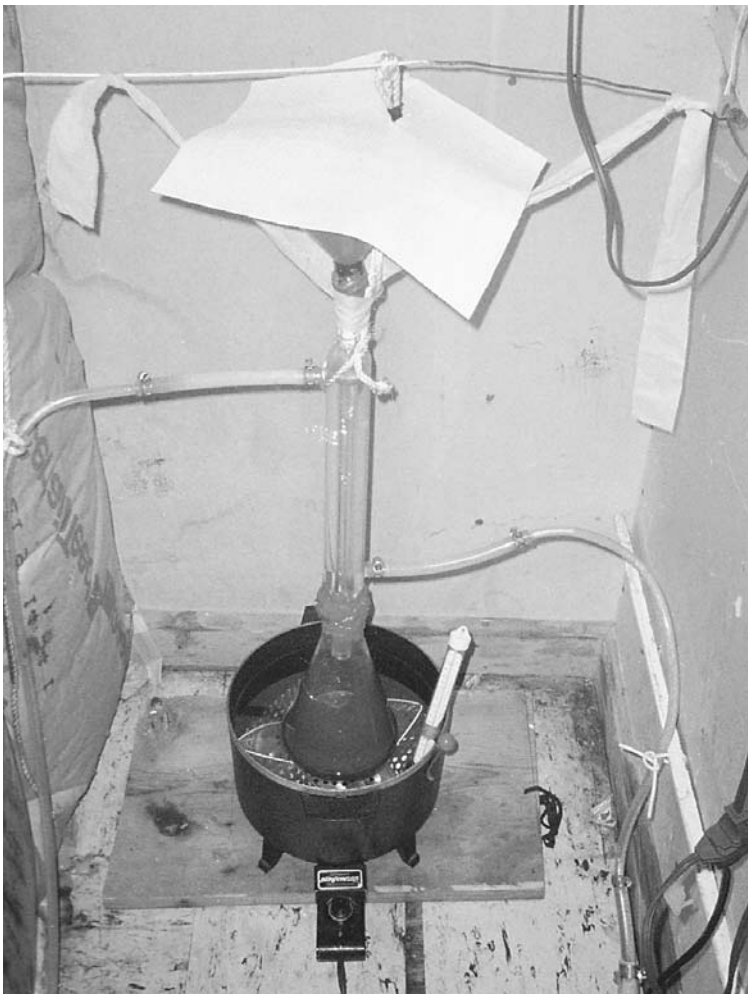
The illegal manufacture of methamphetamine takes its toll on the environment as well. Statistics from "The Meth Epidemic in America" indicate that for every pound of methamphetamine produced, five to seven pounds of toxic waste are created. The solid wastes are usually dumped down household drains, in yards, or on back roads. The accompanying poisonous gas is released into the air. Chemicals from large-scale methamphetamine laboratory dump sites have killed livestock, contaminated streams, and destroyed trees and vegetation.

According to the ONDCP: "The cleanup operation following the discovery of a dump or . . . laboratory site is typically an extremely expensive endeavor." California spent nearly $5 million cleaning up meth sites in 2002, and costs are on the rise. As meth makers refine their skills and upgrade their labs, larger amounts of the drug can be produced at a single site. More meth means more TOXINS, which translates into more expensive cleanup operations. "Some labs are now able to produce 100 pounds or more of methamphetamine per production cycle," notes the ONDCP report. "[T]his increased productivity leaves behind increased amounts of toxic waste." The effect of these chemicals on the nation's water supply—and all the people who drink from it—remains to be seen.

What Is It Made Of?

Methamphetamine is closely related to amphetamine but has longer lasting and more toxic effects on the user's system. Meth is a white, odorless powder that dissolves easily in water or alcohol. Production of the drug begins with common

toxins: poisonous substances



Meth makers concoct various devices to create the drug, including those resembling old moonshine (illegal alcohol) stills of years past. Drug makers use abandoned houses, trailers, barns, vans, motel rooms, and other hidden places to make the drug. *AP/Wide World Photos.*

chemicals, including EPHEDRINE or PSEUDOEPHEDRINE. Ephedrine-containing pills and powders were banned by the U.S. Food and Drug Administration (FDA) in 2004. However, as of mid-2005, illicit supplies were still available through the Internet. Pseudoephedrine is a key ingredient in cold medicines and asthma drugs. (An entry on over-the-counter drugs is available in this encyclopedia.)

ephedrine: pronounced ih-FEH-drinn; a chemical substance that eases breathing problems

pseudoephedrine: pronounced SUE-doh-ih-FEH-drinn; a chemical similar to ephedrine that is used to relieve nasal congestion

Methamphetamine is relatively easy to produce in homemade laboratories. Various newspaper accounts note that meth cooks routinely brew small batches of the drug in their home labs using household goods that they purchased legally in stores. Many use recipes they find on the Internet posted by amateur chemists. As such, the strength and toxicity of each batch can vary considerably. By 2005, more and more Americans were expressing their concern over the ease with which these meth ingredients could be purchased. As a result, lawmakers began to push for crackdowns on the sale of ephedrine and greater restrictions on the sale of pseudoephedrine-containing medicines.

How Is It Taken?

Methamphetamine is swallowed, snorted, injected, smoked, absorbed through the gums, or inserted through the anus.

Legal Form

The prescription form of methamphetamine (Desoxyn) comes in the form of a white tablet. Each tablet contains 5 milligrams of methamphetamine HYDROCHLORIDE. Its chemical formula is $C_{10}H_{15}NHCl$.

Illegal Forms

Illegally produced methamphetamine tablets often contain large amounts of caffeine. The tablets are sweet, brightly colored, and about the size of a pencil eraser. These pills are called ya ba, the Thai term for "crazy drug." Ya ba is especially popular in the Southeast Asian countries of Thailand, Burma, and Laos. It first appeared in the United States in 1999, with use centered in the Southeast Asian communities of California. In a September 2002 article for the *North County Times,* Louise Chu explained, "Ya ba has become a vague label for any type of meth in pill form, although it specifically refers to the brand produced in Southeast Asia."

The powdered form of methamphetamine is much more common. Users absorb it through mucous membranes in a variety of ways—snorted up the nose, rubbed onto the gums, wrapped in a cigarette paper and swallowed, or even wrapped and inserted into the anus. The powder dissolves quickly and is sometimes added to coffee or alcoholic drinks.

hydrochloride: a chemical compound composed of the elements hydrogen and chlorine, often in the form of a crystallized salt

Liquefied methamphetamine is made by adding water to the powdered form of the drug. As a liquid, it can be injected directly into a user's vein or muscle.

Drug smugglers will try just about anything to get their product into the United States. This U.S. Customs photo shows the drug ya ba, a form of methamphetamine, concealed in a shipment of dead bugs.

AP/ Wide World Photos.

Chunks of methamphetamine hydrochloride look like clear crystals and are often referred to as "ice." A common way to smoke ice is in a glass pipe with a bulb on one end. According to G. C. Luna in a 2001 article posted on the *SciELO Public Health* Web site, "some methamphetamine users break off the tops of light bulbs, put the drug into the glass bulb, heat the underside of the bulb, and inhale the contents."

A quarter of a gram of methamphetamine costs anywhere from twenty to sixty dollars on the BLACK MARKET. Meth users are willing to spend the money to purchase such a small amount of the drug because a long-lasting high can be achieved with very small quantities.

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

Was Hitler a User?

During World War II (1939–1945), methamphetamine was one of several stimulant drugs given to soldiers to fight off battle fatigue. Some experts suspect that Nazi dictator Adolf Hitler (1889–1945) used methamphetamine regularly from the mid-1930s until the end of the war, when he committed suicide in an underground bunker. According to the 2005 History Channel television documentary *High Hitler,* "In 1938 the king of Italy told his foreign minister that Hitler was being injected [with] narcotics and stimulants. Hitler's valet said that every morning before he got out of bed he had an injection that made him immediately alert and fresh for the day."

Hitler also had symptoms such as tremors, shuffling, and poor eyesight. It is unknown if some of these symptoms were caused by a neurological disorder such as Parkinson's disease, or by a drug habit. It is well documented, however, that Hitler's personal physician, Dr. Theodor Morell, provided him with a variety of daily medications. As noted in "High Hitler," Morell admitted in his diary that he supplied Hitler with a substance called "vitamultin" in both pill and injectable form. Many experts are convinced that Germany's leader was taking methamphetamine. Historians believe that Hitler's drug abuse affected his judgment and may have influenced his decision-making abilities during the war.

Are There Any Medical Reasons for Taking This Substance?

In the United States, methamphetamine is approved for use in treating certain medical conditions. It is used medically to manage the symptoms of ADHD and narcolepsy. It can also be used as a short-term treatment for obesity.

Usage Trends

Methamphetamine was developed in the early twentieth century from amphetamine. Its stimulating effects on the brain and body quickly led to its abuse as a recreational drug.

Methamphetamine in the Second Half of the Twentieth Century

By the 1960s, the availability of injectable methamphetamine had increased, and the rate of addiction grew substantially. In 1970 the U.S. government passed the Controlled Substances Act (CSA), which classified methamphetamine as a Schedule II substance. This meant that it is approved for medical use with a prescription but nevertheless possesses a high potential for abuse. This legislation

severely restricted the legal production of methamphetamine. With these restrictions, however, came a huge jump in the number of illegal labs that were manufacturing the drug. In the 1980s, a smokeable form of methamphetamine, known as ice or crank, came into widespread use.

Methamphetamine TRAFFICKING and abuse has been on the rise in the United States and throughout the world since the 1990s. Various sources, including the ONDCP's "Action Plan," have found that the methamphetamine problem is spreading from the western United States to the Midwest and the South. Much of the illegal supply is made and distributed by Mexican drug trafficking organizations. By the early 2000s, meth was being distributed by Mexican traffickers through networks that had been established earlier for cocaine, heroin, and marijuana sales. (Entries on these three drugs are also available in this encyclopedia.) According to the Drug Enforcement Administration's "Statistics: DEA Drug Seizures," more than 118 million doses of methamphetamine were seized in 2002. In addition, the agency's National Clandestine Laboratory Database reported that some 7,000 meth labs were destroyed in 2004. The states of Iowa, Missouri, and Tennessee reported the highest number of meth lab incidents that year.

Is There Such a Thing as a Meth User Profile?

Most methamphetamine users report that they began taking the drug as an experiment. They wanted to have more energy and experience a powerful high. In the late 1990s, meth use in the United States was highest among white, male, blue-collar workers on the West Coast. As of 2005, the user profile had broadened to include diverse groups in all regions of the country. The authors of the 2005 study "The Meth Epidemic in America" noted that more high school- and college-aged students were taking the drug. Use had grown enormously among individuals in their twenties and thirties. There is no longer a definition of a "typical meth user." Use is high among the employed and the unemployed, white-collar workers and blue-collar workers, men and women. Though typically associated with whites, use is spreading among Hispanics and Native Americans as well.

Other groups showing increased use of methamphetamine include homeless and runaway youths, individuals who attend RAVES, and homosexuals. The gay community is at special risk because of the "party and play" trend developing in homosexual circles. As reported by David J. L. Jefferson in a February 2005 *Newsweek* article, "party and play" refers to using methamphetamine and then having sex—often without a condom. There is growing concern that this type of abuse

trafficking: making, selling, or distributing a controlled drug

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

will lead to an increase in the spread of acquired immunodeficiency syndrome (AIDS). Jefferson noted that when comparing nonusers and users of methamphetamine, the users were twice as likely to engage in unprotected sex and four times as likely to be HIV positive (carrying the human immunodeficiency virus, which can lead to AIDS).

Teen Use in the United States

The results of the Monitoring the Future (MTF) study were released to the public on December 21, 2004. An annual survey on adolescent drug use and attitudes, it is conducted by the University of Michigan (U of M) with funding from the National Institute on Drug Abuse (NIDA). According to the report, the percentage of eighth, tenth, and twelfth graders who had used methamphetamine in a one-year period decreased over the previous five years. In 1999, some 3.2 percent of eighth graders used methamphetamine at least once during the year, compared to 1.5 percent of eighth graders in 2004. Tenth-grader use in a one-year period decreased from 4.6 to 3 percent, and senior use of methamphetamine dropped from 4.7 to 3.4 percent.

The DAWN Reports

The Drug Abuse Warning Network (DAWN) keeps track of drug-related emergency department (ED) visits throughout the United States. Prior to 2003, statistics on methamphetamine and other amphetamines were grouped together in DAWN reports. The report titled "Amphetamine and Methamphetamine Emergency Department Visits, 1995-2002" showed a rise in the number of ED mentions related to these drugs over the seven-year span. Between 1995 and 2002, methamphetamine and amphetamine ED visits rose from 25,245 to 38,961—an increase of 54 percent. The latest DAWN figures available as of mid-2005 were from the last two quarters of 2003. During that six-month period, methamphetamine use alone accounted for more than 25,000 drug abuse-related ED visits. An additional 18,129 visits were attributed to other amphetamine use. Most of the patients were white males between the ages of eighteen and thirty-four.

Meth Use High Worldwide

Methamphetamine abuse is a global problem. The CBC-TV documentary series *The Fifth Estate* ran an episode called "Dark Crystal" in March of 2005 that reported on the meth problem in Canada. The number of illegal labs shut down by Canadian authorities in 2003 was nearly ten times higher than the number

A one-ounce bag of crystal meth, also known as "ice," is shown here by police in Hawaii. It was seized during a raid on a home located on the same street as the police department. *AP/Wide World Photos.*

shut down in 1998. In addition, methamphetamine-related deaths rose from three in the year 2000 to thirty-three in the year 2004. Most of the deaths resulted from overdoses or car crashes involving a driver high on meth.

According to the 1998 United Nations fact sheet "Amphetamine-Type Stimulants: A Problem Requiring Priority Attention," in Japan nearly 90 percent of all drug-law violations involved methamphetamine. High rates of abuse have also been a problem in Thailand, the Philippines, and Korea since the 1990s. The World Health Organization's "Management of Substance Abuse" report states that "a major epidemic of methamphetamine use . . . appears to be spreading across the entire Asia Pacific region."

Effects on the Body

When snorted or taken orally, one "hit" of methamphetamine can produce a high that lasts for about twelve hours. In general, the faster the meth is absorbed into the body, the more intense the pleasurable feelings experienced by the user. Injecting and smoking methamphetamine deliver a "rush" that cannot be achieved by snorting powder or swallowing pills, which slows the absorption process. Most addicts inject liquid methamphetamine or smoke crystal meth because the rush is what they're seeking.

Injecting methamphetamine is the most dangerous method of use. When methamphetamine is dissolved in water, dust, germs, and other materials can get into the liquid. The syringe used to inject the drug into the veins may be dirty as well. Any contaminants in the liquid or on the needle will be injected directly into the bloodstream. Users who inject methamphetamine run the risk of contracting both HIV and HEPATITIS A from sharing needles. The injections can also cause sores at the injection sites.

Methamphetamine is an extremely dangerous and addictive drug. It increases heart and breathing rates, blood pressure, and body temperature. Other effects include NAUSEA, diarrhea, increased talkativeness, and a tendency to engage in repetitive actions. When the drug is injected, the initial rush leads some individuals to report feeling invincible, as if they can take on the world. Throughout the high that follows, users frequently appear more self-assured, "pumped up," and sexually aroused. They also may become extremely aggressive. As time passes, however, the surge of energy begins to fade. At that point, users are said to be crashing. They typically experience: 1) dehydration—an abnormally low amount of fluid in the body; 2) anxiety—feelings of being extremely overwhelmed, restless, fearful, and worried; 3) tiredness; and 4) depression—feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts.

In severe cases, a mental disorder known as methamphetamine psychosis (sy-KOH-sis) develops. Symptoms of psychosis include paranoia, or abnormal feelings of suspicion and fear; hallucinations, or visions or other perceptions of things that are not really present; and uncontrolled anxiety that may lead to rage and violent behavior. And the hallucinations are not only visual. Users may hear voices. They have also been known to tear their skin apart in search of imaginary "crank bugs" that they think they feel crawling all over their bodies.

hepatitis A: inflammation of the liver caused by a virus

nausea: upset stomach, sometimes with vomiting

A Nasty Cycle

Because methamphetamine users know what to expect when they crash, their main goal is to avoid coming down by getting high

again. This process is referred to as "bingeing." Bingers may continue the drug-taking cycle for so long that they end up staying awake for days. But all meth users eventually reach a point where no amount of the drug will sustain their high. Users in this phase, which is known as "tweaking," become extremely frustrated, irritable, and likely to be involved in a serious fight or accident.

Over time, heavy methamphetamine use takes an extreme toll on the user's body—both inside and outside. A noticeable loss of weight and a tendency to sweat makes them appear ill. They may also develop body odor; yellowing, decay, or loss of teeth; and chalky pale skin. The internal effects of methamphetamine can include an irregular heartbeat, high blood pressure, and possible STROKE. Dangerously high body temperatures, convulsions, and even death may occur if a user overdoses. Methamphetamine abuse during pregnancy can lead to premature delivery and harm to the baby.

What Meth Does to the Brain

Research conducted by Dr. Nora D.Volkow and published in the March 2001 issue of the *American Journal of Psychiatry* indicates that methamphetamine impairs the brain's ability to resist repeated use of the drug. Volkow's research shows that methamphetamine users have fewer dopamine RECEPTORS in their brains than nonusers. With continued abuse, the reward center in the brains of meth addicts will not respond to any stimuli—except more meth. In the 2001 Brookhaven National Laboratory article "Methamphetamine Delivers 'One-Two' Punch to the Brain," Volkow noted that such research "may help explain why drug addicts lose control and take drugs compulsively."

In another study headed by Volkow and published in the December 2001 issue of the *Journal of Neuroscience,* users with damaged dopamine receptors were reexamined after a period of abstinence from the drug. The participants in the study were longtime abusers of methamphetamine, reporting at least two years of continued use for at least five days per week. Changes in their brains were measured in two ways: 1) using brain-imaging techniques, and 2) using their scores on tests of various physical and intellectual abilities.

In the April 2002 edition of "NIDA Notes," Patrick Zickler summarized the results of this second study. Heavy methamphetamine abusers who managed to remain drug-free "for at least nine months showed substantial recovery from damage to the dopamine transporters but not from impairments in motor skills and memory." In other words, the pictures of the recovered addicts' brains looked more like the brains of non-meth users, but their physical and intellectual performance remained low. Zickler quoted Volkow as

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

receptors: groups of cells that receive stimuli

Number of methamphetamine lab sei ures in the nited States, 2000 and 2004

State	2000	2004	Change (+/−)	State	2000	2004	Change (+/−)
Alabama	84	378	+294	Montana	28	64	+36
Alaska	26	57	+31	Nebraska	36	200	+164
Arizona	384	95	−289	Nevada	283	79	−204
Arkansas	243	743	+500	New Hampshire	1	2	+1
California	2,198	673	−1,525	New Jersey	N/A	N/A	N/A
Colorado	142	223	+81	New Mexico	50	118	+68
Connecticut	N/A	N/A	N/A	New York	2	28	+26
Delaware	1	3	+2	North Carolina	14	317	+303
Florida	15	277	+262	North Dakota	34	217	+183
Georgia	54	233	+179	Ohio	29	211	+182
Hawaii	5	7	+2	Oklahoma	399	652	+253
Idaho	127	43	−84	Oregon	351	420	+69
Illinois	127	926	+799	Pennsylvania	8	106	+98
Indiana	363	1,002	+639	Rhode Island	1	N/A	N/A
Iowa	283	1,300	+1,017	South Carolina	4	154	+150
Kansas	641	538	−103	South Dakota	7	31	+24
Kentucky	104	562	+458	Tennessee	249	1,259	+1,010
Louisiana	15	113	+98	Texas	429	434	+5
Maine	2	3	+1	Utah	209	67	−142
Maryland	N/A	1	N/A	Vermont	N/A	1	N/A
Massachusetts	N/A	1	N/A	Virginia	1	73	+72
Michigan	21	282	+261	Washington	944	743	−201
Minnesota	123	165	+42	West Virginia	3	145	+142
Mississippi	126	244	+118	Wisconsin	26	74	+48
Missouri	889	2,707	+1,818	Wyoming	12	21	+9

*Includes all meth incidents, including labs, "dumpsites" or "chemical and glassware" seizures.
Notes: In 2000 California had the most incidents (2,198); in 2004, it was Missouri (2,707). The 2000 figures are based on results submitted by 45 states; 47 states participated in 2004. N/A means that the state did not supply results data.

SOURCE: Compiled by Thomson Gale staff from data reported in "Maps of Methamphetamine ab Seizures," *National landestine aborator Database,* U.S. Drug Enforcement Administration DEA , U.S. Department of ustice, Alexandria, A [Online] http://www.usdo .gov/dea/concern/map_lab_seizures.html [accessed May 25, 2005].

saying that the changes in the brains of heavy methamphetamine abusers "are roughly equivalent to 40 years of aging." Furthermore, people who use meth may run a greater risk of developing Parkinson's disease as they age. The bottom line is that methamphetamine abuse can cause lasting brain damage.

Reactions with Other Drugs or Substances

Various drugs and substances cause dangerous health effects when taken with meth.

- The use of other stimulants along with methamphetamine has an additive effect, which can damage the heart.
- Methamphetamine mixed with over-the-counter cold medicines can cause a dangerous rise in blood pressure.

- To decrease the negative feelings experienced during tweaking, an abuser often self-medicates with a DEPRESSANT such as alcohol. But alcohol only masks the effects of methamphetamine, causing the user to crave another "hit."
- Methamphetamines taken in combination with antidepressant drugs may pose life-threatening health risks.

Treatment for Habitual Users

Methamphetamine users experience extreme psychological withdrawal when they stop using the drug. People suffering from psychological withdrawal feel that they need to keep taking the drug because they can't function without it. Sommerfeld quoted drug researcher Douglas Anglin of the University of California at Los Angeles as saying, "There's not severe physical withdrawal with methamphetamine, but rather a feeling of ANHEDONIA . . . that can last for months and which leads to a lot of relapse at six months." Withdrawal from methamphetamine is characterized by drug cravings, depression, an inability to sleep, and an increased appetite. Users in this stage may become suicidal.

Rehab: Difficult but Possible

Methamphetamine addicts often resist any form of treatment or intervention, according to Luna. They feel that they'll be able to quit on their own when they're ready. Among addicts who do seek help, the treatment process is typically lengthy. It can continue for months or even more than a year after the user has quit the drug. Antidepressant medications may be used to help battle the depression that can accompany withdrawal.

However, drug therapy usually is most helpful when combined with COGNITIVE BEHAVIORAL THERAPY (CBT). According to the *Drug-Rehabs.org* Web site, the most effective treatment for methamphetamine addiction consists of behavioral interventions such as individual and group counseling. These treatments help addicts establish a new circle of non-using friends and improve their coping skills to deal with everyday stressors.

NIDA Fights Against Meth Abuse

NIDA is pursuing research on drugs that could help with the treatment of methamphetamine addiction. Dr. Nora D. Volkow, the head of NIDA, appeared before the U.S. Senate to talk about methamphetamine abuse in 2005. She stated: "To further speed

depressant: a substance that slows down the activity of an organism or one of its parts

anhedonia: pronounced ann-heh-DOE-nee-uh; the inability to experience pleasure from normally enjoyable life events

cognitive behavioral therapy (CBT): a type of therapy that helps people recognize and change negative patterns of thinking and behavior

Oregon Takes Action

To combat the illegal production of methamphetamine in Oregon, the state's lawmakers moved to make various over-the-counter (OTC) medications available only by prescription. Through such actions, occurring in mid-2005, Oregon became the first state in the nation to pass legislation to reclassify OTC cold and allergy products containing pseudoephedrine as prescription drugs. The bill was signed into law and made effective starting in mid-2006. The news was met with enthusiasm by some citizens and concern from others.

Meth is one of the biggest drugs of abuse in Oregon. As such, lawmakers looked for ways to make it more difficult for meth cooks to obtain the ingredients needed to make it. While the bill passed by a large margin in both Oregon's House and Senate, some citizens believe that the new law will create a hardship for the state's citizens who do not have health insurance or can't afford to go to a doctor. Plus, others contend that they are being punished because of the illegal actions of a few criminals. Cold and allergy drug makers also have concerns about the new law, claiming that it will drive up the price of the once-inexpensive OTC drugs.

Those favoring the bill point out that pseudoephedrine-free cold and allergy products are beginning to enter the market. In addition, doctors will be able to phone in prescriptions of the drug, so a visit to one's physician may not be necessary. Whether the measure will curb illegal meth production in Oregon will be studied by various lawmakers, police officers, and other researchers in the years ahead.

medication development efforts, NIDA has . . . established the Methamphetamine Clinical Trials Group (MCTG) to conduct clinical (human) trials of medications for [methamphetamine addiction] in geographic areas in which . . . abuse is particularly high, including San Diego, Kansas City, Des Moines, Costa Mesa, San Antonio, Los Angeles, and Honolulu." Among the drugs being tested are medicines used to treat high blood pressure, an anti-nausea drug, several antidepressants, and an anti-epilepsy drug. (Epilepsy is a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness.) In addition, NIDA is funding research on a substance to treat meth overdoses.

Consequences

The consequences of illicit methamphetamine use include lowered productivity among addicted workers, increased health care costs, higher accident and death rates, and more crime and violence.

Crime and Meth

The increase in methamphetamine abuse by Americans has led to a surge in methamphetamine-related crimes, including theft, domestic violence, and child neglect. In 2001, Luna reported that there were "more persons incarcerated in the United States for drug-related 'crimes' than in any other country in the world." According to "The Meth Epidemic in America," law enforcement agencies in the Southwest reported a 96-percent increase in methamphetamine-related arrests between 2002 and 2005. The Northwest saw a 90-percent increase. "With the growth of this drug from the rural areas of the western and northwestern regions of this country and its slow but continuing spread to the east, local law enforcement officials see it as their number one drug problem," the report concluded.

The ONDCP's "Action Plan" refers to "drug-endangered children" as "the darkest side of the entire methamphetamine problem." In 2003 alone, more than 3,500 children in the United States were involved in meth lab incidents. The authors of the plan noted that "forty-one of these children were reported injured and one child was killed by explosions or fires" at illegal lab sites.

In the Pacific Northwest, lawmakers have stepped up legislation to combat the meth problem there. They aim to reduce the number of meth labs and the sale of the drug. But, they also have other issues to contend with regarding the use of methamphetamines. In 2005, police in several communities reported that a few teens had exchanged sex for meth. Law enforcement officials also announced that meth addicts had begun to support their habit by stealing metal and selling it for scrap at recycling centers. The addicts use the money to buy more meth. Thieves had stolen metal from irrigation systems, roadways, bridges, and even a historic train. They had removed guardrails on various back roads, particularly those in heavily forested areas. The guardrails protect drivers from going over the edge of bridges or driving off the edge of mountainous roads. Police in many communities participate on meth task forces to find ways to combat the problems of meth-related crime and abuse. Students, parents, and teachers also work to educate the public about the dangers of meth.

"The Faces of Meth"

In Multnomah County, Oregon, Sheriff's Deputy Bret King noticed some differences when looking at a batch of mug shots taken of repeat meth offenders. What he saw was shocking. When looking at images taken just a few years apart, King discovered just

Meth is known to alter people's appearance drastically in just a few years. In the top picture, a woman is shown at age 36. The bottom picture shows the same woman after four years of methamphetamine abuse at age 40.

how much meth abuse had changed people's appearances. Some users looked like they had aged ten to fifteen years in just a couple of years. In order to educate people about the meth problem and its devastating effects, King put together a presentation called "The Faces of Meth." In creating the program, he interviewed meth

users to learn what advice they would give to young people who might be tempted to try meth. According to "The Faces of Meth" Web site, in his presentation, King wanted "to be honest with kids, let them hear directly from the inmates." The program is presented in schools and on the Internet.

AIDS Risk

A connection has been established between methamphetamine use and AIDS. In the *MSNBC.com* article "Hooked in the Haight: Life, Death, or Prison," Jon Bonné quoted San Francisco-based meth abuse counselor Michael Siever. "If you're at a party where a lot of people are injecting, when you put your needle down, someone else may pick it up." Sharing used needles greatly increases the risk of transmitting HIV (the human immunodeficiency virus, which leads to AIDS). Meth's reputation for lowering INHIBITIONS and enhancing sexual pleasure often leads users to engage in unprotected sex—another major reason for the spread of HIV and other sexually transmitted diseases.

The Law

Methamphetamine is a Schedule II drug under the Controlled Substances Act (CSA) of 1970. The CSA established five schedules, or lists, of controlled medications and substances. Substances in Schedule I have the highest potential for abuse, while those in Schedule V have the lowest abuse potential. A Schedule II substance is approved for medical use with a prescription but nevertheless has a high potential for abuse.

Unless obtained by prescription, the possession, use, or distribution of methamphetamine is prohibited in the United States. Each of these offenses carries a maximum ten years in prison and $10,000 fine. Repeat offenders receive much harsher jail sentences and fines of up to several million dollars.

Pseudoephedrine Measures

To fight the illegal manufacture of methamphetamine, some of the chemicals used in its production are included in the Comprehensive Methamphetamine Control Act of 1996 (MCA). The MCA increased penalties for the trafficking and manufacturing of methamphetamine along with the chemicals used to produce the drug. Illegal labs can produce about 1.5 pounds (0.68 kilograms) of meth from 2.2 pounds (1 kilogram) of ephedrine. Pseudoephedrine,

inhibitions: inner thoughts that keep people from engaging in certain activities

One of the ingredients used in the production of methamphetamine can be found in over-the-counter cold and allergy medicines. In an effort to curb meth production, some pharmacies began limiting the sales of such OTC drugs as part of a "Meth Watch Program." *AP/Wide World Photos.*

a substance found in cold medicines, can be used for the same purpose. Stores that sell pseudoephedrine are required to report to authorities any large-volume sales of the chemical.

By mid-2005, about thirty states had either passed or were considering passing laws that would limit the sale of pseudoephedrine. Some retailers have voluntarily moved these "over-the-counter" medicines "behind-the-counter" to the pharmacy area. There, the products are locked up and distributed only in limited amounts to customers showing picture identification. Federal and state laws restricting the sale of pseudoephedrine-based cold medicines are leading drug companies to reformulate their products with a substance called phenylephrine (FENN-uhl-EFF-reen or FENN-uhl-EFF-rin). Phenylephrine has been used in the past as an ingredient in eye drops and decongestants. It cannot be converted to methamphetamine in a home laboratory. As of mid-2005, cold products that contain phenylephrine were being sold in Europe.

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See also: Adderall; Amphetamines; Cocaine; Dextroamphetamine; Ephedra; Herbal Drugs, Over-the-Counter Drugs; Ritalin and Other Methylphenidates

Methaqualone

Official Drug Name: Methaqualone (meth-a-KWAY-lone)
Also Known As: 714s, buttons, disco biscuits, love drug, ludes, mandies, mandrakes, Mandrax, Quaalude, quads, quay
Drug Classifications: Schedule I, depressant

What Kind of Drug Is It?

Methaqualone (meth-a-KWAY-lone) is a highly addictive, illegal, SYNTHETIC drug. It was once widely prescribed as a treatment for insomnia, a sleep disorder, and anxiety, a condition characterized by feelings of fear, worry, restlessness, and panic. Methaqualone is probably best known by its former brand names, Quaalude and Mandrax. It was a legal substance from the 1960s until the early 1980s. Shortly after its introduction as a prescription drug in 1965, however, its popularity as a recreational drug skyrocketed among college students and pop-culture figures in music, film, and television. Recreational drugs are those used solely to get high, not for any medical reason.

By the early 1970s, the U.S. government reclassified the prescription status of methaqualone in an attempt to limit its availability. By then, though, imitations of the drug were flooding the market. During the 1970s, the illegal use of methaqualone grew steadily, reaching a peak in the early 1980s. The drug was popular at discos, where people went to socialize and dance. Soon doctors realized the problems associated with the drug and stopped prescribing Quaaludes. Several states then outlawed the sale of methaqualone.

In 1984, the government finally reclassified methaqualone as a Schedule I controlled substance. This is the designation given to a drug that is highly addictive and has no current medical use in the United States. It is illegal to manufacture, use, or possess a Schedule I drug. Within just two years of this action, the use of methaqualone dropped dramatically in the United States. By 1988, the drug was illegal in almost every country throughout the world.

Overview

Methaqualone was first manufactured in 1955 by scientists in India who were trying to find a cure for malaria, a serious tropical disease spread by mosquitoes. The drug was found to have properties that made it useful as a sleep aid and a sedative to help calm anxiety. Sedatives help people relax, relieving nervousness and restlessness. Doctors and scientists believed this new drug was non-addictive.

synthetic: made in a laboratory

Quaaludes were popular at many discos in the 1970s, including Studio 54 in New York. The widespread use of the drug in such nightclubs gave it the nickname "disco biscuit." © *Bettmann/Corbis.*

It was soon on the market in Japan and Europe as a "safe" alternative to the highly addictive BARBITURATES that had previously been the only choice for effective treatment of insomnia.

Methaqualone was approved for use in the United States in 1965 by the Food and Drug Administration (FDA). It had been sold for several years in other countries under names such as Mandrax, Malsed, Malsedin, and Renoval. Doctors were glad to have a new prescription drug available to help patients deal with anxiety and sleeplessness. In the United States, the new drug was marketed under names such as Sopor, Parest, Optimil, and the most famous of all, Quaalude. Although the drug was available by prescription only, it

barbiturates: pronounced bar-BIH-chuh-rits; drugs that act as depressants and are used as sedatives or sleeping pills; also referred to as "downers"

was originally classified as a Schedule V drug, which meant that it was considered a very safe drug without any serious risk of addiction or harmful side effects.

Highly Abused in the 1960s and 1970s

Methaqualone was a big part of the "sex, love, drugs, and rock 'n' roll" culture of the 1960s and 1970s on both sides of the Atlantic Ocean. In the United Kingdom, the most popular version of methaqualone was combined with an ANTIHISTAMINE and sold as Mandrax. Its slang names included "mandies" and "mandrakes." In the United States, the drug was referred to as "quaaludes," "ludes," or the "love drug." By the late 1960s, the Quaalude brand of methaqualone was wildly popular with students who used the drug as an antidote to the stresses of college life. They also believed, in error, that the drug was an aphrodisiac—a substance that would increase sexual desire and performance. The drug also became popular at nightclubs during the disco dancing craze.

In 1973, the U.S. government reclassified methaqualone from a Schedule V to a Schedule II controlled substance. This is the category given to highly addictive drugs that nonetheless have a particular medical use. It means that doctors can still prescribe the drug for patient use, but there are numerous restrictions on how the drug may be prescribed. One of the requirements is that a patient be examined by a physician before a prescription is written. In addition, Schedule II prescriptions cannot be renewed by phone. They must be rewritten by a doctor each time a patient runs out of the drug. This reclassification of the drug was an attempt to restrict its availability.

By this time, however, two things had happened that made it almost impossible for the government to control access to methaqualone. First, prescriptions were readily available through so-called "stress clinics" that were set up in several states. These were not full-service doctors' offices, but were designed specifically to dispense prescriptions for anti-anxiety medications such as Quaalude. Because minimal physical exams were provided, and because the drug was legally available by prescription, it was difficult for law enforcement agencies to close down such clinics.

antihistamine: a drug that blocks *histamine,* a chemical that causes nasal congestion related to allergies

The Quiet Interlude

Quaalude was a brand name created to remind American consumers of the benefits of a popular over-the-counter product called Maalox, which was sold by the same company. Maalox was named for its ingredients—*ma*gnesium and *al*uminum hydr*ox*ides. In the 1960s it was the best-known product of the William H. Rorer pharmaceutical company. Then (and now), Maalox was a product people took to relieve digestive problems and stomach distress. The company decided to use the "aa" of Maalox in the name of their new "feel-better" drug Quaalude. The new drug was marketed as a prescription-only sleeping pill. The intent was to plant the idea that just as Maalox could provide relief for an upset stomach, Quaalude could provide a "quiet interlude" of relief for sleepless nights.

In addition, the world market was flooded with imitation methaqualone pills. During the peak of methaqualone use in the United States, approximately one billion counterfeit pills entered the country every year. Consequently, cracking down on the legal prescription process did little to slow the tide of demand for—or supply of—the drug.

No Longer Available Legally

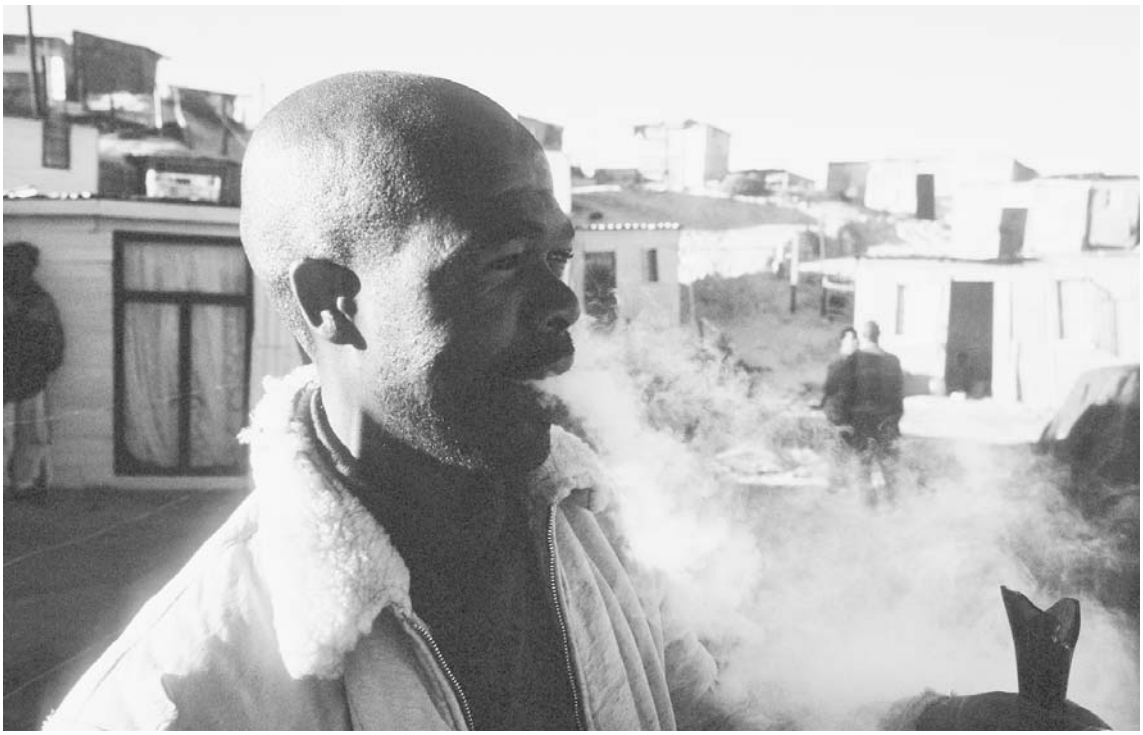
By the early 1980s, as the medical world realized that methaqualone was too dangerous and addictive for most people, many doctors stopped prescribing the drug in any form. In 1984, nine states, including Florida, Georgia, and Illinois, banned the sale of the drug. The last U.S. company still manufacturing methaqualone stopped making and selling it on January 31, 1984. Within months, the drug was reclassified yet again by federal authorities. By order of Congress, methaqualone became a Schedule I controlled substance in August 1984. This made it illegal for any use.

Outlawing the manufacture, sale, or possession of methaqualone resulted in a dramatic drop in its use. According to the National Narcotics Intelligence Consumers Committee, U.S. emergency room visits related to methaqualone overdoses dropped from 2,764 in 1982 to only 163 in 1988.

Another reason for the drop in methaqualone abuse was the end of the disco dance era. In the late 1980s and early 1990s, young adults began attending raves—all-night dance parties that usually involve huge crowds of people, loud techno music, and illegal drug use. Raves brought new drugs onto the dance scene and the once-popular disco drug methaqualone was replaced by other more trendy and readily available drugs, such as ecstasy. In the twenty-first century, methaqualone is no longer monitored as a domestic drug of abuse in the United States.

Methaqualone Survives in South Africa

By 1988, methaqualone was illegal in most countries of the world as well. As of 2005, the drug was still in use in South Africa. Mandrax, which contains both methaqualone and an antihistamine, became the most popular illegal, synthetic drug used in South Africa. The chemicals used to produce methaqualone are made in southern Asia. Since the exportation of these chemicals is not well monitored or regulated, illegal drug manufacturers can buy the chemicals and produce methaqualone anywhere. Labs producing methaqualone have been found in several African countries, including Kenya, Mozambique, Swaziland, Tanzania, Zambia, and South Africa.



Methaqualone abuse is no longer a major problem in the United States. However, it has become the most popular illegal synthetic drug in South Africa. As depicted here, a man smokes Mandrax from a broken beer bottle near Cape Town, South Africa. *Photo by Per-Anders Pettersson/Getty Images.*

South Africa was both the largest producer and the largest consumer of the drug in the world in the early twenty-first century.

What Is It Made Of?

Methaqualone is a drug synthesized from several other chemicals. The key ingredients include compounds such as anthranilic acid, N-acetyl-anthranilic acid, and N-acetyl-o-toluidine. The formal name for methaqualone is 2-methyl-3-O-tolyl-4(3H)quinazolinone, and its chemical formula is $C_{16}H_{14}N_2O$.

Illegal drug makers sometimes use a variety of "filler" substances, including talcum powder and heroin, when manufacturing counterfeit methaqualone pills. No inspection process is available to ensure or measure the purity of the finished product because the substance is illegal.

White Pipe

"White pipe" is a blend of Mandrax, cannabis (marijuana), and tobacco that is unique to South Africa. Although Mandrax is manufactured as a pill to be taken orally, South African users prefer it crushed and smoked as part of this drug combination.

How Is It Taken?

When it was legal, methaqualone was made in tablets (solid pills) and capsules (water-soluble casings filled with a powdery form of the drug). The legal form of the drug was available in various strengths. In the United States, the most prescribed strengths of Quaalude were 150-milligram and 300-milligram pills.

Just as counterfeit versions of methaqualone were produced throughout the world and sold in the United States until the early 1980s, imitations were still being manufactured in 2005 in places such as India and South Africa. The tablets are designed to look like the original pharmaceutical versions, right down to the manufacturer's markings. Illegal forms of methaqualone are also produced in powder and capsule forms. In South Africa, the drug is also mixed with marijuana and smoked.

During the 1970s, one of the most popular ways to take methaqualone was with wine. Called "'luding out," this practice was widespread on college campuses. Taking methaqualone with alcohol was also quite popular—and particularly dangerous, since alcohol increases the DEPRESSANT effect of the drug. This can interfere with the normal breathing process and lead to accidental overdose.

Are There Any Medical Reasons for Taking This Substance?

Methaqualone was originally thought to be safe and nonaddictive as a sleep aid. Once its addictive and dangerous properties were discovered, the medical community and the government determined that the negative effects outweighed any benefits. Thus, there is no current medical use for the drug.

Usage Trends

When methaqualone was introduced in the United States in the 1960s, it was a drug that could be taken by anyone with a doctor's prescription. This meant that the abuse of the drug easily crossed lines of culture, race, and economic status. It was neither an expensive drug accessible only to the wealthy, nor a budget-class drug associated only with low-income users. It did become a drug of

depressant: a substance that slows down the activity of an organism or one of its parts

choice on the rock music scene, which made it appeal to mainstream American teens. Its reputation as a love-enhancing substance popularized the drug on college campuses.

Major Drop in Use during the 1980s

Illegal use of the brand drug Quaalude was widespread on college campuses in the 1970s. Its use rose dramatically between 1978 and 1981, but dropped very quickly after the drug was made illegal in the mid-1980s. In 1981, according to the National Institute of Drug Abuse (NIDA) and the University of Michigan, 10.4 percent of college students said they had tried methaqualone at least once in their lifetimes, and 6.5 percent of college students reported having used it without a prescription at least once in the previous year. In the 1989 survey, which was done five years after the drug was reclassified as a Schedule I substance, only 0.2 percent of college students said they had used methaqualone during the previous year.

A similar reduction in use took place among American high school students, according to the Monitoring the Future survey. This annual study follows drug use patterns of secondary school students in the United States. In 1981, 8 percent of American twelfth-graders surveyed reported use of methaqualone during the previous twelve months, as compared to 0.5 percent and 0.6 percent, respectively, in 1991 and 2003.

Effects on the Body

Methaqualone is a depressant that has both physical and psychological effects on users. It lowers the levels of chemicals called NEUROTRANSMITTERS in the brain and nervous system. When neurotransmitters are decreased, blood pressure drops and the breathing and pulse rates slow. The user enters a state of deep relaxation. These properties explain why methaqualone was originally thought to be a useful drug to treat sleeplessness and anxiety.

Methaqualone reaches its peak levels in the bloodstream within one or two hours after being taken. Its effects generally last from four to eight hours. Regular users of methaqualone build up a physical tolerance to the drug, which means they need more of it each time to achieve the same physical and psychological effects. As a user takes more of the drug to experience a particular response, the nervous system can be overwhelmed and shut down, leading to coma and death.

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

Methaqualone's effects are intensified with the use of other substances, including alcohol. The average lethal dose of methaqualone

Ludes and Pop Culture

In the late 1960s and 1970s, methaqualone's reputation grew to mythic proportions in the media. America's Quaalude craze was seen in the popular, and less-popular, music of the time. Syd Barrett (1946–), founding member and original guitarist and vocalist of Pink Floyd, was asked to leave the band shortly after appearing on stage heavily sedated and sporting a mixture of crushed Mandrax and hair gel on his head. Fee Waybill (1950–) of the lesser-known The Tubes regularly performed as alter-ego Quay Lude in the band's glam rock opera, "White Punks on Dope."

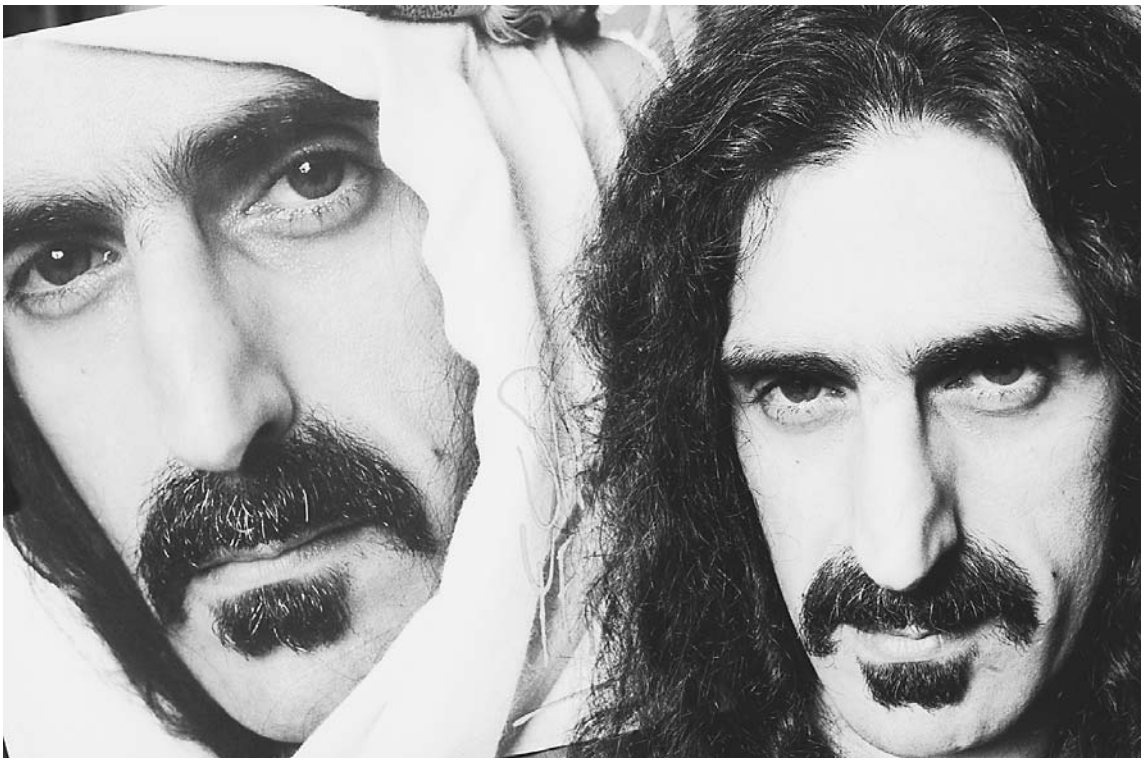
In the song "Flakes" (1979), musician and songwriter Frank Zappa (1940–1993) took a jab at Bob Dylan (1941–) and the folksinger's alleged frequent use of Mandrax. In the song, Zappa sings in the style of Dylan and asks, "Want to buy some Mandies, Bob?" Zappa, who was staunchly anti-drug, referred to Quaaludes in one interview as a way of creating stupid behavior in people.

Methaqualone overdose claimed a number of celebrity lives during the era. In 1972, Billy Murcia (1951–1972), drummer for the New York Dolls, overdosed on methaqualone during a concert and subsequently choked to death. In 1975, Anissa Jones (1958–1975), former child star of the television show *Family Affair,* died of an overdose of barbiturates and Quaaludes. While under the influence of Quaaludes, comedian Freddie Prinze Sr. (1954–1977) died of an accidental, self-inflicted gunshot wound to the head. Other methaqualone users who died in the 1970s in drug-related circumstances include legendary guitarist Jimi Hendrix (1942–1970), Rolling Stone Brian Jones (1943–1969), and the king of rock and roll Elvis Presley (1935–1977).

used alone is between 8 and 20 grams, depending on the size and tolerance level of the user. However, death and coma can result at much lower dosages in the presence of alcohol, which also functions as a depressant on the body.

"Feeling No Pain" Can Be Dangerous

Common side effects of methaqualone include diarrhea, stomach cramps, nausea and vomiting, headache, chills or sweating, irregular heartbeat, skin rash and itching, fatigue, slurred speech, and seizures. Methaqualone affects muscle movement and coordination and can produce a "pins and needles" sensation called paresthesia (pah-russ-THEE-zhuh), usually in the face and fingers. Under the influence of heavy doses of methaqualone, users have a heightened pain threshold, which means they do not feel pain as readily as they would otherwise. The consequence is that they can hurt themselves without noticing any pain. Because their thought processes are also slowed down, they cannot respond quickly enough to avoid serious injury.



Musician and singer Frank Zappa (right) was highly anti-drug. In his song called "Flakes," off his 1979 album *Sheik Yerbouti* (left), he took a jab at folksinger Bob Dylan's alleged frequent use of Mandrax. In the song, Zappa asks "Want to buy some Mandies, Bob?" *© Neal Preston/Corbis.*

Methaqualone can also cause a condition called ATAXIA, in which muscles twitch and move uncontrollably. Users experiencing ataxia are sometimes called "wallbangers." They appear to have lost control of their bodies and may repeatedly run into things because they cannot feel any pain. Driving or operating heavy machinery is especially dangerous for anyone who is under the influence of methaqualone because of ataxia and the slowed reflexes that accompany the sedative effect of the drug.

In the early 1980s, emergency rooms across the country reported increased numbers of trauma victims whose injuries were related to automobile crashes caused by users of methaqualone, often in conjunction with alcohol. According to Paul M. Gahlinger in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* in Broward County, Florida, 82 percent of drunk drivers apprehended in 1980 also had methaqualone in their systems.

ataxia: pronounced uh-TAKS-ee-uh; loss of control of muscle coordination

Dependence and Addiction

Methaqualone also has significant mental effects on users. When it was considered safe, one of its benefits was thought to be its ability to reduce anxiety. Before long, it became clear that users were becoming psychologically addicted to the drug. Common symptoms of PSYCHOLOGICAL DEPENDENCE on methaqualone are memory loss, learning and judgment problems, difficulty focusing on work or school tasks, and a preoccupation with getting more of the drug.

Reactions with Other Drugs or Substances

The sedative effects of methaqualone are increased significantly when the drug is combined with other depressant substances such as alcohol or marijuana. The combination can result in coma or death. In addition, unknown substances in illegally produced methaqualone can cause unexpected, damaging side effects. Some of the ingredients that might be used to make methaqualone pills include talcum powder, flour, baking soda, heroin, decongestants, pain relievers, and laxatives. Impurities may also enter the drug during the illegal manufacturing process.

Treatment for Habitual Users

When a person suddenly stops taking a drug like methaqualone, the body overreacts to the loss of the substance. For example, if the heart rate is slowed by a drug, when that drug is abruptly discontinued, the heart rate will accelerate rapidly and unevenly. Such body changes can cause withdrawal symptoms, which include a range of extremely uncomfortable and sometimes life-threatening physical symptoms. These symptoms last until the user has undergone DETOXIFICATION. Due to the intensity of methaqualone withdrawal, inpatient treatment is highly recommended.

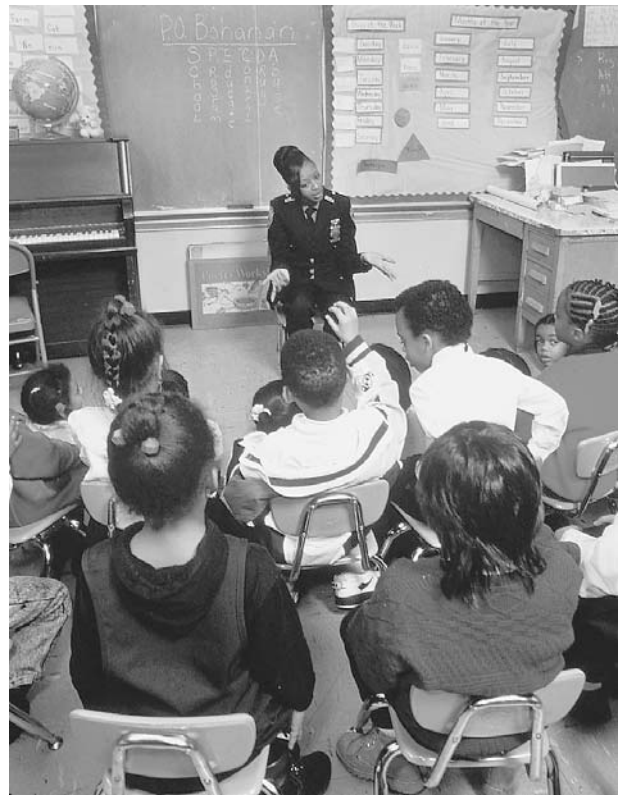
psychological dependence: the belief that a person needs to take a certain substance in order to function

detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

panic attacks: unexpected episodes of severe anxiety that can cause physical symptoms such as shortness of breath, dizziness, sweating, and shaking

In the case of methaqualone, seven to ten days is considered the average detox time for someone who has become dependent on the drug. Withdrawal symptoms will begin at approximately twelve to twenty-four hours after the last dose is taken. They peak twenty-four to forty-eight hours later. Symptoms typically include nausea, vomiting, tremors, an irregular heartbeat, heavy sweating, anxiety and PANIC ATTACKS, insomnia, confusion, convulsions, and seizures. Methaqualone detoxification should always take place in a hospital or rehab setting, under the supervision of healthcare professionals, so that withdrawal symptoms can be treated properly.

During medically supervised withdrawal, doctors may prescribe a substitute sedative to ease the initial symptoms. Antidepressant medication may also be prescribed for individuals experiencing anxiety or sleep disorders.



Early drug education is one way to help students learn about the dangers of certain drugs and ultimately avoid the pain of addiction. Here, a police officer talks with elementary school children in their classroom. *© James Marshall/Corbis.*

Consequences

The consequences of methaqualone use are not just physical and psychological. Social and legal consequences accompany the use of an illegal controlled substance such as methaqualone. As with users of other highly addictive substances, methaqualone abusers quickly become focused on when and where to get the next dose of the drug. Relationships with friends and family often break down when drug use becomes the most important aspect of a person's daily life. Financial consequences result from spending money on drugs as well as from the job loss that frequently accompanies drug addiction.

Use of an illegal drug usually leads to legal consequences, as well. A Schedule I drug like methaqualone is illegal to make, sell, take, or even have in one's possession. Conviction on any level will carry heavy fines and possible jail time as well. Convictions often result in the suspension of a user's driver's license, whether or not jail time is also required. Criminal drug charges may also limit employment and education options. For example, federal law requires that applicants for student college loans reveal whether or not they have ever been convicted of a drug offense. Having a conviction on one's record will result in either temporary or permanent ineligibility for federal financial aid for college.

The Law

Possession of methaqualone is a federal offense in the United States. Even if the amount of the drug is small, the fine for a first offense may be as much as $10,000. The fine amount is set according to the offender's income, financial assets, and circumstances of the case. A first offense for "personal use" possession typically does not

While under the influence of Quaaludes, comedian Freddie Prinze Sr. died of an accidental, self-inflicted gunshot wound to the head in 1977. His son, Freddie Prinze Jr., also an actor, paid tribute to his father in 2004 when the late comedian received a star on the Hollywood Walk of Fame. © *Fred Prouser/Reuters/Corbis.*

result in jail time. However, the offender must pay the fine, stay out of trouble, and pass drug tests as administered.

This is not the case for someone who is convicted of transporting or selling methaqualone. A first-time offender faces as many as twenty years in prison and a $1 million fine. If the case also carries a

charge of causing death or serious injury to another person, the sentence is automatically set at between twenty years and life.

For More Information

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See also: Barbiturates; Rohypnol; Tranquilizers

Morphine

Official Drug Name: Morphine sulfate, morphine hydrochloride (for injection); Duramorph (spinal injection); MS Contin, Oramorph, Kadian, MSIR (pill and tablet forms); Roxanol (liquid for oral use)
Also Known As: M, Miss Emma, monkey, morph, white stuff
Drug Classifications: Schedule II, opiate

What Kind of Drug Is It?

Morphine is a natural product of the opium poppy plant. Of the many mind-altering compounds in the opium poppy, morphine is the strongest. The drug has many important medical uses, all having to do with pain control. It is never used to treat emotional or psychological problems.

For many people recovering from painful surgery—and for even more people facing the daily agony of end-stage cancer—morphine can dramatically improve their quality of life. The drug, called an OPIATE, has been used for pain relief for many years, in many different cultures worldwide.

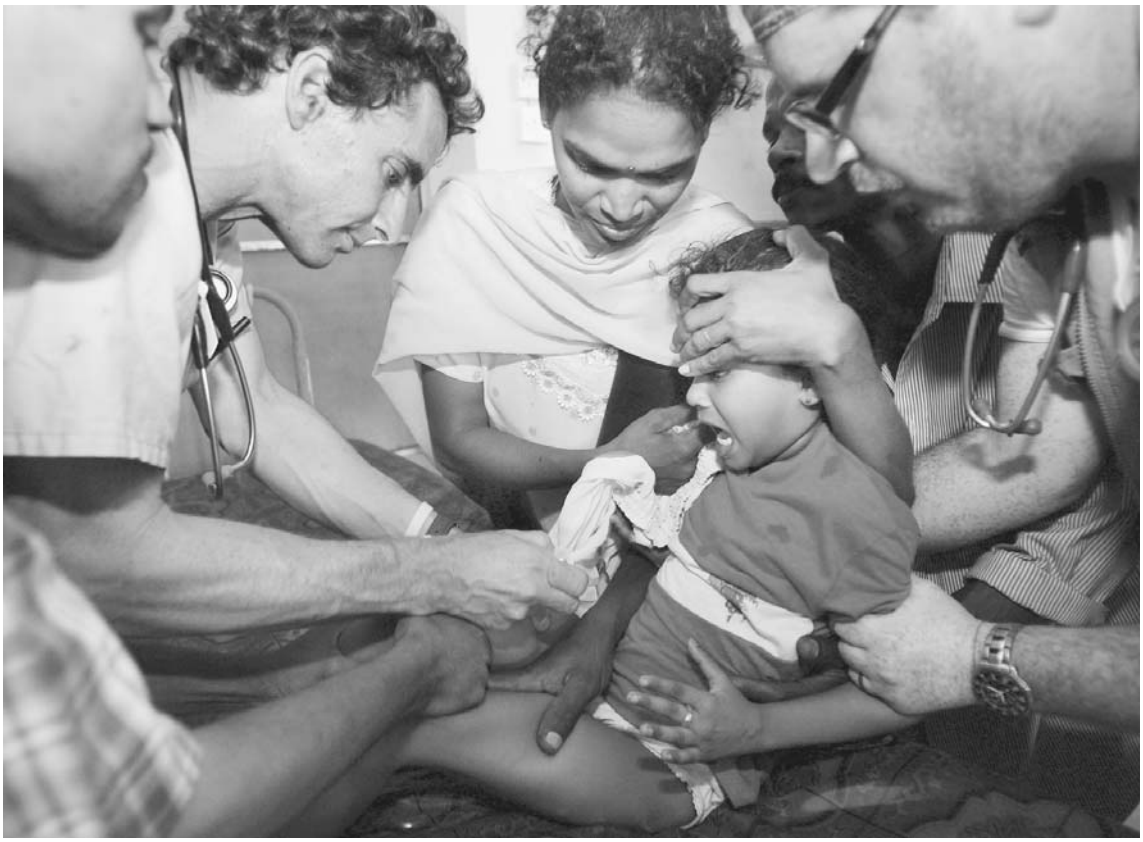
When prescribed for a patient by a physician, morphine can help speed recovery from operations, ease the pain and trauma of childbirth, and give dying people relief from incurable pain. When used illegally as a recreational drug solely to get high, morphine is highly addictive with many unpleasant side effects. When purchased on the street, it is usually found in the form of heroin, a substance that turns to morphine in the brain. (An entry on heroin is available in this encyclopedia.)

Whether used legally or illegally, morphine is a very dangerous drug. Overdoses can cause fatal breathing problems. Even those who use it for pain relief can develop a dependence or physical need for the drug. Doctors tend to be very conservative when they prescribe it for pain because they are aware of its risks and drawbacks. Since the beginning of the twenty-first century, patients' rights groups have urged the medical community to use morphine more freely to control pain. They believe that patients in severe pain would be more likely to contemplate or commit suicide if they were unable to use the drug.

opiate: any drug derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

Overview

Morphine is derived from a flowering poppy called *Papaver somniferum.* This plant can grow in many environments, but it thrives in a soil that contains some sand and loam, in higher elevations with cooler temperatures. Opium poppies were first grown by people



An American doctor and paramedic with the International Medical Corps are shown treating a young tsunami victim with an injection of morphine in Sri Lanka in 2005. The little girl was brought into the makeshift hospital after suffering a broken pelvis during the tsunami tragedy.

Photo by Paula Bronstein/Getty Images.

6,000 years ago in the area that is now Iran and Iraq. A manuscript from the ancient Egyptian city of Thebes, dating to 1552 BCE, mentions opium as a cure for more than 700 illnesses.

From Plant to Drug

Although the leaves and stems of the opium poppy plant also contain opiates, it is the sticky sap in the bulbs that has the most strength. The bulbs begin to ripen after the flower petals fall. As the bulbs ripen, skilled farmers cut them, and the sap flows out. Once collected, the sap is dissolved in boiling water. The twigs and other plant material float to the surface, and the boiled opium is strained.

It is then cooked a second time, this time to remove the water. Once the water has evaporated as steam, what remains is a putty-like substance called "smoking opium." After this simple process, users sometimes smoke or eat the opium to get high.

More commonly, though, the cooked opium goes through another chemical process. Again it is boiled, this time with lime. The lime converts the opium from a non-water soluble morphine ALKALOID into the water-soluble calcium morphenate. Ammonium chloride is added to the solution, and this causes the morphine to settle to the bottom of the cooking pot. The solution is poured through a straining cloth, and what remains is chunks of morphine that are dried in the sun. Legally, these morphine "bricks" are processed into prescription painkillers. Illegally, they are smuggled into laboratories and turned into heroin.

Addictive Effects

None of this chemistry was known to opium farmers in the era prior to modern medicine. In the Middle Ages (c. 500–c. 1500), opium was mixed with wine or other alcohol and called "laudanum." Crude opium was also smoked, particularly after the introduction of pipes from the Americas after Columbus (1451–1506) reached the New World in 1492. When opium smoking became widespread in Asia—and particularly in China—the destructive and habit-forming effects of the drug began to be revealed.

In 1803 German chemist Friedrich Sertürner (1783–1841) experimented with opium and isolated morphine for the first time. He named his discovery after the Greek god Morpheus, who is often depicted in ancient statues sleeping among opium poppies. Within thirty years of Sertürner's discovery, it was possible to buy medicines with morphine from any store that sold remedies. Both morphine and opium cost less than alcohol, and the substances were abused by famous and common people alike. The users of morphine and opium-laced medicines were aware of the dangers. As early as 1821 author Thomas de Quincy wrote *Confessions of an English Opium Eater,* describing his personal experiences of addiction and drug-induced mental breakdown.

alkaloid: nitrogen-containing substances found in plants

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

Morphine, a painkiller that can be dissolved in water, came to the forefront in 1848, when an inventor perfected the hypodermic needle. This allowed the substance to be injected right into a vein, producing pain relief (and EUPHORIA) in minutes. Surgeons welcomed this new tool, since it enabled them to perform pain-free operations. But the medical community quickly learned that morphine was habit-forming. In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry,*

Soldiers who needed to have an arm or leg amputated during the American Civil War were given morphine. Addiction to the drug was so common among returning veterans that it was called "the soldiers' disease." Here, a physician prepares to amputate a soldier's leg at Gettysburg, Pennsylvania, in 1863. *AP/Wide World Photos.*

Use and Abuse, Paul M. Gahlinger estimates that 400,000 soldiers became addicted to morphine during the American Civil War (1861–1865). Morphine addiction was so common among returning veterans that it was called "the soldiers' disease."

Discovery of Heroin

Doctors and chemists continued to experiment with morphine, hoping to create a product that would be less habit-forming but would still control pain. Codeine was isolated in

1832. It was not as strong as morphine but was used in cough formulas and diarrhea medications. Soon it was found to be addictive as well. Another experiment on the morphine compound occurred in 1874, when British chemist Alder Wright created diacetylmorphine (DIE-uh-SEE-tuhl-MOR-feen), marketed as heroin.

With the introduction of heroin, morphine users and opium smokers hoped they had found a cure for their addictions. Many tried heroin to wean themselves off the other substances. In doing so, they traded a bad addiction for an even worse one. By that time, over-the-counter medicines containing codeine, morphine, heroin, and cannabis (marijuana) could be bought for problems as varied as toothaches, headaches, and fussy babies. (Entries for codeine and marijuana are available in this encyclopedia.) At that time, people did not realize the dangers of using such products.

Dealing with the Growing Abuse

China had long struggled with large numbers of opium addicts. As Chinese immigrants came to the United States to work, some brought the habit with them. By the late 1800s, almost every major city in the United States had at least 1 opium "den"; New York had more than 300. Opium dens were darkly lit establishments where people went to smoke opium. Many dens had beds, boards, or sofas upon which people could recline while experiencing the effects of the drug.

On February 1, 1909, China and the United States led a meeting called the International Opium Commission. Eleven other countries participated. Three years later, a convention in the Netherlands produced the first international agreement on the regulation of NARCOTICS—especially opium and heroin. Gahlinger wrote: "This began a process whereby the United States took a global leadership in controlling the international narcotics trade, even while its own domestic use of addictive drugs was rampant. One hundred years later, this situation has not changed."

The Harrison Narcotics Act of 1914 made it illegal to sell medicines containing heroin, morphine, or opium without labels warning of the presence of the drug in the product. In 1926 heroin was made completely illegal. Morphine remained legal but only when prescribed by a doctor.

narcotics: a painkiller that may become habit-forming; in a broader sense, any illegally purchased drug

The twentieth century was marked by enormous progress in surgery, medications, and treatments of all sorts of diseases. Scientists

Two morphine addicts from the 1880s are depicted here. The woman on the right is already experiencing the effects of the drug while the woman on the left is giving herself a shot of the painkiller. *Photo by Three Lions/Getty Images.*

developed SYNTHETIC painkillers based on the properties of morphine, such as oxycodone and fentanyl. However, they made no progress in removing the habit-forming effects of the substances. (Entries on oxycodone and fentanyl are available in this encyclopedia.) Morphine is still widely used in hospital settings and is prescribed as pills and liquids. It is also available in a pump implanted in the body, for use in the most stubborn, ongoing, and incurable pain. Except in the case of surgery, doctors use morphine as a drug of "last resort," after all other painkillers have failed. It is most often used when a patient is dying. At the last stage of life, the fact that morphine is addictive is no longer significant.

synthetic: made in a laboratory

Morphine is a natural product of the opium poppy plant. Much of the opium sold illegally throughout the world is grown in Afghanistan. As shown here, Afghan police destroy a poppy crop in 2005. *AP/Wide World Photos.*

What Is It Made Of?

Morphine is an alkaloid, the chemical class to which many drugs belong. It is also an organic product, meaning that it is derived from a plant. The process of extracting morphine from opium is so simple that farmers can do it alongside their fields, with few other tools than cooking pots, lime (an ingredient in fertilizers), and ammonium chloride (also found in fertilizers). In its basic form, the morphine alkaloid is not soluble in water. Once it has been treated with lime and ammonium chloride, however, it becomes the water-soluble compound calcium morphenate. Further treatments produce morphine sulfate, morphine hydrochloride, and morphine. All of these are used in medicines.

After having gone through chemical processing, morphine salts appear as a bitter white powder. Some people take this powder by mouth, while others snort it or dissolve it in water and inject it. Morphine products are not as fat soluble as heroin. A highly fat-soluble drug like heroin enters the bloodstream quicker and moves to the brain faster, no matter how it is taken. As such, morphine products do not work as quickly to produce the intense high that is experienced with heroin use. Injected morphine does work quickly, in about five to ten minutes, whereas heroin works almost immediately.

The vast majority of legal morphine is converted to codeine, a milder painkiller and cough suppressant used in great quantities worldwide. The remainder of legal morphine is processed as a painkiller. More than 1,000 tons of morphine are produced *legally* every year, from poppies grown on government-regulated farms in India, Turkey, and the Australian province of Tasmania. Illegal opium production is widespread in the highlands of Burma, Laos, Vietnam, Thailand, Pakistan, Afghanistan, Colombia, Mexico, and Lebanon.

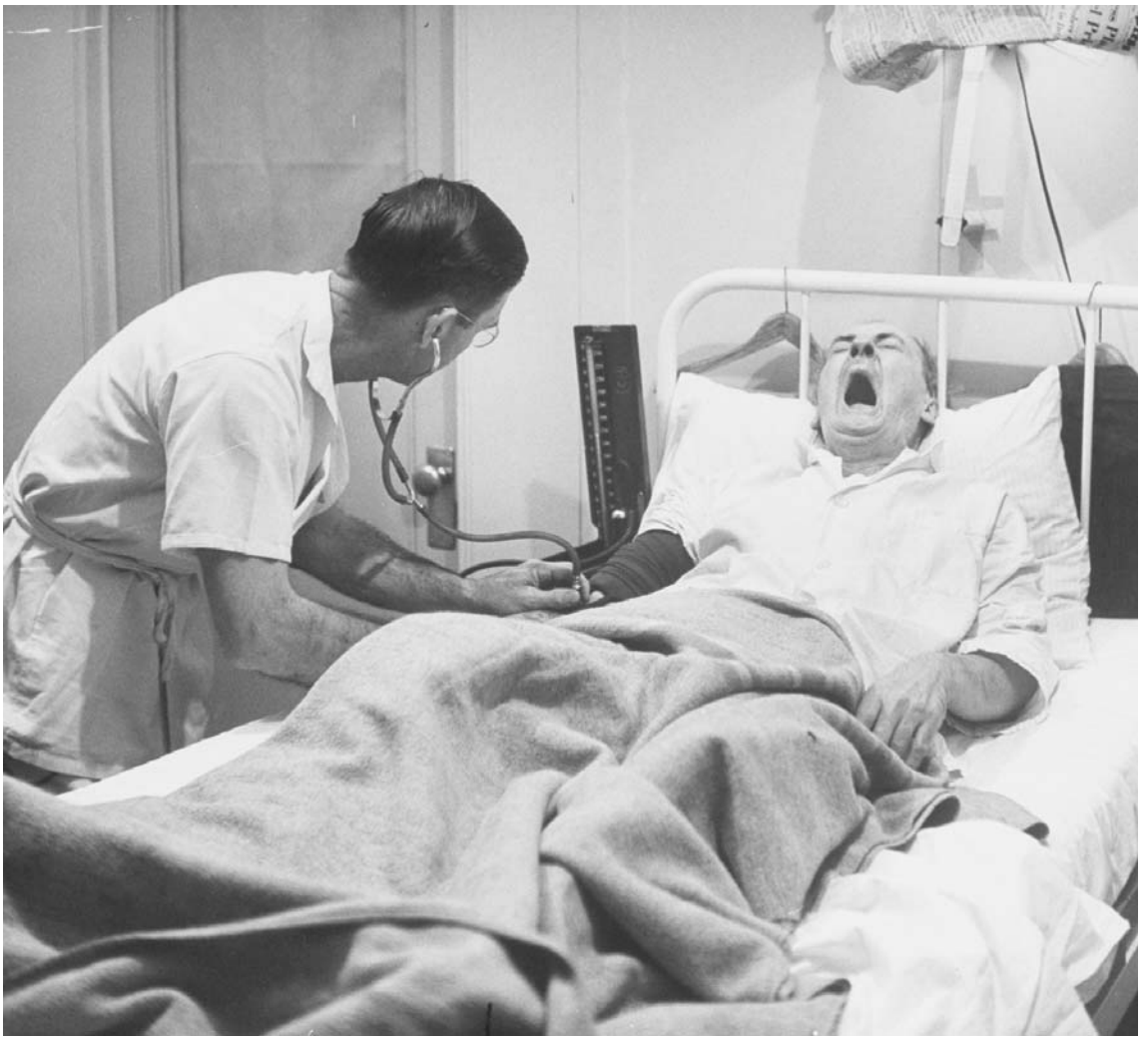
How Is It Taken?

Prescription morphine comes in many forms. As morphine sulfate and morphine hydrochloride, it is a liquid injected into veins. As Duramorph, it is a liquid injected into the fluid surrounding the spine. This type of injection is called an epidural. Duramorph is used in childbirth and some forms of surgery that can be performed while a patient is awake. Morphine pills of various strengths are also available and are prescribed for cancer pain, back pain, recovery from surgical procedures, and occasionally migraine headaches. The drug can also be found in rectal SUPPOSITORIES. The latter form of morphine is usually given to people suffering from nausea. A liquid form of morphine is available for oral use among patients who have difficulty swallowing pills.

Some patients use morphine pumps. These come in two forms. Either the patient is hooked up to a needle (IV) and can press a button to increase the flow of morphine through the needle, or a morphine dispenser is implanted under the skin, releasing a set dose of the medicine at hourly intervals. The pumps are usually programmed so that a patient cannot receive too much morphine and overdose. Too much morphine can lead to death by stopping a patient's breathing.

Morphine is usually sold illegally on the street in its pill forms. Users crush the pills and snort, smoke, or inject them.

suppositories: medicines that are delivered through the anus



A man addicted to morphine is shown in a hospital setting in the late 1940s. He yawns and gasps for air as he experiences severe withdrawal from the drug. *Photo by Ralph Morse/Time Life Pictures/Getty Images.*

Are There Any Medical Reasons for Taking This Substance?

Morphine is used most often to ease the pain of dying from cancer. Cancer causes tumors (abnormal growths) in just about any organ in the body, from the brain to the limbs. These tumors can cause intense pain that never goes away. Morphine does *not* shrink

tumors. Rather, it causes the brain not to respond to the pain that the tumor causes. Patients know they are in pain, but they feel more comfortable. Their anxieties are also eased by the relaxing components of the morphine.

Newspapers and magazines report cases of end-stage cancer patients who, with high doses of morphine, are able to take care of themselves around the home, do tasks such as gardening and attending family functions, and even work on projects they want to finish before death. HOSPICE workers who try to make dying patients as comfortable as possible report a greater sense of calm and less trauma for the patient and family when morphine is used to sedate and control pain.

Terri Schiavo

One of morphine's main uses is in end-of-life situations where doctors try to control pain and suffering. In March of 2005, after a long legal battle, Terri Schiavo—who was diagnosed with severe brain damage and no hope of recovery—was removed from the feeding tube that had kept her alive for fifteen years. As she perished from starvation and dehydration, doctors administered morphine to ease any suffering she might have felt. Terri Schiavo died on March 31, 2005.

Recovery from surgery without morphine would be a terrible ordeal for many patients. Even though the drug is often used only for the first few days, it greatly eases the pain and trauma the patient feels after a procedure. Used in this way it does not promote addiction. As the body recovers, doctors reduce the doses of the painkiller, eventually switching to over-the-counter products such as aspirin, acetaminophen, or ibuprofen.

Morphine's Not for All Patients, Though

For chronic, or ongoing, conditions such as back pain and migraine headache, morphine is never used as the first drug for treatment. Typically the drug is only prescribed for people who have used other opiate or opioid painkillers, or other prescription drugs, with disappointing results. Morphine's side effects—TOLERANCE, constipation, nausea, drowsiness, and dizziness—make it a drug of last resort for people in pain.

Some people suffer pain that does not respond to morphine. This kind of pain, known as nerve damage, is particularly frustrating both for patients and their doctors. If nerves are damaged, they cannot read the chemical message morphine sends them.

Doctors who prescribe morphine must be certified to do so by the U.S. Drug Enforcement Administration (DEA). Morphine prescriptions require extra paperwork to determine how much medicine each patient receives and whether or not the doctor is

hospice: a special clinic for dying patients where emphasis is placed on comfort and emotional support

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

Sniffer dogs are used by custom officials to search planes, cars, trucks, ships, and trains for illegal substances. These trained dogs are able to detect cocaine, marijuana, heroin, methamphetamine, and morphine-based drugs, among others. *© Houston Scott/Corbis SYGMA.*

over-prescribing it. In response, doctors tend to *under-prescribe* morphine for two reasons. First, doctors do not want to be seen as dispensing drugs without good reason. Second, doctors do not want to take the chance that a dose they deem safe for a patient might actually lead to a fatal overdose.

Usage Trends

Morphine enters the illegal market in two ways. Most of it is transformed into heroin in illegal laboratories in Asia, Mexico, and South America and smuggled into the United States. The rest is diverted from its legal use through theft from pharmacies or through "doctor shopping" for prescriptions. An illegal practice, doctor shopping occurs when an individual continually switches physicians so that he or she can get enough of a prescription drug to

feed an addiction. This makes it difficult for physicians to track whether the patient has already been prescribed the same drug by another physician. Additionally, some morphine fatalities can be tied to people legally taking the drug, but taking it in higher doses than recommended, or combining it with other painkillers, alcohol, or cocaine.

People of all ages and income levels abuse prescription painkillers, sometimes with fatal results. Users often start taking the prescription drug for a painful condition and wind up abusing it for the mental effects. It is difficult to determine the number of deaths caused by morphine every year because heroin shows up as morphine on drug tests. Sometimes the cause of death is simply listed as "opiate overdose," and this could also include codeine or other prescription painkillers.

According to the "2003 National Survey on Drug Use and Health (NSDUH)," an estimated 119,000 teenagers between twelve and eighteen had tried heroin at least once. If given a drug test, these teenagers would test positive for morphine. Emergency room mentions of pure morphine are much lower than those for heroin, OxyContin, and Vicodin. The strength of morphine, the difficulties doctors face prescribing it, and the close watch kept on supplies in hospitals and pharmacies tend to keep illegal supplies low. Plus, the higher purity of illegal heroin makes that drug more attractive for abuse.

Effects on the Body

Morphine floods a group of receptors in the brain and spinal column that take in ENDORPHINS and ENKEPHALINS. Biologists think that endorphins and enkephalins work together naturally to dull pain or to ease anxiety when someone is hurt or close to death. Morphine replaces these natural molecules, and in a much greater quantity than the body can supply. Pain signals surging from an injury or a cancerous tumor cannot relay their messages to the brain because morphine has blocked the receptors that register the pain, while rewarding the receptors that enhance pleasure. Patients may still hurt, but the pain will not bother them as much, and they will be able to concentrate on other aspects of life.

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

enkephalins: pronounced en-KEFF-uh-linz; naturally occurring brain chemicals that produce drowsiness and dull pain

Not Typically Abused for a High

Morphine is not as fat soluble as heroin, so even when injected it does not produce the instant rush of pleasure that

makes heroin attractive as an abused drug. Nevertheless, morphine does induce a dreamy state of happiness, drowsiness, and relief from anxiety that can last from four to six hours, depending on the dose and the way it was administered. Most people taking morphine for pain learn to live with the drowsiness and confusion. Some opt to live with the pain instead so that their senses are not dulled by the drug. Usually patients will work closely with their doctors to monitor doses so that a balance can be achieved.

Scientists are finding that patients in pain can become tolerant to very high doses of morphine—doses that, if taken recreationally, would kill a person outright. Tolerance, or needing higher doses of a drug to achieve the same results, is a standard side effect of opiate use.

All opiates produce similar side effects in the body. Morphine users will typically develop constipation because the drug slows muscle movement in the bowels. Breathing may be slowed as well. The drug can affect coordination—users must adjust to the medicine before driving or operating machinery. Other side effects include nausea and vomiting, loss of appetite, loss of sexual function, and pinpoint pupils. Some people develop a mild allergic reaction in the skin that causes itching or prickling.

Even when used as directed, morphine can cause WITHDRAWAL symptoms if a dose is missed or the medication is stopped suddenly. These symptoms include sneezing, runny nose, muscle aches, insomnia and anxiety, diarrhea, muscle twitching, sweaty and clammy skin, and goose bumps.

Reactions with Other Drugs or Substances

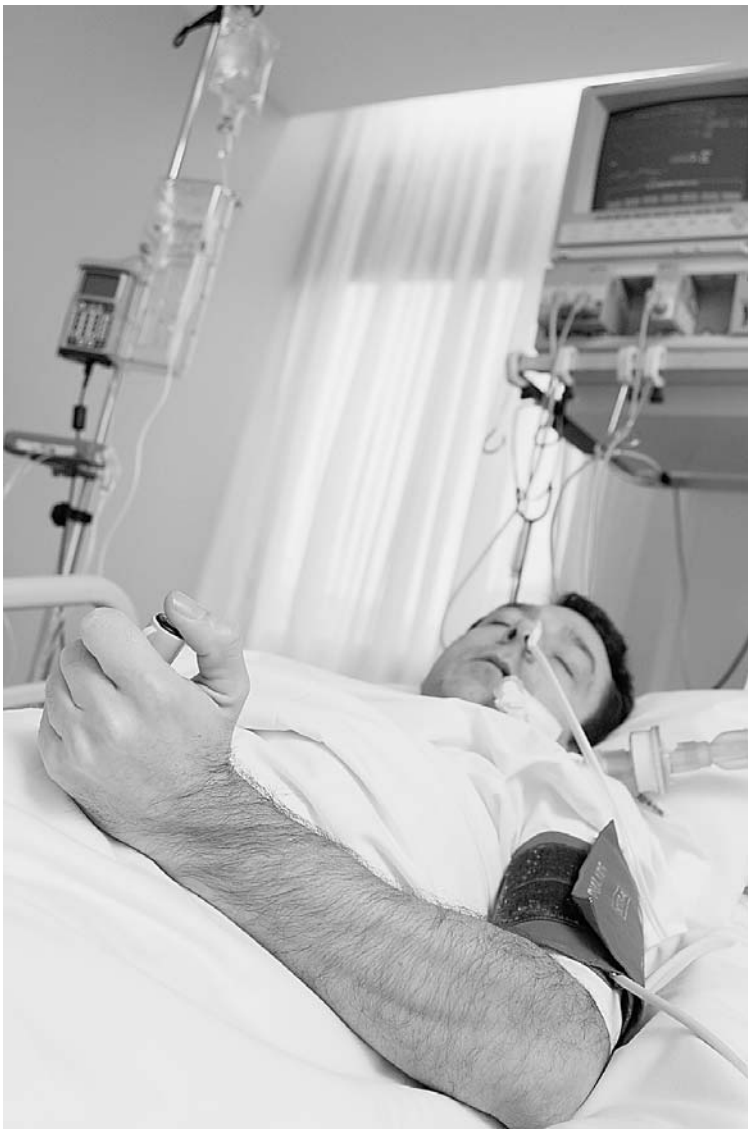
withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

sedatives: a drug used to treat anxiety and calm people down

chemotherapy: a treatment for cancer that causes nausea, vomiting, and other side effects

Because morphine can slow breathing and reaction time, it is much more dangerous when taken with alcohol, tranquilizers, SEDATIVES, anti-anxiety medications, antidepressants, or even over-the-counter allergy medicines. Doctors must also monitor patients who take the pill form of morphine for reactions with other medicines metabolized in the liver, including medicines for tuberculosis, such as Rifampin, and medicines for seizures and epilepsy, including Dilantin. Some antibiotics can increase the level of morphine retained in the bloodstream.

Cancer patients on CHEMOTHERAPY may have difficulty taking morphine because the drug can upset the stomach. These patients sometimes experience relief by using rectal suppositories or by using



In cases of severe pain, some patients are allowed to self-administer their morphine using a pump. This permits them to take the drug for pain when they need it. Using a programmed pump with doses determined by a doctor, a patient presses a button to release a shot of morphine. The pump is designed to prevent an overdose. *AJ Photos/Hop Americain/Photo Researchers, Inc.*

pumps that bypass the stomach. However, doctors must evaluate the loss of appetite that results when morphine and chemotherapy are combined.

Some drug abusers combine morphine and cocaine. This can be particularly deadly, especially in terms of addiction. The two drugs work differently in the brain, causing high levels of disorientation, and both are habit-forming. Addicts who use opiates and cocaine at the same time find it hard to free themselves completely of both drugs.

Treatment for Habitual Users

Morphine use can lead to addiction. Even after years of not using the drug, opiate users can still crave the drug because they remember how they felt when they were taking it. Withdrawal from morphine and other opiates is a difficult task that lasts three to five days, if the user quits "cold turkey." More commonly, addicts seek treatment with methadone or buprenorphine, medications that will curb the withdrawal symptoms and block the effects of morphine in the brain. (An entry on methadone is available in this encyclopedia.) A morphine overdose that has caused breathing to stop can be treated with naloxone (Narcan), a drug that quickly rids the body of opiates. However, many opiate deaths occur in private settings. The user stops breathing, and no one is present to call for emergency care.

Health professionals advise anyone wishing to end morphine dependency to work closely with doctors and a psychiatrist or other therapist. If the dependency was brought about by morphine's use as a painkiller, a doctor may taper the dose so that the patient gradually becomes free of the drug. If the dependency comes from recreational use, the addict must learn strategies to live free of the drug's influence, often including finding new friends and staying away from the people and places associated with the drug use. Doctors and nurses who take opiates recreationally often lose their jobs—jobs they had trained for over many years.

Narcotics Anonymous (NA) is a self-help group that allows recovering addicts to meet and obtain assistance from other people who have lived through drug abuse. The nonprofit organization has a telephone helpline and group meetings in most cities and towns in the United States. Opiate dependency is one of the toughest addictions to beat, and the support of a group of peers is extremely helpful during moments of CRAVING, anxiety, or depression.

craving: an overwhelming urge to do something, such as take an illegal drug

Morphine Chronology

4000 BCE Opium poppies are cultivated in the Fertile Crescent (now Iran and Iraq) by the ancient cultures of Mesopotamia.

1552 BCE An ancient Egyptian papyrus text from the city of Thebes lists 700 uses for opium.

600-900 CE Arabic traders introduce opium to China.

1524 Swiss doctor Paracelsus mixes opium with alcohol and names the product laudanum.

1803 German scientist Friedrich Sertürner isolates morphine as the most active ingredient in the opium poppy.

1848 The hypodermic needle is invented, allowing for quicker delivery of morphine to the brain.

1861–1865 An estimated 400,000 soldiers return home from the American Civil War with addictions to morphine.

1874 British chemist Alder Wright uses morphine to create diacetylmorphine (heroin), in an effort to produce a less addictive painkiller.

1914 The Harrison Narcotics Act ends over-the-counter purchases of medicines that do not have a full list of ingredients on the label.

1970 The Controlled Substances Act names morphine as a Schedule II controlled substance, recognizing its uses in pain relief and surgical settings.

1974 The first hospice facility opens in the United States.

2005 Terri Schiavo receives injections of morphine as her feeding tube is removed and she is allowed to die, after spending fifteen years in what doctors called a persistent vegetative state.

Consequences

One of the most serious consequences of a heroin or morphine addiction is the long-term profile a person creates for his or her future health care. Doctors are reluctant to prescribe powerful painkillers to people who have no history of drug abuse. They are much less likely to prescribe these drugs to people who have abused opiates in the past.

Advocates for the terminally ill point to another consequence of recreational opiate use. Some people in pain view prescription painkillers as dangerous and addictive, products that will make them crazy, or make them sleep all the time, or turn them into criminals. Such people suffer needlessly because of the negative perception attached to opiates. Doctors feel this too. They feel they are being monitored by the government and their jobs may be in jeopardy if they prescribe too much pain medication. As a consequence, they under-prescribe, even for dying patients. The bottom line: Many people suffer pain because other people abuse painkillers.

The Law

The Controlled Substances Act of 1970 placed morphine on the Schedule II list of controlled substances. This means that the U.S. government deems morphine to be a drug with medicinal uses that also carries the potential for abuse and addiction. Doctors who wish to prescribe morphine must register with the U.S. Drug Enforcement Administration (DEA). Morphine prescriptions are not like the typical slips of paper issued for most prescription drugs. They are more complicated and must be filed with the DEA, where records are kept on each doctor and how much morphine he or she prescribes. If the DEA determines that a doctor is prescribing too much morphine, that doctor can face criminal prosecution and possible jail time.

Illegal possession or sale of morphine, or any Schedule II drug, carries serious penalties, even on a first offense. Anyone caught with the drug can expect fines of as much as $10,000, mandatory drug testing, loss of driver's license, loss of federal government college financial aid, and a permanent criminal record. Judges often order opiate abusers into DETOXIFICATION clinics. Second offenses almost always carry jail time and very heavy fines.

Because morphine is so habit-forming, its use can lead to other sorts of crime. People craving the drug are more likely to rob homes in search of cash or valuables. They are more likely to break into pharmacies or to commit armed robbery. They may resort to prostitution to pay for their habits, making themselves vulnerable to the human immunodeficiency virus (HIV) and other sexually transmitted diseases. An arrest for any of these offenses will result in jail time, where the addict will receive little treatment as he or she faces drug withdrawal.

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detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

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See also: Cocaine; Codeine; Fentanyl; Heroin; Hydromorphone; Methadone; Opium; Oxycodone

Nicotine

Official Drug Name: Nicotine (beta-pyridyl-alpha-N-methylpyrrolidine), tobacco
Also Known As: Bidis (BEE-deez), chew, chewing tobacco, cigars, cigarettes, coffin nails, fags, kreteks, snuff, spit, smokes
Drug Classifications: Not scheduled, illegal for purchase by persons under eighteen years of age; stimulant

What Kind of Drug Is It?

Nicotine is the ingredient in tobacco that causes changes to the brain and behavior. Tobacco, a broad-leafed plant that originated in the Americas, is one of the most widely abused PSYCHOACTIVE, or mind-altering, substances in the world. In the United States alone, one in four men and one in five women smoke cigarettes, cigars, pipes, or use oral products such as chewing tobacco or snuff. In other parts of the world the percentage of users is even higher.

Nicotine use typically begins among Americans between the ages of eleven and eighteen—an age group too young to buy the product legally. Young users soon discover that nicotine is habit-forming, that all the ways of taking it pose great health risks, and that it can lead to troubles on the job and sometimes an early death.

Movies and tobacco advertisements present nicotine use as a glamorous, rebellious, adult activity. And adults can smoke legally. What the advertisements do not note, however, is the fact that one-third of all smokers live below the poverty level; that the more educated a person is, the less likely he or she is to use tobacco; and that an estimated one billion people will die from tobacco-related illnesses worldwide in the twenty-first century. Tobacco use is one of the leading causes of preventable death. Its link to CANCER, emphysema and asthma (lung disorders), and depression (a mood disorder), has been clearly established. Smokers can expect to live seven to ten years *less* than people who do not use tobacco products.

Popularity Decreases

At the height of tobacco's popularity in the United States in the 1960s, more than half of all adult men and about one in three adult women smoked cigarettes. People smoked in movie theaters and on buses and planes. They smoked at their desks in office buildings and in their beds at night. Famous film and television stars promoted certain brands of cigarettes in commercials and on billboards. Even in those times, however, people knew that smoking could ruin their health.

psychoactive: mind-altering; a psychoactive substance alters the user's mental state or changes one's behavior

cancer: out-of-control cell growth leading to tumors in the body's organs or tissues

Nicotine occurs naturally in the leaves of the tobacco plant. For many farmers in the southern United States, tobacco plants are their livelihood.

A half-century later, in the early 2000s, smokers can find it difficult to get a job if they reveal a tobacco habit. Smoking is not permitted on planes, in theaters, in many office buildings, or on public transportation. Many cities have enacted bans on smoking in restaurants and bars.

Studies have proven that SECONDHAND SMOKE, or "passive" smoke, can cause many health problems for the nonsmoker. Pregnant women who smoke endanger the health of their unborn babies. Most Americans are less tolerant of smoking than they used to be. Yet, the "2003 National Survey on Drug Use and Health (NSDUH)" reported that 40 percent of young adults age eighteen to twenty-five admitted to smoking cigarettes at least once in their lives.

secondhand smoke: the smoke exhaled from a cigarette user and breathed in by someone nearby

No country that has learned to use tobacco has ever given it up. Nicotine addiction, a physical dependence on the drug due

Secondhand smoke can cause many health problems for the non-smoker. In an attempt to protect employees from secondhand smoke, the owners of a casino in Atlantic City, New Jersey, installed devices, called air curtains, on the gambling tables. *AP/Wide World Photos.*

to repeated drug use, continues to be a global public health issue. It is one of the leading causes of preventable illness in adults. The U.S. government keeps a watchful eye on tobacco companies to ensure they do not target cigarette advertisements to teens for several reasons. First, teens are not allowed to smoke legally. Second, adults over the age of twenty-five rarely—if ever—begin smoking after never having smoked before.

Overview

The first European to record seeing tobacco use was the explorer Christopher Columbus (1451–1506), in 1492. On his initial voyage to the New World, Columbus wrote in his diary that the native peoples he encountered "drank" smoke from the burning leaves of a certain plant. Even without understanding their language, Columbus could see that the people he met highly valued their tobacco.

Use Originated in the Americas

Archaeologists are not sure where or when tobacco use began in the Americas. More than sixty varieties of tobacco grew all over North and South America. Even the garden flower known as the petunia is related to tobacco. The earliest documented use of tobacco among Native Americans occurred with the Mayan culture, a civilization from Central America that peaked about 2,000 years ago. A carving on a Mayan temple shows an elaborately dressed man smoking a long-stemmed pipe. Other historians of ancient America believe that pipe smoking may have begun in North America and spread south. Whatever the case, by 1000 CE, most Native American cultures used tobacco in religious and political rituals. The plant did not grow in Europe.

Columbus and his crew were baffled and disturbed by the sight of people smoking tobacco. Nevertheless, they collected specimens of the plant, as well as pipes, and took them back to Spain. As the Spanish and Portuguese began to explore and settle the Americas, they began "drinking smoke" themselves. Sailors who moved between Europe and America were among the first to discover that once they began smoking tobacco, they could not stop.

By 1535, Spanish colonists in the New World were planting tobacco for their own use. At around the same time, farmers in Europe began to cultivate the plant. In 1559, the French ambassador to Portugal, Jean Nicot (1530–1600), became interested in tobacco. He thought it might be useful as a medicine. He introduced powdered tobacco—*snuff*—at the French court and made the substance fashionable. It is from his name, "Nicot," that the word *nicotine* is derived.

Tobacco in the American Colonies

Tobacco was one of the first crops planted when English colonists arrived in Jamestown, Virginia. Ships filled with tobacco sailed from America to Europe, where the tobacco was traded for items the colonists could not make or buy in the New World, including tea, furniture, and high-quality cloth. In some parts of America, tobacco could be used instead of money. The need for new fields to grow tobacco—a plant that uses up the rich nutrients in the ground—pushed settlers westward, into territories occupied by Native Americans. By the time the Declaration of Independence was signed in 1776, tobacco smoking was common in America. Every tavern kept a supply of clay pipes for use by visitors. When smokers were finished with their pipes, they broke off the part of the stems their lips had touched and passed the pipe to a new user.

Tobacco plants are hung up to dry out in barns and other buildings. Once dried, the plants are prepared for use in cigarettes, cigars, and chewing tobacco.

By the nineteenth century, different classes of people used tobacco in different ways. The upper classes tended to "take snuff," inhaling powdered tobacco through the nose. The middle classes preferred pipes, and the lower classes held wads of tobacco between their gums and teeth, a practice known as "chewing." Within 300 years of its discovery by Columbus, tobacco had spread to all parts of the world. Many cultures considered it a beneficial medicine. The Native Americans had wrapped shredded tobacco in larger leaves, and "cigars" became popular by the turn of the twentieth century. "Cigarettes" were invented by people who gathered the shredded cigar tobacco that had gone to waste and wrapped it in small papers to smoke it.

The popularity of cigarettes skyrocketed during World War I (1914–1918), because they were easy to transport into battle. Many young soldiers brought the cigarette habit home with them, and factories stood ready to create the product on assembly lines. By the

1920s, whole industries built on tobacco advertised in print, on billboards, and through movies and radio. Women were encouraged to smoke, and they took up the habit as well. The "Jazz Era" generation was the first to embrace tobacco in great numbers. The era's great athletes smoked when not on the playing field and chewed tobacco during games. During the Great Depression (1929–1941), U.S. President Franklin Delano Roosevelt (1882–1945) was sometimes photographed with a cigarette, in a holder, in his mouth.

Tobacco-Related Illness Begin to Surface

Americans who had been young in the 1920s were entering their sixties by the 1960s. At that time, tobacco use began to show its downside. Even as new generations became hooked on nicotine, older Americans suffered increasing numbers of lung, throat, and mouth cancers. Others died of emphysema, a disorder that affects the lungs' ability to process oxygen. In 1961 the Surgeon General of the United States requested a report on the effects of tobacco use on health. Facing opposition from tobacco companies—who claimed to have done their own research—a panel of experts met to study the problem.

In 1964 the panel submitted a report to the Surgeon General that linked tobacco use to lung cancer, mouth and throat cancer, heart attacks, STROKES, emphysema, and other diseases of the stomach and liver. The report, to no one's surprise, declared that nicotine was habit-forming. At the time the report was issued, 40 percent of adult Americans used some form of tobacco.

By the late 1960s, nonprofit groups from many sectors were uniting to stop tobacco use in the United States. Groups such as the American Heart Association, the American Lung Association, and the American Cancer Society launched advertisements to counter the popular characters featured in cigarette ads, including Joe Camel and the Marlboro Man. Perhaps just as effective for younger people was the personal experience of a loved one—a parent, a grandparent, or an older sibling—suffering the ill effects of tobacco use. Smoking declined among the American public as a result.

The terms PASSIVE SMOKING and "secondhand smoke" had not been invented in the 1960s. However, by the 1990s people had become aware that tobacco smoke posed a threat not only to the smoker, but also to those exposed to the smoldering cigarette or cigar, and the exhaled smoke. Private companies began to ban smoking in office buildings, and a whole series of laws followed, banning smoking in public transportation, on airplanes, in health care facilities, and in government buildings. People who had once puffed at their desks were forced to smoke on their breaks, huddled outside in all

strokes: loss of feeling, consciousness, or movement caused by the breaking or blocking of blood vessels in the brain

passive smoking: inhaling smoke from someone else's burning cigarette

sorts of weather. At the same time, states began to levy higher taxes on cigarettes to help pay for Medicaid and other social welfare programs.

Tighter Laws Cut Down on Nicotine Abuse

On November 16, 1998, forty-seven states and the District of Columbia came to an out-of-court settlement with four major American tobacco companies. (The other three states had previously come to agreements.) The states had sued the tobacco companies for the costs of providing health care to poor people suffering from tobacco-related illnesses. The cigarette companies agreed to pay the states $206 billion for health care. The companies also agreed not to market their product to adolescents through advertisements or promotional items. They further agreed to fund a program to discourage teenage smoking. One consequence of this settlement: The average price of a pack of cigarettes rose fifty cents in one year, from $2.20 in 1998 to $2.70 in 1999. By 2005, cigarettes were selling for about $4.00 per pack. For heavy smokers, many of them poor already, this was a difficult increase to manage.

Despite the successes made in the anti-tobacco campaign, smoking still appealed to youth who wanted to rebel against authority. In fact, by suggesting that tobacco was something that only adults should use just made it more popular with rebellious youth who wanted to seem hip and mature. Smoking was also glamorized in various movies as something that cool people do. As of the early twenty-first century, a large number of teens still take up smoking. The National Center for Chronic Disease Prevention and Health Promotion estimates that about 4,000 people under the age of eighteen begin smoking each day in the United States.

More recently, the healthcare industry has focused on smoking in films. "Product placement" is very important in movies. When a character in a film uses a particular food or beverage product, sales of that product often climb. In 2005 the American Medical Association recommended that the film industry adopt a policy that would automatically give an "R" rating to any movie in which a character uses tobacco. (People under seventeen are not supposed to be admitted to "R" rated movies without a parent or adult.) Whether the film industry will honor that request is uncertain.

What Is It Made Of?

Nicotine is a poisonous ALKALOID that occurs naturally in the leaves of the tobacco plant. While still in the leaves of the plant, it is a colorless liquid. Sixty milligrams of nicotine, about the amount

alkaloid: a nitrogen-containing substance found in plants

Philadelphia Phillies outfielder Lenny Dykstra is shown as he begins chewing a large wad of tobacco in 1990. He later appeared in a public service announcement telling teens to aspire to play like him, not chew tobacco like him. *Jonathan Daniel/Allsport USA.*

a bottle cap would hold, can kill a human being. It is used as a pesticide to kill insects on plants and internal parasites in animals.

The chemical formula for nicotine is $C_{10}H_{14}N_2$. The average cigarette contains 8 to 10 milligrams of nicotine, but much of this

Tobacco Statistics

Did you know that. . . .

- As of 2005, tobacco use was considered to be the leading preventable cause of death in the United States. Nearly 500,000 deaths are related to tobacco use each year.
- The Centers for Disease Control and Prevention estimates that smoking takes 5.6 million years of potential life away each year in the United States.
- In the United States each day, some 4,000 people under age 18 smoke their first cigarette.
- Most adult smokers started using tobacco before their 18th birthday—nearly 80 percent of them, in fact.

is lost in the process of burning. Typically, a smoker receives about 1 milligram of nicotine per cigarette. A pinch of chewing tobacco contains between 4.5 and 6.5 milligrams of nicotine. Since chewing tobacco enters the body more slowly than smoked tobacco, more of the dose is absorbed, but over a longer period of time.

In addition to nicotine, a smoking leaf of tobacco releases more than 4,000 different chemicals. Four hundred of these are known to be poisonous, and forty-three have been shown to cause cancer. A lit cigarette releases, among other things, CARBON MONOXIDE, ammonia, hydrogen cyanide, benzene, formaldehyde, acetone, methanol, and vinyl chloride. Tobacco companies add other ingredients to cigarettes as well, including menthol. Menthol numbs the throat to the irritating effects of the smoke. It also widens the pathways in the lungs, allowing more smoke to penetrate the tissues.

When smoke is exhaled from the lungs, a substance called tar remains in the body. As its name suggests, tar is a sticky residue that clings to lung tissue. Tar contains cancer-causing compounds. Receiving nicotine through the mouth by chewing reduces some of the dangerous chemicals from tar, but it also exposes the tissues in the mouth to cancer-causing agents and compounds that cause tooth decay and gum disease. The same compounds in tar simply cling to the mouth tissues and are absorbed by the gums, cheeks, and throat.

How Is It Taken?

Nicotine is taken in several ways. The most common and quick-acting manner is smoking. The user lights a cigarette, draws the smoke into the lungs, and exhales it. The effects of the nicotine can be felt within ten seconds, and they usually last between fifteen minutes and an hour.

People who smoke cigars and pipes generally "puff" them and do not inhale the smoke into the lungs. Even so, the soft tissues in the mouth absorb the nicotine and send it through the bloodstream to the brain. Smoking pipes or cigars is, indeed, habit-forming. Puffing is just another way to deliver nicotine to the brain.

carbon monoxide: a poisonous gas with no odor; carbon monoxide is released when cigarettes burn

The presence of the smoke in the mouth and throat can lead to cancers in those body parts, and to cancer of the esophagus, the tube leading into the stomach.

With chewing tobacco, the user takes a wad of moist tobacco and presses it between the cheek and the gum. As the mouth fills with saliva, the user must spit, because swallowing tobacco-laced saliva could be deadly and certainly causes stomach upset. Users of chewing tobacco generally keep a wad in the mouth for about thirty minutes, during which time about 2 milligrams of nicotine enter the bloodstream through the cheek and gum tissue.

Few people snort snuff anymore, but it was once a popular way to use nicotine. Snuff, finely-ground tobacco, was snorted up the nose and usually removed by sneezing. A "pinch of snuff" was thought to ward off colds and other infectious diseases.

Are There Any Medical Reasons for Taking This Substance?

Some small studies have been performed to see if nicotine patches help reduce memory loss in ALZHEIMER'S DISEASE patients and muscle tremors in PARKINSON'S DISEASE patients. Since nicotine is so highly addictive, however, its valid medical uses are considered very minimal.

The only acceptable medical use for nicotine is to help people overcome addiction to nicotine. "Nicotine delivery systems" include skin patches, gum, inhalers, and nasal sprays. Tobacco users trying to quit the habit can curb nicotine's WITHDRAWAL symptoms with these products. The products become very dangerous if a person smokes while using them. In that case, nicotine overdose is possible. Although some nicotine replacement products are available over the counter, most encourage nicotine addicts to seek the advice and counsel of a medical doctor while attempting to curb nicotine use.

Alzheimer's disease: a brain disease that usually strikes older individuals and results in memory loss, impaired thinking, and personality changes; symptoms worsen over time

Parkinson's disease: an incurable nervous disorder that worsens with time and occurs most often after the age of fifty; it is generally caused by a loss of dopamine-producing brain cells; symptoms include overall weakness, partial paralysis of the face, trembling hands, and a slowed, shuffling walk

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

Usage Trends

The *American Heart Association* Web site posts data on patterns of tobacco use among adults age eighteen and older in the United States. As of 2002, 25.2 percent of white American men and 20.7 percent of white American women used tobacco. In 2002, 27 percent of African American men and 18.5 percent of African American women used tobacco. Hispanic/Latino men reported 23.2 percent usage, and Hispanic/Latino women, 12.5 percent. Asian Americans were the least likely to use tobacco, with 21.3 percent of men and 6.9 of women reporting usage. The population most likely to use

Some chronic tobacco users seek to end their addiction to the drug by using nicotine patches. Such therapies can be habit-forming, too. Patch users must take care not to exceed the recommended dose on the label.

Photograph by Robert J. Huffman/Field Mark Publications.

tobacco, according to the American Heart Association data, is Native Americans/Alaskan Natives, who reported that 32 percent of adult men and 36.9 percent of adult women were tobacco users. The numbers add up to 47.5 million adult American users.

What the Surveys Say

The 2003 NSDUH found 70.8 million tobacco users in the United States, factoring in anyone over the age of twelve who had ever tried tobacco. Of these, the NSDUH characterized 35.7 million as nicotine addicts. This number includes Americans age twelve and older. The NSDUH data on teenage nicotine use does not break down by race or ethnic origin, reporting simply that 12.5 percent of girls age twelve to eighteen use tobacco, along with 11.9 percent of boys. These rates are down from previous years.

Incidents of tobacco use seem to peak between the ages of eighteen and twenty-five, when, according to the NSDUH, 40.8 percent of people report at least one experience with the product. The data clearly show that most Americans begin using tobacco products between the ages of twelve and twenty-five. It is this "target audience" that the anti-smoking campaigns seek to educate about the health dangers of tobacco. According to various anti-smoking organizations, it is this same group that smoking advertisements target.

Although the number of young smokers remains high, data from the 2004 Monitoring the Future (MTF) study show a slow but steady drop in the percentage of eighth-, tenth-, and twelfth-grade students who smoke cigarettes. Back in 1996, 21 percent of eighth graders, 30.4 percent of tenth graders, and 34 percent of twelfth graders had smoked during the month prior to the survey. Eight years later, in 2004, the figures had fallen to 9.2 percent of eighth graders, 16 percent of tenth graders, and 25 percent of twelfth graders reporting past-month cigarette usage. Teens who said they smoked more than a half a pack of cigarettes daily fell significantly over the eight-year span as well. In addition, according to MTF survey authors, "the perception of harm from smoking one or more packs per day increased significantly among eighth- and tenth-graders from 2003 to 2004."

Charley, the Addicted Chimp

According to *First Coast News* in April of 2005, Charley, a resident of the Bloemfontein Zoo in South Africa, picked up a smoking habit after finding a pack of cigarettes thrown into his cage. Helpful zoo visitors lit his cigarettes for him. Charley learned to hide his cigarettes from the zookeepers, who would take them from him. The zoo staff feared he had become addicted. They posted signs asking visitors not to give Charley any more tobacco for fear that it was damaging his health.

Ties to Social Problems?

The various surveys show another fact as well. According to the American Heart Association, people with a high school education or less are three times more likely to be smokers than those with a college education. The prevalence of cigarette smoking is highest among people living below the poverty level, with one in three reporting tobacco use.

A study of more than 4,000 students in Oregon and California linked early smoking with problem behaviors. Kids who start smoking around age twelve are considered "early smokers." In an article published in the *Journal of Adolescent Health,* Phyllis L. Ellickson and her coauthors reached the following conclusion: "Compared with nonsmokers, early smokers were at least three times more likely by grade twelve to regularly use tobacco and marijuana, use hard drugs, [and] drop out of school." In addition, these adolescents were "at higher risk for low academic achievement and behavioral problems at school."

Effects on the Body

Nicotine is the addictive compound in tobacco. When it enters the bloodstream, either through the lungs, the skin inside the mouth, or the nasal passages, it moves to the brain. There it binds with ACETYLCHOLINE receptors, triggering the release of other NEUROTRANSMITTERS and hormones. Basically, nicotine causes two sensations: stimulation in the thought processes, and general relaxation in the user.

The *Need* for a Cigarette

The quick-acting nicotine increases the amount of DOPAMINE in the brain. This causes pleasure and relaxation of muscles. At the same time, it enhances NOREPINEPHRINE and acetylcholine levels, increasing mental stimulation and suppressing appetite. Nicotine also enhances memory and promotes a feeling of well-being. In other words, the drug stimulates the brain's reward system, making the user "feel good."

When people say that cigarettes help them to concentrate, they are not exaggerating. Nicotine does have that effect. However, the effect wears off quickly unless another dose of nicotine enters the brain. Likewise, nicotine does cause a feeling of relaxation, but this too passes quickly, leading to a craving for more of the drug. Many behaviors are related to the addicting qualities of nicotine. The user, taking a puff on a cigarette, might just feel more relaxed because withdrawal symptoms have been held at bay for another hour.

acetylcholine: pronounced uh-settle-KOH-leen; a neurotransmitter that forms from a substance called choline, which is released by the liver

neurotransmitters: a substance that helps spread nerve impulses from one nerve cell to another

dopamine: pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

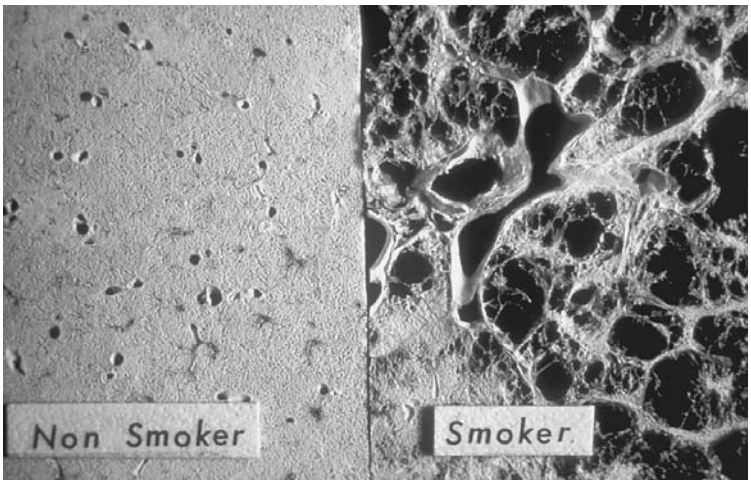
norepinephrine: pronounced nor-epp-ih-NEFF-run; a natural stimulant produced by the human body

epinephrine: pronounced epp-ih-NEFF-run; a hormone that increases heart rate and breathing; also called adrenaline

A Dangerous Habit

Nicotine causes a release of EPINEPHRINE, leading to a faster heartbeat, higher blood pressure, quickened breathing, and higher blood sugar. So while the user may feel relaxed, the body is actually working harder to pump blood and take in oxygen. Over a long period of time, this strain on the heart and elevated blood pressure can lead to heart attack and stroke. The drug also complicates the chemistry of the blood, causing blood vessels to become smaller and blood cells to stick together in clots. This can increase the risk of organ damage and stroke. Over time, nicotine contributes to the build-up of plaque in the arteries, a leading cause of heart disease. The chemicals in cigarette smoke also irritate the throat, interfere with the lung's ability to clear debris and bacteria, and promote nausea and other digestive disturbances.

Most scientists agree that nicotine is the most addictive substance used by humankind—worse than cocaine, although it works in a similar way on the brain's reward centers. (An entry for



Smoking can lead to severe lung damage. On the left are the lungs of a nonsmoker; on the right, the lungs of a smoker.

cocaine is available in this encyclopedia.) Because nicotine works so quickly and exits the brain just as quickly, it begins to induce cravings in most users within days or weeks of first use. Its effects are particularly strong on those with attention-deficit/hyperactivity disorder (ADHD), for whom it may be calming, and those with depression or a tendency to become depressed. People with those problems have a harder time freeing themselves from a nicotine addiction, so they are advised not to use tobacco at all.

Getting Hooked

Regular tobacco use causes TOLERANCE, a condition that can lead to heavy smoking or chewing, and to lifestyle changes based on that heavy use. People find themselves spending a great deal of money on tobacco products, using them recklessly (smoking in bed, smoking while driving), and endangering the health of others with secondhand smoke.

At overdose levels, nicotine causes dizziness, vomiting, muscle tremors, convulsions, and paralysis of the lungs leading to an inability to breathe. All of these symptoms can develop within minutes. Tobacco products should be kept out of reach of children and pets. Those using nicotine replacement products should never smoke or chew tobacco at the same time. In addition, great care should be taken with any insecticide or other product containing pure nicotine.

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

The immediate effects of nicotine are generally mild and pleasurable; the long-term effects of tobacco use are not. Smokers accumulate a huge buildup of tar in the lungs, promoting cancer and clogging the air sacs that transfer oxygen into the bloodstream. The cancer-causing chemicals in tobacco promote growth of tumors in the mouth, on the lips, in the throat, in the lungs, in the esophagus, and elsewhere in the body. Nearly one in five deaths due to heart disease can be blamed on tobacco, and the overall death rate from cancer is twice as high among smokers as among nonsmokers.

More Dangers

People who smoke damage tiny, hair-like structures called cilia that lead to the lungs. Cilia help to remove germs and dirt from the lungs. This leads to an accumulation of mucus in the lungs and bronchial tubes—the famous "smoker's cough." Smokers also suffer more frequent and more serious cases of flu and pneumonia. Heavy tobacco use can cause men to become impotent and their sperm counts to decrease. Tobacco use has also been linked to cancers in the female reproductive organs.

Perhaps the most dangerous aspect of nicotine is the time it takes for the deadly side effects to develop. Most people begin using tobacco as teenagers, a time when they are most vulnerable to peer pressure and subtle advertising techniques. The vast majority of teenagers are enjoying the best health they will ever have in their lives. They cannot imagine growing old, developing health problems, or being at risk for fatal diseases. By the time they begin to understand how fragile the body is, they can already be deeply dependent on nicotine.

Becoming free of nicotine addiction causes immediate and long-term health benefits, including improved breathing, better sensation of taste, healthier teeth and skin, and improved strength. Quitting smoking also lessens the risks of cancer—but not entirely. Sometimes people who have not smoked in years discover that they have lung cancer. The disease is difficult to diagnose in its early stages. The very best way to avoid nicotine-related illnesses is to avoid any use of nicotine at any stage of life. If nicotine use has begun, the sooner it ends, the better the chances of living a long and healthy life.

Reactions with Other Drugs or Substances

Tobacco use causes the liver to produce more enzymes that can lower the blood levels of other medicines. Doctors should alter the doses of prescription drugs and monitor patients more carefully

if those patients are using tobacco or nicotine replacement products. Nicotine should not be combined with certain asthma drugs, blood thinners, antipsychotic drugs, drugs for migraine headaches, and some antidepressants. Nicotine also interferes with some blood pressure medications such as Procardia and Tenormin. Women who are using birth control pills are urged not to smoke, because the combination of the pills and the tobacco can increase the likelihood of blood clots.

Any combination of nicotine and cocaine, opiates, hallucinogens, or marijuana can heighten the effects of the illegal drugs and possibly lead to irregular heartbeat or breathing problems. Heavy use of tobacco and alcohol further increases cancer risks. (Entries on alcohol and marijuana are available in this encyclopedia.)

Nicotine Withdrawal Symptoms

Nicotine withdrawal causes a variety of symptoms, including:

- restlessness
- anxiety
- impatience
- anger
- difficulty concentrating
- increased appetite and weight gain
- depression
- loss of energy and interest in life
- dizziness
- headache
- sweating
- insomnia, the inability to sleep
- tremors, shaking of limbs
- tightening of muscles
- cravings for tobacco.

Treatment for Habitual Users

Giving up the nicotine habit can be very difficult. Within hours of the last cigarette or chew, the body begins to respond to the lack of the drug. People become irritable and anxious, they overeat, they cannot sleep, and they can experience muscle tremors and a craving for tobacco. Many times, it is just easier to get another cigarette rather than to face the withdrawal symptoms.

Many self-help groups, including Nicotine Anonymous, the American Lung Association, the American Cancer Society, and the National Cancer Institute, have smoking cessation, or stopping, programs. Local- and state-funded programs also provide counselors and various treatment methods to the motivated addict who wants to quit using tobacco. These treatment programs may use hypnosis, group therapy, or behavior modification to encourage alternate behavior and help individuals combat the many facets of nicotine addiction. In many cases, health insurance companies will help pay for nicotine treatment programs.

Probably the most successful treatment methods involve nicotine replacement products such as gum (Nicorette) and skin patches (NicoDerm CQ, Nicotrol, Habitrol, and ProStep). These products recommend that the user work closely with a doctor or therapist to taper the doses of nicotine slowly. People using nicotine replacement

Kreteks and Bidis

Kreteks are clove-spiced cigarettes from Indonesia. Bidis are small, flavored cigarettes from India. Both are available on the American market, and both contain high concentrations of nicotine—higher, even, than American cigarettes. These items are tobacco products, and they are habit-forming.

therapies must take care not to use tobacco products at the same time, since this may lead to nicotine overdose. They must also be aware that these therapies can be habit-forming themselves, so they must be motivated not to exceed the recommended dose on the label of the package.

Other prescription drugs used to curb nicotine abuse include buproprion (Zyban), an antidepressant, and Clonidine (Catapres), a medicine to reduce high blood pressure. Both of these products block nicotine's pleasurable effects and help a recovering user avoid tobacco products.

For most, the best way to treat a tobacco habit is to combine a nicotine replacement therapy with counseling, education, group support, and the encouragement of family and friends. A heavy tobacco user must expect that the process will not always go smoothly and must have strategies in place for times of stress. Recovering nicotine addicts usually need to alter their lifestyles in order to avoid the people and places associated with smoking. If other family members smoke in the home, this can be very challenging.

The least effective way to attempt to quit nicotine is to depend on will power or to attempt to cut back on smoking by using low-tar cigarettes or by smoking less. People who try to quit in this way usually compensate by drawing more deeply on the cigarettes they do smoke. The relapse rate for this type of cessation is very high.

Consequences

Nicotine erodes health slowly at first. Most people begin smoking early in life, when they are enjoying the best health they will ever have. Gradually, however, the consequences of long-term tobacco use become evident. People suffer from bad breath, discolored teeth, cravings, and dryness and thinning of the skin. They may develop a "smoker's cough" or a gravelly voice from damage to the larynx, the organ that produces sound in the throat. They may develop lesions—sores that do not heal or that heal very slowly—on their lips or inside the mouth. All of these are early warning signs of trouble to come.

Increased Risk of Cancer and Other Illnesses

It is estimated that one-third of all cancers and 87 percent of lung cancer in the United States can be traced directly to tobacco use. Cancer

An anti-smoking billboard shows a sickly character named "Joe Chemo" in his hospital bed suffering from cancer due to years of smoking. The character is a takeoff of the famous "Joe Camel," who was once featured on packs of Camel cigarettes. *AP/Wide World Photos.*

is an illness in which cells grow and reproduce too quickly, causing tumors inside the body. The tumors can be small at first and then grow rapidly. If the cancer reaches the lymph glands that send hormones throughout the body, the cancer can spread through the body as well. Cancer treatment generally involves surgery to remove tumors. Surgery is often followed by chemotherapy, a process that shrinks tumors but also causes nausea, weakness, hair loss, and malfunction of the immune system. Some tumors are treated with radiation to stem their growth. Radiation can cause pain and burning of the skin.

Cancer is treatable, but smokers are twice as likely to die of it as nonsmokers diagnosed with the same illness. Heavy smokers are four times more likely to die of their cancers as nonsmokers diagnosed with similar cancers.

Test your knowledge: How much do you know about Nicotine?

The National Institute on Drug Abuse of the National Institutes of Health has created this quiz for teens about nicotine and its effects. The answers follow the quiz, but don't peek. See how much you know!

1. Tobacco use can be contributed to about _____ deaths in the United States each year.

   a) 50,000
   b) 100,000
   c) 500,000

2. Smokers crave cigarettes because they _____.

   a) like the smell of cigarette smoke
   b) are addicted to nicotine
   c) like the way cigarettes make them look

3. Smoking cigarettes changes _____.

   a) the amount of a brain chemical that allows us to experience pleasure
   b) the amount of blood that flows to the brain
   c) the number of things we worry about

4. After smoking cigarettes for a while, the smoker _____.

   a) needs less nicotine to get the same feeling from smoking
   b) needs more nicotine to get the same feeling from smoking
   c) doesn't notice any change in how much nicotine they need.

5. Cigarette smoke contains _____ chemicals.

   a) 4,000
   b) 1,000
   c) 400

6. Cigarette smokers are addicted to _____.

   a) tar
   b) carbon monoxide
   c) nicotine

7. After a puff on a cigarette, nicotine is in the brain in _____ seconds.

   a) 8
   b) 18
   c) 80

8. In the brain, nicotine locks into receptors on neurons making the smoker feel _____.

   a) irritable
   b) sleepy
   c) alert and satisfied

9. After a while, the brain shuts down some receptors so a smoker needs a cigarette _____.

   a) to stop cravings
   b) just to feel normal
   c) both a and b

Answers

1. **C**: Tobacco use causes more illnesses and death than all other addicting drugs combined. Nicotine is the drug in tobacco that is responsible for addiction and keeps people smoking despite harmful effects.
2. **B**: The correct answer is b. Nicotine, the drug in tobacco cigarettes, is highly addictive. It causes changes in the brain that give smokers a strong appetite for cigarettes.
3. **A**: Nicotine boosts the amount of a brain chemical called dopamine. At first, this produces feelings of pleasure. But soon, the smoker needs nicotine just to feel normal.
4. **B**: After nicotine causes floods of brain chemicals, the brain starts to make less of the chemicals. So a smoker soon needs to smoke more to get the effects that one cigarette used to provide.
5. **A**: The addictive drug nicotine is only one of 4,000 chemicals in cigarette smoke. Many of them, such as tar and carbon monoxide, are toxic and cause diseases such as cancer.
6. **C**: Smokers are addicted to the nicotine in tobacco. However, both tar and carbon monoxide are also toxic chemicals causing many health problems.
7. **A**: After a smoker inhales cigarette smoke, nicotine enters the blood in the lungs, goes through the heart and is pumped to the brain—a journey that takes only eight seconds.
8. **C**: Nicotine is similar in size and shape as brain chemicals that regulate feelings of alertness and pleasure or satisfaction.
9. **C**: Smokers have changed the way their brains work, so that they crave cigarettes as a way to make them feel normal. Without nicotine, smokers feel irritable and depressed.

SOURCE: Adapted from "Quiz: Nicotine," in *The Science Behind Drug Abuse: NIDA for Teens,* National Institute on Drug Abuse, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MA [Online] http://teens.drugabuse.gov/parents/documents/nicotine_quiz.doc [accessed May 24, 2005]

Long-term tobacco use is directly linked to heart attack, various lung illnesses, high blood pressure, and stomach ulcers. It also reduces the body's ability to heal broken bones, promotes arthritis, and causes bad breath and yellowing of the teeth. All of these effects stem from a product that is legal for use in the American adult population. However, the U.S. Surgeon General's warning about the various health consequences of smoking appears on all packs of cigarettes sold in the United States.

The Law

In most states, people must be eighteen years old to purchase tobacco products legally. In Alabama, Alaska, and Utah, the minimum age for purchase of tobacco is nineteen. As of the early 2000s, four other states—California, New Jersey, Illinois, and Massachusetts—were considering laws to raise the age as well. The burden of keeping underage persons from buying cigarettes or smokeless tobacco falls on the stores that sell it.

Shopkeepers risk prosecution if they are caught selling tobacco to minors. Most stores require that younger buyers produce valid identification showing date of birth. Occasionally, young undercover police officers will attempt to buy tobacco without proper identification to see if the shopkeepers are abiding by the law. A store owner who sells tobacco to a minor risks losing his or her license to sell the product, as well as fines or closure of the business.

People under the age of eighteen who get caught with tobacco products do not face criminal prosecution. However, they can be suspended from school if caught with tobacco on school grounds. Most authorities contact parents or legal guardians to report the situation. For teens who smoke, secrecy rarely lasts very long. The telltale smell of tobacco clinging to clothing and hair is hard to disguise.

Discrimination Against Smokers

In some states, private companies have introduced policies that deny jobs to smokers. The companies cite the extra burden of health care costs for their smoking employees, as well as loss of work time due to smoking breaks. Many smokers claim that this is discrimination and should not be a factor deciding employment, especially since smoking is legal. As of early 2005 no lawsuits had yet developed from the introduction of these measures, but analysts expected that legal action would soon occur.

Various states have laws that prohibit employers from discriminating against their staff for engaging in certain legal activities, like

smoking, while they are not at work. According to Marshall H. Tanick in the Minneapolis *Star Tribune* "about two dozen states . . . have so-called 'lifestyle rights' laws," including Minnesota, Texas, California, and Florida. Such laws prohibit employers from discriminating against "employees because of lawful off-duty conduct." Tanick noted that the 1992 Minnesota law specifically "extends to consumption of 'food, alcohol, or non-alcoholic beverages and tobacco.'" Employers can restrict the use of certain products, consumed by the employee off-duty, if use of those products interferes with the person's ability to do his or her job.

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See also: Alcohol; Cocaine; Marijuana

Nitrous Oxide

Official Drug Name: Nitrous oxide, dinitrogen oxide, nitrogen oxide
Also Known As: Balloons, buzz bombs, cartridges, hippie crack, laughing gas, nitrous, whip-its, whippets, whippits
Drug Classifications: Not scheduled

What Kind of Drug Is It?

Nitrous oxide is a type of anesthetic, a substance used to deaden pain. It can alleviate pain without causing a loss of consciousness. Best known by the nickname "laughing gas," nitrous oxide is used primarily by dentists to keep patients comfortable during painful procedures. It can also be used in combination with other drugs as a GENERAL ANESTHETIC. When administered by trained medical professionals, the gas is considered a safe and effective form of anesthesia.

As a recreational drug—a drug used solely to get high, not to treat a medical condition—nitrous oxide is classified as an inhalant. (An entry on inhalants is available in this encyclopedia.) Inhalants contain dangerous vapors, which are gases or fumes that can be irritating or physically harmful when breathed in. Vapors from inhalants produce psychoactive, or mind-altering, effects when breathed in through the mouth or nose.

More than 1,000 different household and industrial products—all readily accessible to consumers of any age—are sniffed or HUFFED for their intoxicating effects. Glues, paints, markers, nail polish, correction fluid, and shoe polish are among the most commonly abused inhalants.

Among young teens, nitrous oxide is typically obtained from canned whipped cream available at grocery stores. Nitrous oxide gas is used to propel, or to drive out, the whipped cream from the can. Sales of nitrous oxide to older teens and adults usually occur at dance clubs and all-night dance parties called RAVES or through Internet transactions.

Overview

In the 1700s and the 1800s, chemists, doctors, and dentists in Europe and the United States experimented with three different anesthetic gases: nitrous oxide, ether (EETH-uhr), and chloroform (KLOR-uh-form). These compounds revolutionized surgical and dental procedures. While under the influence of an anesthetic gas, a patient's perception of pain is altered. Nitrous oxide, ether, and chloroform all dull or block painful sensations. They also produce a rather intense high.

general anesthetic: an anesthetic that causes a loss of sensation in the entire body, rather than just a specific body part, and brings on a loss of consciousness

huffed: inhaled through the mouth, often from an inhalant-soaked cloth

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

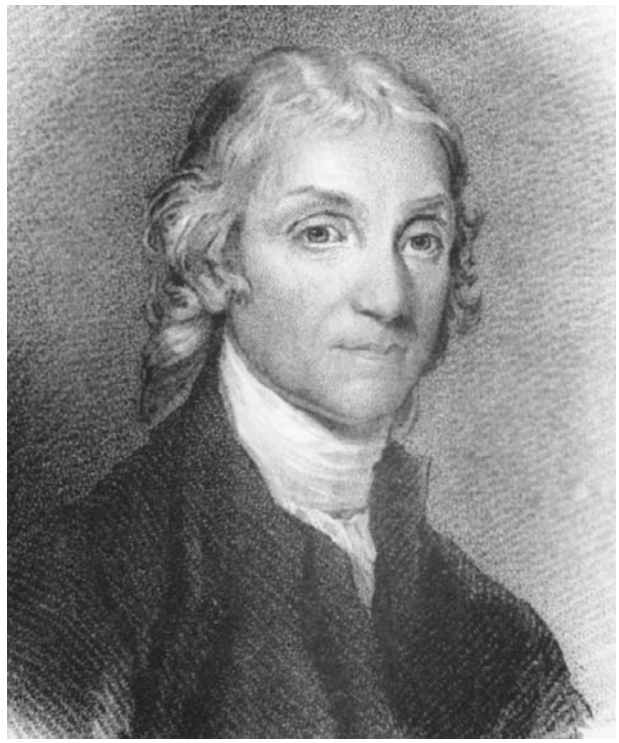
Various devices used for inhaling nitrous oxide are displayed. *Photo by Erowid, © 2001 Erowid.org.*

The intoxicating side effects of the gases, however, led to their use and abuse as recreational drugs. A research report titled "Inhalant Abuse," prepared by the National Institute on Drug Abuse (NIDA) and updated in 2005, noted that "nitrous oxide is the most abused of these [three] gases."

Nitrous oxide is a gas with both anesthetic and analgesic (pain relieving) properties. It was first discovered in 1772 by British scientist, theologian, and philosopher Joseph Priestley (1733–1804). Earlier, Priestley had identified oxygen, which he termed "phlogisticated (floh-JISS-tih-kay-ted) air." The term "phlo-gis-tic" comes from a Greek word meaning "flammable."

Nitrous Demonstrations: An Unusual Form of Entertainment

Although Priestley is credited with discovering nitrous oxide, another scientist recognized the potential value of its numbing and intoxicating effects. This man was Sir Humphry Davy (1778–1829), a British chemist who experimented with the gas on himself and his friends. In a book Davy wrote on the subject in 1800, he suggested that nitrous oxide's ability to dull pain might make it a useful anesthetic in surgeries. But, as Julie M. Fenster noted in *Ether Day: The Strange Tale of America's Greatest Medical Discovery and the Haunted Men Who Made It,* "no one took his suggestion."



Nitrous oxide was first discovered in 1772 by British scientist, theologian, and philosopher Joseph Priestley. (Some sources cite his name as Priestly.) © *Bettmann/Corbis.*

And so, despite Davy's writings on the subject, nitrous oxide was not put to use in the medical field for another four decades. Apparently, according to historical sources, pain was such an accepted part of medical intervention during the early nineteenth century that neither scientists nor doctors seriously considered trying to ease it. Instead, nitrous oxide, which had earned the nickname "laughing gas," enjoyed popularity as a way for the British upper classes to entertain themselves at social gatherings. "The gas was soon offered at dinner parties instead of wine," wrote Fenster. It was even demonstrated in theaters and at festivals. In 1824, crowds in London were amazed by a show called "M. Henry's Mechanical and Chemical Demonstrations." The highly successful performances showed the uninhibiting effects of nitrous oxide on audience volunteers eager to try the gas.

"A New Era in Tooth-Pulling!"

Meanwhile in the United States, laughing gas was featured in traveling medicine shows and carnivals. Gardner Q. Colton (1814–1898), a former medical student, made a good living by giving public demonstrations of nitrous oxide. In New York City in 1844, he organized the "Grand Exhibition of Nitrous Oxide" on Broadway, charging the then-outrageous price of twenty-five cents per ticket. Colton moved his act to Hartford, Connecticut, later that year. Dr. Horace Wells (1815–1848), a dentist in Hartford, attended the

nitrous exhibition with his wife. The evening's entertainment changed Wells' life forever.

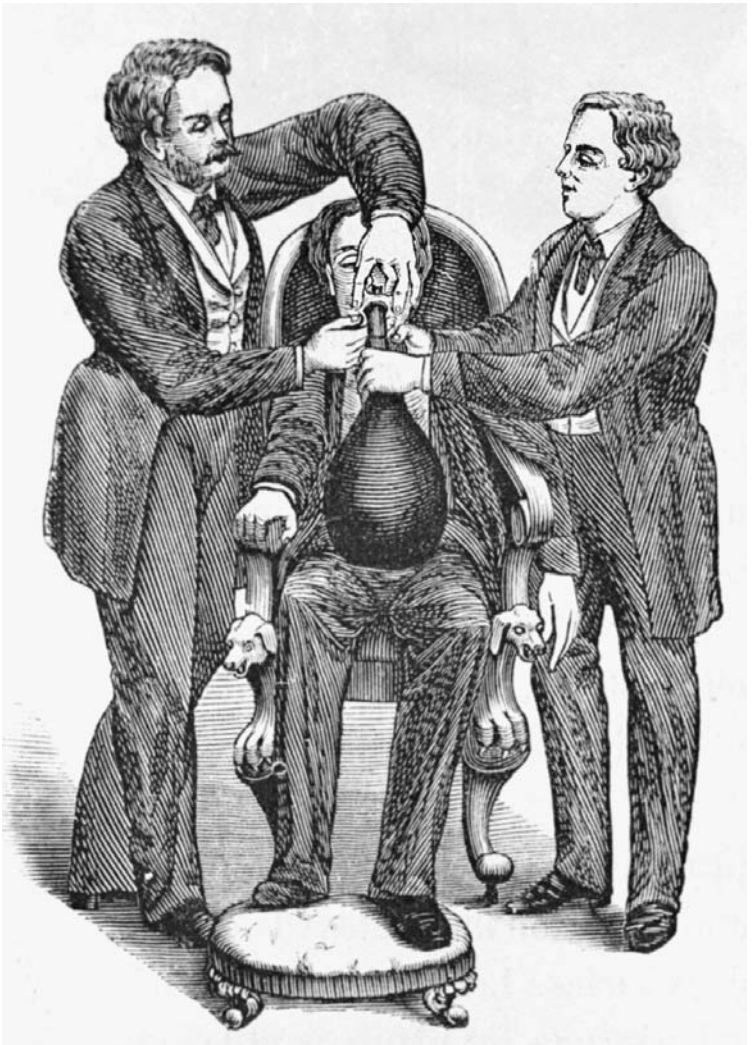
Both Wells and his wife were among the volunteers from the audience who tried the laughing gas. The couple apparently engaged in some silly antics after sampling the nitrous oxide, but Wells was actually more interested in the effects of the gas on another member of the audience. A local man named Sam Cooley had seriously gashed his legs on a piece of furniture while stumbling around the stage on his nitrous high. His knees were bleeding badly, but he felt no pain. In fact, he didn't even realize he had been hurt. Wells was stunned by the effect of the gas and concluded that nitrous oxide might be useful as a medical anesthetic. In Wells' own often-quoted words, it was the beginning of "a new era in tooth-pulling!"

In keeping with the tradition of scientific experimentation in the nineteenth century, Wells used himself as a test subject. He devised a test case involving his dental colleague and friend Dr. John Riggs, who agreed to extract a tooth from Wells' mouth. The experiment took place on December 11, 1844. Wells asked Colton to set up his nitrous oxide equipment at the office Wells shared with Riggs. Wells administered the gas himself and soon nodded off from its effects. Riggs immediately pulled a sore wisdom tooth from Wells' mouth. The nitrous oxide had worked. Wells woke up shortly after the procedure and reported feeling no pain.

Considering his test a success, Wells began using nitrous oxide—quite successfully—as an anesthetic in his dental practice. When people heard about the new dental procedure, Wells' business increased. He was confident that painful dentistry would soon become a thing of the past.

A Demonstration Gone Bad

In January of 1845, before an audience of experts from the Harvard Medical School and Massachusetts General Hospital, Wells attempted to demonstrate the anesthetizing effects of nitrous oxide. He used a bag of the gas to sedate a patient before removing a tooth. However, the bag was withdrawn too soon, and the patient awoke before the procedure was complete. The experiment was considered a failure, and Wells was devastated. He never fully recovered from the disastrous demonstration and committed suicide in 1848. More than a decade later, in the early 1860s, the medical community came to understand and accept nitrous oxide as a valuable tool. It was finally being used not as a prop in a traveling sideshow, but as the anesthetic that Wells had suggested.



Over the years, nitrous oxide has been used in various ways. As depicted in this illustration from 1863, the gas was used as an anesthetic when preparing witnesses for trial in Great Britain. Here, one man administers the mixture from a bag while another pinches the witness' nostrils shut.

Modern Uses

By 1871, companies in both the United States and Great Britain were producing compressed nitrous oxide in cylinders. As of 2003, according to the Compressed Gas Association (CGA), nearly 90 percent of the nitrous oxide manufactured

About Those Other Gases . . .

Ether is a flammable liquid with the chemical formula $C_4H_{10}O$. (Flammable means that the substance is capable of catching fire and burning quickly.) The intoxicating effects of ether have been known since the thirteenth century. It was first used as an anesthetic beginning in the mid-1800s, but its high flammability made it dangerous for medical use. The word *ether* comes from the Greek term meaning "to ignite" or "blaze."

Because ether is a liquid at room temperature, it can be swallowed, or the fumes from the liquid can be inhaled. In the 1760s, it was often dispensed by doctors by the drop onto a lump of sugar or mixed with water and used as a tonic. The use of ether as a recreational drug increased when users realized that it produced intoxication without a hangover. For a time, ether was actually consumed in place of alcohol, but many accidental fires occurred when drinkers sipped on their ether cocktails with a cigarette in hand.

It was not until the nineteenth century that ether caught on as an inhalant. So-called "ether frolics," or parties, became quite popular in the 1820s. The ether high was often compared to a spiritual experience. In fact, the term *ethereal* refers to the heavens or regions beyond the bounds of Earth.

Dr. William T. G. Morton first administered ether as a general anesthetic on October 16, 1846, at Massachusetts General Hospital. That day has since become known as "Ether Day."

Chloroform is a toxic (poisonous) liquid with a chemical formula of $CHCl_3$. This colorless anesthetic, discovered in 1833, is volatile, meaning it easily converts to a vapor. It is no longer used as a general anesthetic because of its dangerous side effects, which include serious damage to the liver.

Chloroform is an age-old tool of the trade among villains in films and television shows. In typical "bad-guy" style, a villain douses a cloth with chloroform and then approaches an unsuspecting victim from behind, placing the chloroform-soaked cloth over the person's nose and mouth. When inhaled, the fumes from the cloth quickly knock out the victim, leaving him or her defenseless.

in the United States is intended for medical and dental applications. Another 5 to 8 percent is used in the food industry. Other legitimate uses for nitrous oxide include the manufacture of airbags, semiconductors, and fuels that boost horsepower in race car engines.

However, the laughing gas parties and public demonstrations of the early 1800s evolved into a serious problem of abuse that has persisted into the twenty-first century. The gas is often sold at dance clubs and raves in balloons. Whipped cream cartridges, nicknamed "whippets," also contain nitrous oxide. These cartridges are sold through restaurant supply companies but are frequently purchased for illegal use.

What Is It Made Of?

Nitrous oxide is a compound made from nitrogen and oxygen. Its chemical formula is N_2O. The gas itself is clear and colorless, with a slightly sweet odor and taste. Nitrous oxide should not be confused with the potentially toxic gas known as nitric oxide (NO). Nitric oxide is found in the atmosphere as an air pollutant. It is also found in very small amounts in the human body, where it helps to move oxygen to the tissues and transmit nerve impulses.

Nitrous oxide is best described as a liquefied gas. It is SYNTHESIZED from a compound found in fertilizers and explosives. This compound, ammonium nitrate (NH_4NO_3), forms steam and nitrous oxide when heated. The nitrous oxide is then processed and turned into a liquid form for storage in tanks, cylinders, or cartridges.

Pure nitrous oxide is deadly. The gas must be mixed with oxygen to be used safely as an anesthetic.

How Is It Taken?

N_2O is used as an AEROSOL propellant in cans of whipped cream and some other food and beverage products. These products are a primary source of nitrous oxide for some abusers.

Depending on its intended use, nitrous oxide can be purchased in varying "grades," or degrees of purity. A food-grade version of the gas is sold to restaurants and caterers in small, bullet-shaped, metal cartridges. These cartridges are perfectly legal for use in the food preparation industry. Nitrous abusers refer to them as "whippets." One whippet delivers enough nitrous oxide to produce a three- to five-minute high. To release the nitrous oxide from a whippet, the high-pressure seal on the canister is pierced with a device called a "cracker." The resulting hole then emits a stream of nitrous oxide gas, which users inhale directly or use to inflate a balloon. Mishandling the cracker or piercing the wrong part of the canister can result in explosions and serious injuries.

Dealers often sell nitrous oxide to users at concerts, clubs, and raves. Instead of using small food-grade canisters, however, they use huge medical-grade nitrous tanks to dispense the gas into balloons. (Medical grade nitrous oxide is considered a prescription drug. These tanks can only be purchased legally by qualified medical personnel.) Nitrous-filled balloons sell for $3 to $5 apiece. One large cylinder of nitrous oxide can fill enough balloons to generate $20,000 to $30,000 in sales.

Sometimes, users fill plastic bags with nitrous oxide gas and then place the bags over their mouths or heads. This method of use carries

synthesized: made in a laboratory

aerosol: a gas used to propel, or shoot out, liquid substances from a pressurized can

Scooby and Shaggy Rile Viewers

Nitrous oxide abuse became a hot topic in 2004, when recreational use of the gas showed up in a kids' film. In a one-minute-long scene from the PG-rated Warner Bros. movie *Scooby-Doo 2: Monsters Unleashed,* one of the main characters, Shaggy, sniffs nitrous oxide from a whipped cream can and jokes about it. Seeing Shaggy do whippets is "supposed to make kids laugh," wrote Sue Marquette Poremba on the *Preteenagers Today* Web site. "It's supposed to be harmless fun. . . . That's the problem."

The scene in question begins with Shaggy and Scooby going to the kitchen. Shaggy opens the refrigerator and takes out a can of whipped cream. He shakes it up, sprays some cream into Scooby's mouth, and smiles broadly while Scooby's mouth fills up with the cream. Shaggy then takes a "hit" off the whipped cream canister. He breathes in the nitrous oxide without dispensing any cream, then hiccups. Shaggy then acts drunk and silly, saying that he needs to go outside to get some fresh air.

Concerned parents contacted the National Inhalation Prevention Coalition (NIPC) about the Scooby-Doo whippet spoof. Many were upset and believed that the film company was being insensitive to people who had lost loved ones due to inhalant abuse. One parent was especially concerned that the joke might go right over some adults' heads, yet lead children to copy the behavior. Harvey Weiss, the NIPC's executive director, brought attention to the issue in an "NIPC Inhalant Update Alert." Weiss urged Americans to view the scene from the film as a wakeup call, stating: "Our efforts should be to advance people's understanding about the dangers of inhalant use so they are recognized as a broad public health issue."

a particularly high risk for serious injury and possible death. The user can easily lose consciousness and SUFFOCATE on the bag. Suffocation can also occur when nitrous oxide is consumed in large quantities in poorly ventilated spaces, such as closed-up cars or closets.

Are There Any Medical Reasons for Taking This Substance?

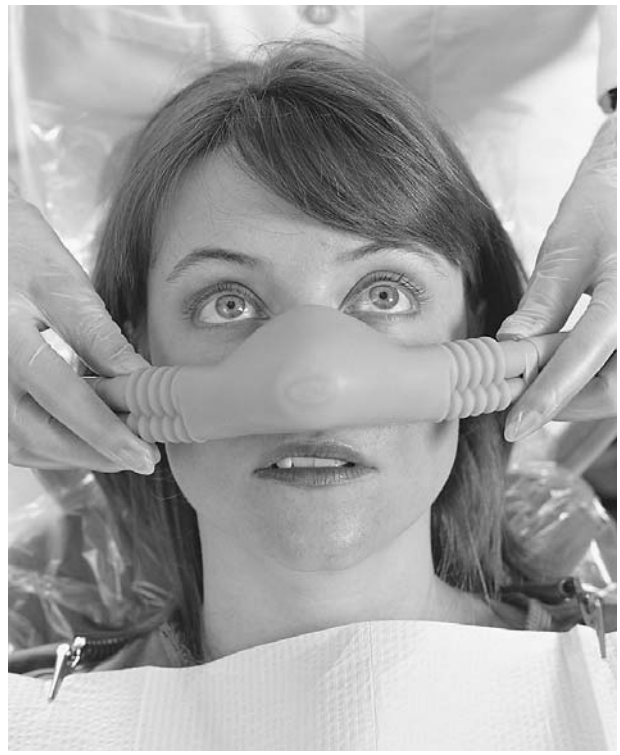
As an anesthetic, nitrous oxide has many legitimate uses. Its ability to reduce anxiety, restlessness, and fear makes it especially useful in the field of dentistry. Adults and children over the age of six have been shown to experience less discomfort and mental distress when given nitrous oxide during short but painful medical or dental procedures.

American obstetricians—physicians specializing in the birthing process—used nitrous oxide as a common pain management tool for women in labor until the early 1970s. By the early twenty-first century, however, the anesthetic had been replaced by newer drugs in the

suffocate: unable to breathe; death caused by a blockage of air to the lungs

United States. However, a half-and-half mixture of nitrous oxide and oxygen was still being used in the United Kingdom to ease the pain of childbirth.

In a 2005 article for *The Age,* Julie Robotham reported on a group of Australian doctors who believed that nitrous oxide should no longer be used as a base for general anesthetics. According to an international study involving more than 2,000 patients, the use of nitrous oxide "doubles the rate of serious vomiting and PNEUMONIA after surgery," explained Robotham. Both of these side effects can result in a patient's death.



As an anesthetic, nitrous oxide has many legitimate uses. In dentistry, it is used to calm patients and lower their anxiety. © *Royalty-Free/Corbis.*

Usage Trends

Nitrous oxide is among the substances of abuse categorized as inhalants. It gained popularity on the dance club circuit because of its supposed APHRODISIAC effects. It is also preferred over other inhalants such as spray paints, shoe polish, markers, and glue because it does not leave stains on skin and clothes.

Food-grade nitrous oxide chargers, better known as "whippets," are available by the box or the case and are sold on the Internet. David Holthouse commented in a *Phoenix New Times* article, "The cardboard boxes [of whipped cream chargers] are decorated with images of fancy desserts and fresh berries, next to warnings not to . . . directly inhale the contents." Whippets were blamed for the death of a twenty-year-old Virginia Polytechnic Institute student in 1999. The student suffocated after inhaling nitrous oxide from whipped cream cartridges he had purchased through an online merchant.

Patterns of Inhalant Abuse

The *Office of National Drug Control Policy (ONDCP)* Web site notes in its "Inhalants: Drug Facts" publication that "typically, first use of inhalants occurs between late childhood and early adolescence." According to the "2003 National Survey on Drug Use and Health (NSDUH)"—the latest survey data available in 2005—more youths age twelve and thirteen used inhalants than marijuana between 2002 and 2003. (An entry on marijuana is available in this encyclopedia.)

pneumonia: a disease of the lung, usually brought on by infection, that causes inflammation of the lung tissue, fluid buildup inside the lungs, lowered oxygen levels in the blood, and difficulty breathing

aphrodisiac: pronounced aff-roh-DEE-zee-ack; a drug or other substance that excites or increases sexual desire

Dental Highs

In an article posted on the *American Dental Association (ADA)* Web site titled "Escaping Addiction: The Door to Freedom," Dr. Thomas L. Haynes discusses the topic of addiction among dentists. "The access to large amounts of nitrous oxide," noted Haynes, along with the stress and isolation of the profession, increases the risk of abuse. "Many a dentist has been found lifeless in the office," he continued, "the N_2O mask still strapped to the face."

But general statistics on the broad category of inhalant abuse do not necessarily reflect the rate of nitrous oxide abuse. The 2003 NSDUH reports that less than one third of 1 percent of U.S. twelve and thirteen year olds reported using nitrous oxide as a recreational drug in their lifetimes. However, the rate of glue and/or shoe polish inhalation among youths in the same age group was nearly fifteen times higher than that, at about 4.3 percent.

Heavy nitrous abusers tend to be eighteen years of age or older. This may be due to N_2O's growing status as a club drug. According to NIDA, nitrous oxide use occurs frequently at raves, where it is often mixed with other club drugs such as ketamine, ecstasy (MDMA), GHB, and LSD (lysergic acid diethylamide). (Separate entries on each of these drugs are available in this encyclopedia.) By the early 2000s, nitrous oxide had gained popularity as a drug that enhanced sexual pleasure. It was even featured in a 2004 episode of the television series *CSI: Miami* as the cause of death in an otherwise healthy young woman.

Abuse in the Medical and Dental Fields

There have also been cases of nitrous oxide abuse among healthcare professionals. Dentists and ANESTHESIOLOGISTS with easy access to the drug seem to be at a higher risk than the general public of developing nitrous-related dependence problems. Dependence is the belief that a person needs to take a certain substance in order to function.

Substance abuse is also especially high among healthcare professionals who administer anesthesia in a hospital setting. According to the American Association of Nurse Anesthetists (AANA), about 15 percent of anesthesia providers are substance abusers. "Nurse anesthetists are dying . . . from accidental overdose or from suicide," reported Carlos "Rusty" Ratliff in "Anesthetists in Recovery: Chemical Dependency in the Profession." Like dentists, certified registered nurse anesthetists have large supplies of nitrous oxide readily available to them. Consequently, nitrous oxide is one of the drugs these professionals may end up abusing.

"Chemical Dependence in Anesthesiologists," a document developed by the ASA TaskForce on Chemical Dependence, addresses the problem of drug abuse among anesthesiologists. Although addicted medical doctors typically become hooked on

anesthesiologists: medical doctors trained to use medications to sedate a surgery patient

OPIOIDS such as fentanyl, nitrous oxide was mentioned by the ASA as another potential drug of abuse. (An entry on fentanyl is available in this encyclopedia.)

Calling Attention to a Serious Problem

NIDA began an intensive campaign against inhalant abuse in 2005. This action was prompted by the results of the 2004 Monitoring the Future (MTF) study, an annual survey of drug use among young people in the United States. The MTF survey is conducted by the University of Michigan with funding from NIDA. Findings for 2002 through 2004 indicate that inhalant abuse among eighth-grade students was on the rise during that period. As of 2004, approximately 17.3 percent of eighth graders in the United States had abused an inhalant at some time in their lives. That represents an increase over the 2003 figure of 15.8 percent. This "upward trend in use," according to the MTF report, was accompanied by a "decline among eighth graders in the perceived risk of using inhalants."

Effects on the Body

Nitrous oxide acts as a DEPRESSANT on the human body. Once inhaled, the gas enters the bloodstream through the lungs. The blood then carries it throughout the rest of the body. It reaches the brain quickly, affecting vital functions such as breathing and heart rate. It also alters other mechanisms of the nervous system, such as the activity of NEUROTRANSMITTERS that regulate thought processes, behavior, and emotions.

A single balloon filled with nitrous oxide can bring on a short-lived but intense high. The overall effects of the gas depend largely on the user's frame of mind. It can further stimulate an already excited user, or it can sedate a more relaxed user. Symptoms of a nitrous oxide high include giddiness, a loss of balance, slurred speech, twitching, mental confusion, and an inability to feel pain. After the effects of the gas wear off, users may experience side effects such as nausea (upset stomach), restlessness, tiredness, difficulty concentrating, and the appearance of spots before their eyes.

opioids: substances created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine

depressant: a substance that slows down the activity of an organism or one of its parts

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

How Nitrous Oxide Works

Nitrous oxide alters the user's perception of time. Because the effects of a single "hit" last only three minutes or so, some abusers inhale the gas many times over the course of a few hours. Such attempts to maintain a nitrous high can be fatal, since continued

Dealers often sell nitrous oxide to users at concerts, clubs, and raves. Instead of using small food-grade canisters, however, they use huge medical-grade nitrous tanks to dispense the gas into balloons. Users then inhale the gas from the balloons. *Photo by Tim Sloan/AFP/Getty Images.*

breathing of the gas causes RESPIRATORY DEPRESSION. In addition, the possibility of brain damage increases when the brain does not receive sufficient amounts of oxygen.

Abusers also run the risk of vomiting and losing consciousness while intoxicated by nitrous oxide. Unconscious individuals are not able to clear their own airways of vomit. This increases the possibility of death by choking. Even if vomiting does not occur, an individual who loses consciousness from an overdose of nitrous oxide is likely to stop breathing. In addition, pure nitrous oxide takes the place of oxygen in the lungs. This process could result in asphyxiation—death or unconsciousness caused by the inability to breathe—unless the unconscious person is quickly moved to an area with fresh air. According to the CGA, death frequently occurs when abusers of the gas "attempt to achieve a higher state of euphoria [happiness and well-being]" by breathing "pure N_2O in a confined space—in a small room, inside an automobile or other vehicle cab, or by placing their head inside a plastic bag."

respiratory depression: a slowed breathing rate; severe cases can cause a person to slip into a coma or even stop breathing entirely

Death by overdose of nitrous oxide is very difficult to recognize. It leaves no telltale signs for a coroner or medical examiner to

identify. Under normal circumstances, blood carries oxygen to the tissues and organs of the body. But nitrous oxide pushes oxygen out of the blood. Without a sufficient supply of oxygen in the bloodstream, the tissues and organs of the body cannot function properly. Damage to the brain and other organs may result. Long-term abuse of nitrous oxide can also interfere with the production of blood cells in the BONE MARROW.

Additional Dangers

As nitrous oxide takes the place of oxygen in the lungs, a deficiency in vitamin B_{12} may result. This sparks a series of negative effects within the body. The user's red blood cell count decreases, leading to anemia (uh-NEE-mee-uh), a condition in which the blood is lacking in oxygen-carrying red blood cells. Nerve damage may also occur, leading to difficulty walking as well as tingling, numbness, or pain in the arms and legs. These side effects are usually reversible if nitrous use is stopped.

People who have a genetic disorder called phenylketonuria (fenn-uhl-kee-tuh-NORR-ee-yuh) should be particularly careful about nitrous oxide use. Phenylketonuria (PKU) is an inherited disorder that interferes with the breakdown of a certain protein called phenylalanine (fenn-uhl-AL-uh-neen). The protein is found in milk, eggs, and other foods. Individuals with PKU require a special diet that can cause a vitamin B_{12} deficiency. Because nitrous oxide can remove even more B_{12} from the bloodstream, the possibility of nerve and brain damage is especially high under these circumstances.

Nitrous users who inhale the gas while standing risk falling down and possibly breaking a limb or suffering a head injury. In addition, injury to the face, mouth, throat, and hands may occur because of the extremely low temperature of nitrous oxide. In an article for the *Phoenix New Times,* David Holthouse warned, "When N_20 is released from a whippit, it's cold enough to flash-freeze spittle." Sometimes, users who get hurt while high on nitrous oxide are completely unaware of their injuries because of the numbing effect of the gas.

Improper handling of any compressed gas tank or cylinder can also cause injuries. Attempting to inhale a gas like nitrous oxide directly from a large gas cylinder can damage the lungs beyond repair. The force of the gas entering the lungs is so powerful that the air sacs in the lungs actually burst. Victims die in a matter of seconds due to internal bleeding. Inhaling any compressed gas is especially risky for people with ear problems, as the pressure of the gas may damage the inner ear.

bone marrow: soft tissue in the center of bones where blood cell formation occurs

N_2O Plus Pre-Existing Conditions Can Equal Death

Individuals with certain medical conditions may also suffer severe and potentially fatal side effects from the use of nitrous oxide. For example, anyone with a history of PULMONARY HYPERTENSION, asthma, airway obstruction, head injury, or chest infection should not take nitrous oxide under any circumstances.

Nitrous oxide should not be given to pregnant women in the early or middle stages of pregnancy. The gas can interfere with the baby's development and may cause the mother to lose the baby before it is born. Heavy, ongoing nitrous oxide exposure during pregnancy has been shown to cause birth defects in animals.

Reactions with Other Drugs or Substances

Nitrous oxide produces effects on the body similar to those of alcohol, which is a depressant. When used along with other depressants, nitrous oxide can slow the user's breathing rate to a dangerously low—and sometimes even deadly—level.

The increasing use of nitrous oxide in combination with other club drugs poses serious risks to users. In the event of a multiple-drug overdose, emergency medical personnel may not be able to identify the mix of drugs the patient has consumed. This further complicates emergency treatment and could delay lifesaving measures.

Treatment for Habitual Users

Abuse of nitrous oxide alone has not been shown to cause withdrawal symptoms—the physiological effects of terminating use of an addicting drug. Because of this, it is not considered an addictive or habit-forming substance. At the very least, however, the gas does appear to cause PSYCHOLOGICAL DEPENDENCY. "Supposedly, nitrous is nonaddictive," wrote Holthouse, but "habitual users have a [tendency] to sit around doing whippit after whippit until all the whippits are gone, then go buy more whippits."

Nitrous oxide is eliminated from the body rapidly. However, if the patient has been abusing other drugs as well, the detoxification period, in which one rids the body of the drugs' toxins, could take up to forty days, depending on the chemicals involved. After detox, the primary goal of treatment is avoiding future drug use.

pulmonary hypertension: a life-threatening condition of continuous high blood pressure in the blood vessels that supply the lungs

psychological dependency: the belief that a person needs to take a certain substance in order to function

Substance abusers need to identify the underlying causes of their drug use. To curb drug abuse, they may need to alter their lifestyles substantially. This may include not going to the same clubs or hanging out with the same circle of friends if they are continuing

to use drugs illegally. It may mean finding a new supportive, drug-free network of friends. Nitrous oxide abusers, like other substance abusers, typically benefit from individual therapy that focuses on changing unhealthy patterns of behavior and developing better coping skills. Group therapy and self-help organizations can also assist in the recovery process. Discussing addiction in a group setting can help drug abusers gain insight into their own thoughts and behaviors through the eyes and experiences of others.

Consequences

There are few studies that focus specifically on the illicit use of nitrous oxide. Rather, the abuse of this gas is usually lumped into the general category of inhalant use. According to the 2003 NSDUH report, young adolescents who use inhalants tend to have more academic, social, and behavioral problems than those who do not. High school dropout rates and involvement in serious fights, thefts, and illicit drug use were especially high among inhalant abusers. These statistics reflect patterns seen among users of all inhalants, not just nitrous oxide.

Specifically, nitrous oxide abuse may cause mood swings and personality changes in heavy users. Users report that the gas decreases their INHIBITIONS. People with lowered inhibitions tend to take more chances and engage in riskier behavior than they would if they were not high. Nitrous oxide is also viewed as an aphrodisiac (sex enhancer) in some social circles. Some users might engage in unsafe sex, thereby increasing their risk for contracting sexually transmitted diseases, including HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome).

The Law

Nitrous oxide is regulated by the U.S. Food and Drug Administration (FDA) as a food-grade propellant, medical-grade gas, and prescription drug. In 1971, the state of Maryland began controlling its sale and distribution. In the 1990s, in an attempt to curb the growing abuse of the gas, a number of other states followed suit. Connecticut, Arizona, Texas, Michigan, and Wisconsin were among the states that passed laws placing strong safeguards and stricter penalties on the illicit use of nitrous oxide.

Selling nitrous oxide for use as a drug carries stiff penalties. Distributors face up to 15 years in prison and fines of up to $1.5 million. In 2001, an Arizona man was sentenced to a 15-month jail

inhibitions: inner thoughts that keep people from engaging in certain activities

term and fined $40,000 for a nitrous oxide sale that resulted in the death of a Virginia college student.

Until federal legislation is passed to prohibit the possession, inhalation, and distribution of nitrous oxide for purposes of intoxication, the CGA has proposed a list of recommendations regarding its use. The main goal of these recommendations is to keep the gas from falling into the wrong hands. Among the guidelines proposed by the CGA are:

- restricting the sale of nitrous oxide to those who can prove they have a "legitimate use" for it
- encouraging legitimate users to store containers of the gas and other equipment in a secured area
- requiring medical and restaurant personnel to keep a careful count of used and unused cylinders
- reporting any thefts to the police immediately.

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See also: Amyl Nitrite; Inhalants

Opium

Official Drug Name: Opium; laudanum (tincture with alcohol); paregoric (tincture with camphor); Dover's powder.
Also Known As: Ah-pen-yen, Aunti, Aunti Emma, big O, black, black pill, black stuff, black hash (mixture with hashish), black Russian, block, Buddha (mixture with marijuana), chandoo/chandu, Chinese molasses, Chinese tobacco, dopium, Dover's deck, dream gun, dream stick, dreams, easing powder, fi-do-nie, gee, God's medicine, gondola, goric, great tobacco, gum, guma, hop/hops, joy plant, midnight oil, O, O.P., ope, pen yan, pin gon, pin yen, pox, skee, toxy, toys, when-shee, ze, zero
Drug Classifications: Schedule II, opiate

What Kind of Drug Is It?

Opium is the sticky white sap that flows from ripening seed pods of the *Papaver somniferum* plant. The plant's Latin name means "poppy" (*Papaver*) "that induces sleep" (*somniferum*). The word *opium* comes from the Greek word for *sap.* For more than 6,000 years, humans have CULTIVATED opium poppies and have used opium to relieve pain and to induce euphoria, a heightened sense of happiness and well-being. As of 2005, opium poppy plants are grown legally to supply painkilling, cough suppressing, and anti-diarrheal medicines to people all over the world. Illegally, the plants are grown to produce cooked opium, morphine, and heroin—highly addictive substances that are abused for their mind-altering effects.

All of the heroin, morphine, codeine, and THEBAINE used in the world begins as opium. Raw opium, removed from the plant, is first refined by cooking. It is then chemically altered in various ways to produce the other products. In its crudest form, opium is smoked or eaten by people to get high. In fact, farmers who grow it illegally sometimes become high just by collecting the sap. More commonly, though, raw opium is passed through a series of chemical processes that isolate its morphine. The morphine is the plant's most psychoactive, or mind-altering, ingredient. Then the morphine is further refined into heroin. (Entries for codeine, heroin, and morphine are available in this encyclopedia.)

Morphine, codeine, and heroin are relatively recent alterations of basic opium. For much of its long history, opium was the primary drug of use and abuse. Its use has been recorded in many cultures in Europe, Asia, Africa, and the United States. Its power and strength were such that Italian explorer Christopher Columbus (1451–1506) was instructed to bring back opium as he set off on his first voyage to the New World. When Europeans came to the Americas, they brought poppy seeds with them and began growing opium in the Western Hemisphere. More than 150 years ago, the drug caused a major war between Great Britain and China. In the early twenty-first century, the United States—and the United Nations—spent many millions of dollars trying to destroy illicit, or illegal, poppy fields.

cultivated: planted and tended with the intention of harvesting

thebaine: pronounced thee-BAIN; one of the active alkaloids in opium, used to create synthetic painkillers

Afghanistan produces almost 90 percent of the world's illegal opium. Most of it is refined into heroin and sent to Europe, Russia, and the United States.

Overview

Archaeologists have found evidence of opium poppy cultivation dating back more than 6,000 years. As early as 4,000 BCE, the plant was grown in the Fertile Crescent, an area then known as Mesopotamia. The region is now the countries of Iran and Iraq. Poppy seeds and seed pods have been found in Stone Age deposits in Switzerland. The ancient Sumerians called the plant *hul gil,* or "joy plant." A document that survives from the Egyptian city of Thebes, written in 1552 BCE, lists more than 700 medicinal uses for opium.

It is likely that opium has always been grown for its mind-altering properties, but it is important to note that the plant provides food as well. The small black poppy seeds on the top of bagels and cakes come from the plant, and poppy seed oil is also used in cooking. In his book *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* Paul M. Gahlinger noted that eating poppy seeds can result in positive drug tests for morphine in the

urine. However, the seeds do not contain enough opium to produce a high, no matter how many one consumes.

Known and Used Worldwide

At some point deep in human history, farmers learned to cut the ripening poppy pods. This allows the sap to flow out and harden into a dark-colored gum. That gum is raw opium.

Opium use was widespread in ancient Greece and Rome. In his 800 BCE poem *The Odyssey,* Homer described a medicine called *nepenthe* that could erase pain as well as the sorrow of grief. These ancient peoples credited certain gods with showing humankind the wonders of opium. The Greek god Morpheus, god of dreams, is often depicted in statues sleeping among poppy flowers.

Ancient cultures also knew of the drug's dangers. The Romans used opium as a poison, recognizing that an overdose could cause a victim to stop breathing. Legend says that the famous General Hannibal (247 BCE–c. 183 BCE) used opium to commit suicide.

When trade routes were established between the Middle East and Asia in the fifth century CE, opium made its way into the Far East. The cultures there began to grow it for its painkilling effects, and the plant thrived in many areas of Western Asia. Europeans knew opium from the cultural influences of the Greeks and Romans. Christopher Columbus was instructed to find new sources of the plant when he set sail in 1492. A more widespread use of the drug in Europe dates from 1524, when Swiss doctor Paracelsus (1493–1541) mixed opium with alcohol and named the resulting product *laudanum,* Latin for "to be praised." One of opium's drawbacks as a medicine was its bitter, unpleasant taste. Mixing the drug with wine, spices, and sweeteners made its taste more tolerable, which meant more people started using it. It remained in the mainstream until the twentieth century.

Opium Pipes and Patent Medicines

Columbus did not discover opium in the Americas. However, he did learn about tobacco and the pipes used to smoke it from the native peoples he met. He returned to Europe with both the pipes and the tobacco. Within 100 years, Europeans had taken to both. It is likely that opium had been smoked in the Eastern Hemisphere prior to the introduction of the Native American-style pipe.

However, the long stem typical of American pipes made smoking opium a more pleasant experience by dulling the harshness of the

A collection of opium pipes is displayed at an antiques store in Vietnam. *STR/AFP/Getty Images.*

smoke. Users of smoked opium quickly learned that this method of taking the drug heightened the euphoria—and hastened DEPENDENCE.

Opium addiction developed in various ways on different continents. In Europe and America, people ate opium or became dependent on patent medicines that mixed opium with alcohol, sugary syrups, or camphor (known as paregoric today). Patent medicines, including tonics and elixirs, contained "secret" ingredients and promised to cure various diseases. They were also called "cure all" medicines, but most failed to deliver the promised cure.

A Different Type of Drug War

dependence: a physical need for a drug in order to ward off withdrawal symptoms

In the Far East, particularly China, the smoking of refined opium became a public health problem as early as 1746. By the 1830s, crime had become widespread in the nation as its men, in particular, sought out the drug. Families starved when their

When China refused to allow opium imports, the British declared war and sailed their military fleet to Canton in the early 1840s. *© Bettmann/Corbis.*

providers fell victim to addiction. In response, the Chinese government banned the use and importation of opium.

This ban angered the British, who believed they already had a trade imbalance with China. The Chinese exported much tea to Great Britain and America, so the British wanted China to buy their opium in return. When China refused to allow opium imports, the British declared war and sailed their military fleet to Canton, arriving in June of 1840.

Thus began the first of two "Opium Wars," known in Great Britain as "The War for Free Trade." The conflicts occurred from 1839 through 1842 and again from 1856 to 1860. When the wars ended, the combination of peasant rebellion and British military might had brought China to its knees.

Gahlinger estimates that by 1900, a quarter of the Chinese population—and half of all its adult males—were addicted to smoked opium. Those who did not fall victim to the drug became

bitter toward Western capitalism and its emphasis on private ownership, free trade, and competition. The Chinese believed the West had encouraged the opium epidemic. Their bitterness played no small role in China's move toward communism in the twentieth century. In the communist system of government, the means of production are owned by the state.

Opium Dens

Beginning in the mid-nineteenth century, Chinese laborers came to the United States to help build railroads in the Western states. Some of these immigrants brought their opium habits with them. Opium "dens" began to spring up around the country, especially in the big cities. Opium dens were usually darkly lit establishments where people went to use the drug. Many dens were set up in the Chinatown section of major cities, but were visited by people of various ethnicities. By the 1890s, the practice of smoking opium in dens had spread, especially among younger American men.

Refinements in the pipe led to the practice of reclining on boards or sofas on one hip while smoking or experiencing the effects of the drug. This practice gave birth to the phrase "on the hip," meaning someone with an opium habit. The phrase was shortened in the twentieth century to "hip," and the term is still used in 2005 to describe someone who is adventurous and perhaps a bit too willing to break the rules. The word "hippie" also has its origin from the way opium was smoked in dens.

Addiction on the Rise in the 1800s and 1900s

As the twentieth century dawned in the United States, civic leaders came to realize that the country had its own drug problem. By one estimate, New York City had more than 300 opium dens. Others pointed to the overuse of then-legal medicines that contained variations of opium—either heroin, codeine, or morphine. It was actually possible to buy a "soothing syrup" for fussy infants that contained OPIATES. Children also became addicted to the medicines and sometimes died of an overdose.

The Western world was not ignorant of the dangers posed by opium. As early as 1821, British writer Thomas de Quincey (1785–1859) described the horrors of addiction and withdrawal in his book *Confessions of an English Opium Eater.* The isolation of morphine from its parent substance led to widespread addiction in the soldiers who returned from the American Civil War (1861–1865). Many soldiers were given morphine to ease injuries they received in battle. Later, the introduction of heroin as an

opiates: drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

Customers of an opium den in New York City are shown lying on bunks and beds as they consume the drug through pipes in the early 1900s. Many opium dens operated in the Chinatown section of large cities in the United States. In fact, in 1896, more than 300 opium dens existed in New York City alone.

over-the-counter remedy in 1898 made a bad situation worse. People addicted to opium and morphine were encouraged to take heroin as a "cure"—and found themselves more deeply addicted than ever. By 1900, reformers such as Dr. Hamilton Wright were calling for an international agreement on regulation of the NARCOTICS trade.

The first in a series of international conventions on the then-legal trade of opium occurred February 1, 1909, in Shanghai, China. The thirteen countries that attended the International Opium Commission could not agree on how best to regulate the growth, sale, and distribution of opium and its by-products. A second conference, held on January 23, 1912, in The Hague in the Netherlands, was only

narcotics: painkillers that may become habit-forming; in a broader sense, any illegally purchased drugs

A Word about Opioids

Semisynthetic and synthetic narcotics are produced that have opiate-like effects. These narcotics are collectively known as opioids. They include methadone, the designer drug fentanyl, and a number of commonly prescribed medicines such as Darvon, Demerol, Dilaudid, Orlaam, OxyContin, Percodan, Talwin, and Vicodin. Darvocet is an opioid that also contains acetaminophen.

slightly more successful. Participating countries signed an agreement requiring each country to "try to" control the trade of narcotics, including not only opium, but also cocaine. (An entry for cocaine is available in this encyclopedia.)

The United States Takes Further Action

Within its own borders, the United States had already taken steps to stop opium smoking. The Smoking Opium Exclusion Act of 1909 made the importation of opium illegal, except for legal pharmaceutical use. Five years later, the Harrison Narcotics Act of 1914 put an end to over-the-counter patent ("cure-all") medicines containing opiates and made it more difficult to obtain substances such as heroin and morphine from doctors. These two laws, combined with an atmosphere of discrimination against Asian Americans, effectively curbed the use of smoked opium in dens.

In 1970 the U.S. Controlled Substances Act named opium a Schedule II drug. This means that it has some valid medical uses but also has the potential for misuse and addiction. In Europe and the United States, the vast majority of opium appeared on the street in its alternate forms—morphine, codeine, or heroin. These other opium-based products are all still abused in America today, while pure opium abuse only occurs in some minority populations of Southeast Asian origin. The Drug Abuse Warning Network (DAWN) recorded more than 82,000 emergency room visits due to drug abuse in 2000—only 167 of these were for opium or opium combined with other drugs. There was no mention of opium-related emergency department visits in the DAWN 2003 interim report, which featured the latest information available as of August 2005. Opium use has largely been replaced by heroin use in the United States. When opium is abused, it is usually mixed with other drugs.

What Is It Made Of?

Opium contains as many as fifty substances called ALKALOIDS—naturally occurring chemicals with mind-altering characteristics. The main derivatives of opium are morphine, codeine, and thebaine. Morphine and codeine are used as painkillers, cough

alkaloids: nitrogen-containing substances found in plants

In the 1939 movie *The Wizard of Oz,* the Wicked Witch of the West uses poppies to put Dorothy, Toto, and the Cowardly Lion to sleep. The Good Witch helps the group awaken so that they can finally reach their destination, the Emerald City. *The Kobal Collection/MGM.*

suppressants, and, in some cases, as cures for diarrhea. Thebaine is added to synthetic (laboratory-made) painkillers called OPIOIDS.

Opium comes from a flowering plant that must be started from seed each growing season. It takes about 120 days for the plant to grow, flower, and produce the seeds needed for next year's crop. When it flowers, the opium poppy plant is beautiful. It is like the field of poppies in the film *The Wizard of Oz* that puts Dorothy, Toto, and the Cowardly Lion to sleep. Opium poppy flowers range from white to pink to deeper shades of red and purple. The plant does best in soil that contains some sand and loam, and it can thrive in highland meadows as well as warm, dry climates.

opioids: substances created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine

The plant flowers after ninety days and stands between three- and five-feet tall. When the flower petals fall off the pods, farmers begin the opium harvest. Where the plant is grown legally, machines are used to grind up whole fields into poppy straw. It is from this straw that legal morphine, codeine, and thebaine are produced. More than 1,000 tons of morphine are produced legally from opium every year, from poppies grown on government-regulated farms in India, Turkey, and the Australian province of Tasmania.

Illegal Farming

In the illegal poppy fields, opium is collected by hand. Farmers use special knives to slice the pods that still remain on the plant. If done carefully, the slicing forces the pods to leak a white fluid for several days. Overnight, the fluid thickens and turns into a dark-colored paste. In the morning the farmer passes through the field and collects the paste from each pod. A few of the largest pods are left to ripen without being sliced. From these the farmers will collect the seeds for the next year's harvest.

Illegal hand-collected opium yields about seven to thirteen pounds per acre of poppies. Once the fluid has been harvested from the plant, it is allowed to dry in the sun until it becomes a thick, dark-brown, sticky gum. This is raw opium. Even at this stage people have smoked or eaten it to get high. Usually, however, the raw opium is boiled with water and strained through cloth to remove plant debris and further concentrate the psychoactive substances. This "cooked" opium will not spoil, even if kept for years.

The vast majority of illegal opium is then converted into morphine, which is then turned into heroin. These processes occur in mobile laboratories in the countries in which the poppies are grown. These countries include Burma, Laos, Vietnam, Thailand, Pakistan, Afghanistan, Colombia, Mexico, and Lebanon. In these nations, political corruption and police bribes allow farmers and chemists to work with little regard for the law.

Illegal poppy farming can be bad for the environment. Farmers use slash-and-burn techniques to clear fields of native wild plants in order to grow the crop. They may fertilize poppies with human waste, chicken droppings, or other fertilizers that leave toxins in the soil. The techniques used to refine opium into morphine and heroin also produce toxic chemical waste that is dumped into waterways or left in empty fields. Law enforcement efforts to curb poppy production have included the spraying of fields with plant-killers, including Agent Orange, a poisonous substance linked to human illness.

Opium is the sticky white sap that flows from ripening seed pods of the opium poppy plant. Farmers cut the pod to let the opium bleed from the plant, then return a day later to collect the sap. *Photo by Yoray Liberman/ Getty Images.*

How Is It Taken?

When pure opium is used as a drug, it is usually smoked, sometimes in combination with tobacco. It is also eaten. More often, opium is collected and refined into morphine and heroin, because these drugs act on the brain more quickly, and they are easier to inject than opium. Doctors occasionally prescribe paregoric, a liquid combination of opium and camphor, for stomach

Substances Produced from Opium

Raw opium can be separated into three natural substances: morphine, codeine, and thebaine. Morphine undergoes further chemical treatment to produce heroin. Codeine is the world's most widely used medicine. Thebaine is one of the ingredients in oxycodone, a painkiller better known as OxyContin.

upset, diarrhea, or irritable bowel syndrome. Paregoric is a liquid that is taken by mouth.

Are There Any Medical Reasons for Taking This Substance?

The medical reasons for taking opium—for pain relief, cough suppression, and diarrhea—are better addressed by more modern medications such as morphine, codeine, and synthetic painkillers. Except for paregoric, which is rarely used, doctors do not prescribe pure opium.

Usage Trends

Although opium is not used as readily in its pure form anymore, its production has not decreased. The fall of the Taliban government in Afghanistan in 2001 enabled farmers in that rugged country to begin cultivating poppy plants again. Under the Taliban, opium production was strictly controlled; some farmers were severely punished for not following the Taliban's rules. The Taliban were forced from power when U.S. and coalition forces invaded Afghanistan after terrorists attacked the United States on September 11, 2001. Terrorists had been allowed to train in Afghanistan.

Once the Taliban fell, opium crops began to thrive again. Increased poppy production throughout Afghanistan, Pakistan, and Southeast Asia in an area known as the GOLDEN TRIANGLE has led to lower prices, higher quality, and larger quantities of heroin in Russia, Europe, and the United States. More farmers also began growing opium poppies in Mexico, Central America, and South America as well, sensing that the market for heroin is rising while the market for cocaine is declining.

Opium use occurs mostly where it is grown, although the farmers that produce it are not eager consumers of their cash crop. Some sources say that up to a quarter of raw opium is used by the people who grow it, their neighbors, and those who process it into morphine and heroin. Other sources say that opium farmers are less likely to abuse the drug than people involved in the purification of opium into morphine and heroin. Sometimes the drug is still used for its medicinal qualities, especially the control of diarrhea and chronic, or long-lasting, pain.

Golden Triangle: the highlands of Southeast Asia, including parts of Burma, Laos, Vietnam, and Thailand, where opium poppies are grown illegally

Effects on the Body

The power of opium's effects depends on how it is delivered into the body. It works fast when smoked, because the opiate chemicals pass into the lungs, where they are quickly absorbed by blood vessels and sent to the brain. Opium's effects occur more slowly when it is eaten or mixed in a liquid, because then the drug has to pass through the stomach and upper intestines, and into the liver before moving on to the brain. The process of digestion weakens the drug as it passes through the various organs before being absorbed by the bloodstream.

An opium high is very similar to a heroin high. The user experiences a rush of pleasure, followed by an extended period of relaxation, freedom from anxiety, and the relief of physical pain. Breathing slows and the pupils of the eyes become like pinpoints. In the brain, opium binds to the receptors that search for pleasure-enhancing ENDORPHINS and painkilling ENKEPHALINS. Because opium floods these receptors, it produces a higher state of pleasure than the body can produce on its own. Opium also inhibits muscle movement in the bowels, leading to constipation, or the inability to have a bowel movement. It works on the part of the brain that controls coughing and—especially when smoked—can dry out the mouth and the mucous membranes in the nose. The effects of a dose of opium last about four hours.

A Hard Cycle to Break

Continued use of opium produces two effects: 1) tolerance, or the need for greater and greater doses of a substance to achieve the same original effect; and 2) dependence, a physical and psychological craving for the drug. When people take higher doses, or take opium more often, they run the risk of overdosing. An overdose can kill because people just stop breathing and quickly die of asphyxiation. (It was this effect that led the ancient Romans to use opium as a poison.) Dependence occurs when the user begins to experience withdrawal symptoms when the drug's effects wear off. These symptoms occur because, in the presence of opium, the brain stops making its own pleasure-enhancing compounds. So, the rest of the body adjusts to the presence of the drug as well.

When the user quits taking opium, the body rebounds with a set of withdrawal symptoms that mimic a bout of the flu. The symptoms include watery eyes, runny nose, sneezing or yawning, muscle pains and involuntary motion, anxiety and agitation, nausea, diarrhea, insomnia, and cold sweats. Some people experience goosebumps,

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

enkephalins: pronounced en-KEFF-uh-linz; naturally occurring brain chemicals that produce drowsiness and dull pain

which is where the term "quitting cold turkey" came into being. These unpleasant symptoms can last from three to five days.

If quitting opiates was as easy as overcoming a bout of the flu, addiction would not be a problem. However, most opium users also suffer an extended period of dysphoria (diss-FOR-ee-yuh), a long-lasting period of anxiety, depression, and lessened enjoyment of life. It is dysphoria that usually leads the opium user back to the drug for relief—and the whole cycle of abuse starts again. Addiction to opium can turn good citizens into criminals as they search for ways to obtain the drug. In the regions of the world where illegal opium is grown, farmers who wish to make an honest living are often bullied into growing poppies by corrupt officials, or forced to grow them out of economic need. Even if they do not use the drug themselves, they are trapped by the environment of crime that opiate addiction creates.

Reactions with Other Drugs or Substances

Opium causes slowed breathing and difficulties with motor coordination. During a high, the user might not move at all, or move more slowly. For this reason, opium should never be used with any other legal or illegal drug that causes SEDATION. A combination of opium and alcohol can lead to fatal breathing problems. Opium should not be used with tranquilizers, antidepressants, sleeping pills, or anti-anxiety medications such as benzodiazepines. Opium should not be used when taking certain prescriptions that affect liver function, including medicines for tuberculosis, such as Rifampin, and medicines for seizures and epilepsy, including Dilantin. Some antibiotics can increase the level of opium in the bloodstream.

Illegal opium combinations include the "Buddha," a mixture of marijuana and opium or heroin, and "black Russian" or "black hash," a mixture of opium and hashish. These mixtures can create high levels of disorientation and paranoia, or a feeling of heightened discomfort. According to the Drug Abuse Warning Network, most emergency room visits related to opiate abuse are overdoses or problems stemming from combining use of an opiate with another substance, such as marijuana, alcohol, or cocaine. Combining drugs of any sort with opium is very dangerous. An overdose of opium can be treated with naloxone (Narcan), a drug that quickly rids the body of any opiates. For the habitual opium user, a dose of Narcan will provoke the entire spectrum of withdrawal symptoms—but it can also save someone who has stopped breathing.

sedation: drowsiness or lowered levels of activity brought on by a drug

Treatment for Habitual Users

Opiate addiction is very hard to treat, and often an abuser will fail to stay clean several times before finding the motivation to stay free of the drug. Symptoms of withdrawal can be kept in check with drugs such as methadone and buprenorphine, administered by a licensed doctor or clinic. The recovering addict should also work with therapists to address underlying psychological issues that might have led to the drug use originally. Self-help groups such as Narcotics Anonymous provide a sympathetic peer group, telephone hotlines, and the support of other recovering users. Most important, the opium user may need to stay away from the people, places, and situations that contributed to the drug abuse in order to avoid temptation.

Raw or cooked opium is rare in the United States. However, the growing supply of heroin and the illegal use of opiate painkillers ensure that drug rehabilitation programs will need to continue to address the health issues associated with the opium poppy.

Afghanistan and Opium Production

The Taliban rulers of Afghanistan imposed severe penalties on anyone caught growing illegal opium poppies. Since the Taliban regime fell in 2001, poppy cultivation in Afghanistan has skyrocketed. According to a 2005 article in the *Christian Science Monitor,* Afghanistan produces almost 90 percent of the world's illegal opium. Most of it is refined into heroin and sent to Europe, Russia, and the United States.

The result? Heroin is cheaper, higher in purity, and easier to obtain than ever before.

The United States and the United Nations are working with the Afghan government to reduce illegal drug trafficking in Afghanistan. International aid workers report that corruption based on poppy production is so widespread that police officers and local officials are often paid more to overlook poppy fields than they can make in legal salaries. Lawmakers who try to curb poppy production run the risk of assassination.

Consequences

Opium production is a problem that wrecks lives in many parts of the world. Farmers in Southeast Asia, Pakistan, and Afghanistan are forced—by economic need or by powerful drug lords—to grow great quantities of illegal poppies. These poppies supply the opium that becomes the heroin that hooks recreational drug users in Europe, Russia, the United States, and just about everywhere else. It is rare to find an American opium user, but in 2003 the National Survey on Drug Use and Health (NSDUH) observed that 119,000 teenagers between the ages of twelve and eighteen reported using heroin at least once. Since heroin is just opium that has been chemically altered to work more quickly and more powerfully, it is safe to say that all the consequences of heroin abuse can be traced to opium abuse.

The consequences of trying to support a drug habit include criminal behavior such as theft, armed robbery, drug dealing, and prostitution. They also include health issues such as the possibility of

Opium Chronology

4000 BCE Opium poppies are cultivated in the Fertile Crescent (now Iran and Iraq) by the ancient cultures of Mesopotamia.

1552 BCE An ancient Egyptian papyrus text from the city of Thebes lists 700 medical uses for opium.

183 BCE Carthaginian General Hannibal uses a fatal dose of opium to commit suicide.

600-900 CE Arabic traders introduce opium to China.

1524 Swiss doctor Paracelsus mixes opium with alcohol and names the product *laudanum*.

1821 Thomas de Quincey (1785–1859) publishes *Confessions of an English Opium Eater*.

1839–1842/1856–1860 Great Britain and China engage in the "Opium Wars" when China tries to forbid opium imports.

1896 More than 300 opium "dens" operate in New York City. Users recline "on the hip" as they smoke the drug through long-stemmed pipes.

1909 The first International Opium Commission is held in Shanghai, China on February 1.

1909 The Smoking Opium Exclusion Act is passed.

1914 The Harrison Narcotics Act is enacted in the United States.

1942 The Opium Poppy Control Act makes it illegal to grow opium poppies in the United States, even as garden flowers.

1970 The Comprehensive Drug Abuse Prevention and Control Act names opium a Schedule II controlled substance, recognizing its uses in pain relief as well as its potential for addiction and abuse.

2005 After the fall of the Taliban government in 2001, opium poppy production begins to soar in Afghanistan, accounting for almost 90 percent of the illegal heroin created worldwide.

contracting human immunodeficiency virus (HIV), the virus that leads to AIDS, or hepatitis viruses from shared needles; malnutrition from a lack of appetite; and loss of quality of life. Addictive opiates tear families apart and deprive people of jobs, college loans, driver's licenses, and social status. Users face criminal records, lengthy DETOXIFICATION programs, and long-lasting cravings for the drug they are trying to kick.

How does opium affect world politics? In December of 2004, Mark Steven Kirk, a Republican congressman from Illinois, returned from Afghanistan to report that notorious terrorist Osama bin Laden, the leader of the al Qaeda terrorist network, has used cash earned from opium production to pay for his personal bodyguards, weapons, and secret hiding places. Al Qaeda has paid Pakistani drug lords to help keep bin Laden hidden from U.S. forces. Afghan drug dealers have also worked with bin Laden to provide shelter on their side of the border. According to Kirk, the purchase of a packet of

detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

heroin in the United States helps America's worst enemies avoid arrest and prosecution half a world away.

The Law

Opium is a Schedule II controlled substance. Its only legal use is in a few rarely used prescription drugs, such as paregoric. Any other possession or sale of opium carries strict penalties that vary from state to state but almost always include heavy fines, permanent criminal records, mandatory detoxification, drug testing, and loss of privileges such as driver's licenses. Second offenses almost always result in lengthy jail sentences. Third offenses can earn someone a lifetime behind bars.

To the dismay of some gardeners, it is also illegal to grow opium poppies in the United States, even in small numbers. A single poppy plant can yield up to 80 milligrams of raw opium. (Other species of poppy remain available to the backyard gardener.) In July of 2004, *UPI NewsTrack* reported that three people were arrested and prosecuted in Pella, Iowa, for growing 22,000 poppy plants among rows of vegetables on a farm. The people were charged with manufacturing a controlled substance, even though the poppies had not yet ripened.

Elsewhere in the world, agents from the United Nations, various European countries, and the United States work with government officials in Afghanistan, Pakistan, and other poppy-producing regions, to kill poppy plants. Poppy reduction programs require the cooperation of governments where the illegal activity takes place. They also must offer some financial alternative to the farmers who earn money from the opium harvest. Many difficult issues must be faced if the notorious opium poppy—the source of so many beneficial medicines—is to be restricted to legal production.

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See also: Cocaine; Codeine; Heroin; Hydromorphone; Marijuana; Methadone; Morphine; Oxycodone

Over-the-Counter Drugs

Official Drug Name:
Anti-allergy drugs/antihistamines/decongestants: brompheniramine maleate (BROME-fenn-IRR-uh-meen MAL-ee-ate; Dimetapp), chlorpheniramine maleate (KLOR-fenn-EAR-uh-meen MAL-ee-ate; Clor-Trimeton, Coricidin, and Sudafed), diphenhydramine hydrochloride (dye-fenn-HY-druh-meen high-droh-KLOR-ide; Benadryl), guaifenesin (gwy-FENN-ess-inn; Humibid, Organidin NR, and Robitussin), hydrocortisone (HIGH-droh-KORE-tih-zone; Hydrocort and Westcort), loratadine (lor-AT-ih-deen; Claritin), and pseudoephedrine hydrochloride (SUE-doh-ih-FEH-drinn or sue-doh-EFF-ih-drinn high-droh-KLOR-ide; Sudafed; also some forms of Claritin);
antiemetics: dimenhydrinate (di-men-HI-dre-nat; Dramamine) and meclizine hydrochloride (me-KLI-zeen high-droh-KLOR-ide; Antivert and Dramamine II Less Drowsy);
antitussives: dextromethorphan hydrobromide (deks-troh-meth-ORR-fan high-droh-BROH-mide; Robitussin and Coricidin);
dietary supplements: herbs or other botanicals, minerals, and vitamins;
pain relievers: acetaminophen (uh-SEE-tuh-MINN-uh-fenn; Tylenol), aspirin, ibuprofen (EYE-byoo-pro-fenn; Advil and Motrin), dyclonine hydrochloride (DYE-kloe-neen high-droh-KLOR-ide; Sucrets), phenol (FEE-nole; with or without menthol; Cepacol, Cepastat, and Chloraseptic);
sleep aids: diphenhydramine hydrochloride (dye-fenn-HY-druh-meen high-droh-KLOR-ide; Nytol, Sominex, and Unisom SleepGels), doxylamine succinate (dok-SILL-uh-meen SEK-seh-nate; Unisom SleepTabs);
stimulants: caffeine (Caffedrine, No-Doz, and Vivarin);

(continued on next page)

What Kind of Drug Is It?

Over-the-counter (OTC) medicines are preparations that are sold to consumers without a doctor's prescription. The most common OTC medications are used to treat aches and pains, allergies, drowsiness, and cold and influenza (flu) symptoms. OTC drugs are also commonly used to remedy coughs and sore throats, constipation (the inability to have a bowel movement), and diarrhea (loose, watery, or frequent bowel movements).

Other ailments that are relieved by OTC drugs include insomnia (having difficulty falling asleep or being unable to fall asleep); motion sickness; nausea (an upset stomach, sometimes combined with vomiting); and obesity (being extremely overweight). Herbal dietary supplements and vitamins are also sold over the counter. Volumes could be written on the use and abuse of OTC medications. The following entry attempts to provide as much relevant information as possible for the scope and intended audience of this encyclopedia.

Overview

The Italian adventurer Casanova (1725–1798) is often quoted as saying: "In wise hands, poison is medicine. In foolish hands, medicine is a poison." Such is the case with over-the-counter (OTC) drugs—those medicines found on shelves in drugstores, convenience stores, and supermarkets. The sale of nonprescription drugs, vitamins, and herbal dietary supplements is a multi-billion dollar industry. Improper use of these medications, however, can be dangerous. Some individuals take OTC drugs not for medical reasons but for recreational use. In other words, they take the drugs to get high.

In *From Chocolate to Morphine,* Andrew Weil and Winifred Rosen noted, "Sometimes, people who are desperate for drugs . . . consume overdoses of these preparations in an effort to get high." Still others turn to OTC drugs in suicide attempts. Illicit drug makers often use the ingredients found in certain over-the-counter preparations to create designer drugs in homemade labs. Harmful and

(continued from previous page)

stomach/intestinal remedies: bisacodyl (biss-ah-COE-dill; Correctol and Dulcolax), bismuth subsalicylate (BIZ-muth sub-sah-LISS-uh-late; Kaopectate and Pepto-Bismol), calcium carbonate (Rolaids and Tums), docusate (DOE-coo-sate; Colace), kaolin and pectin (KAY-oh-lin and PEK-tin; Kapectolin and K-P), loperamide hydrochloride (loe-PER-a-mide high-droh-KLOR-ide; Imodium), magnesium hydroxide (Phillips' Milk of Magnesia), psyllium (SIH-lee-um; Fiberall and Metamucil), senna (Exlax and Senokot), simethicone (sy-METH-ih-cone; Gas-X and Mylanta)
Also Known As: Various; some examples include: downers (for diphenhydramine and doxylamine); red devils, skittles, triple-C (for dextromethorphan hydrobromide); and uppers (for caffeine)
Drug Classifications: Not scheduled or Schedule V; sold without a prescription

addictive, designer drugs are sold illegally on the streets by drug dealers looking to turn a sizable profit.

From ancient times to the twenty-first century, people have experimented with plants and even animals for use in medicines. Every human culture has used its regional plant life to cure ills—or at least to ease them. Home remedies were passed down from generation to generation, with parents teaching children what herb or plant to grow to cure various ailments. Plants with greater potency, or strength, especially those with hallucinogenic properties, generally became the tools of the trade for the shaman or medicine man of the indigenous, or native, peoples. (Hallucinogens are capable of producing visions or hallucinations, which alter the user's perception of reality.) Shamans, who closely guarded the secrets of their potions, were trained spiritual leaders who sought to cure the sick and uncover hidden truths. By the time of the great ancient civilizations of Egypt, Greece, Rome, and the Mayan empire, scholars were already writing texts on medicines and poisons. The medical profession had been established.

Patent Medicines Are Introduced

In the nineteenth century, few laws existed in the United States to regulate what ingredients went into medicines, or what sort of medicines could be sold. Traveling salespeople could peddle "patent medicines," which were over-the-counter drugs containing secret ingredients not listed on the label, and "tonics" and "elixirs" that promised they could cure just about anything. In those days, truth in advertising wasn't practiced by many who were looking to make a quick buck.

Larger companies manufactured bottled products, sold over the counter, with comforting names like "Mrs. Winslow's Soothing Syrup." No laws required that these products contained labels listing their ingredients. Plus, drug makers did not have to prove that their tonics actually worked or could achieve anything close to what advertisements claimed these medicines could do.

Patent medicines fell into two categories: 1) Those containing drugs such as alcohol, cocaine, heroin, marijuana, morphine, and opium; and 2) those containing little or no drug content at all. (Separate entries on alcohol, cocaine, heroin, marijuana, morphine, and opium are also available in this encyclopedia.) Many people used these medicines thinking they were effective and safe. Some even gave the products to their children and infants.

What's in a Name?

Patent medicine advertisements made all sorts of claims about what certain products could do for the consumer. Many promised they could "cure whatever ails you," while others just promised to treat specific ailments. In some cases, the medicines failed to produce any relief or led to addiction of various drugs, such as cocaine. Other home remedies did provide some relief.

Here's a look at some of the interesting names of patent medicines from that bygone era.

- Cocaine Tooth Drops
- Christie's Magnetic Fluid
- Dr. J. Hostetter's Stomach Bitters
- Dr. Morse's Indian Root Pills
- Dr. Pierce's Golden Medical Discovery
- Gooch's Mexican Syrup
- The Great Dr. Kilmer's Swamp-Root Kidney Liver & Bladder Cure Specific
- Lash's Kidney and Liver Bitters
- Lydia E. Pinkham's Vegetable Compound
- Mrs. Winslow's Soothing Syrup
- M&R Licorice Wafers (for throat irritation)
- Moxie Nerve Food
- Stanley's Snake Oil
- Stearns' Headache Cure
- Warner's Safe Kidney & Liver Cure

Addictions Run Rampant and the Government Steps In

As the twentieth century began, however, babies and children frequently faced addiction and death from so-called tonics containing narcotic drugs. Such drugs are painkillers that can easily become habit-forming. Grown men and women became dependent on their "medicines," thinking that they needed the tonics in order to function. They were unaware that they were consuming dangerous, addictive drugs.

This development, combined with fears about unsanitary conditions in meat-packing plants, led Congress to enact the Food and Drugs Act in 1906. With the passage of this act, the U.S. government took the first steps toward the regulation of patent medicines. The Food and Drugs Act did not ban any specific medicines, but it did require that companies list the medicine's ingredients on the label. Finally, Americans could look at a bottle of tonic and know exactly what it contained.

In 1914, the Harrison Narcotics Act sought to curb the use of habit-forming drugs such as opium and cocaine. This act required prescriptions for these and other addicting narcotics. In 1937, marijuana was taken off the medical market. The following year, the U.S. Food, Drug, and Cosmetic Act (FDC) required that all new drugs, both prescription and over-the-counter, be tested for safety in animal and human studies before being released to the public.

The Role of the FDA

All medicines sold in the United States fall under the regulation of the U.S. Food and Drug Administration (FDA). The agency began in 1862 as the Bureau of Chemistry. Its name was changed to the Food, Drug, and Insecticide Administration in 1927 and shortened to the Food and Drug Administration in 1930. This agency has many responsibilities that encompass safety testing, ingredient labeling, and the listing of nutritional guidelines on products that are ingested. It also regulates the ingredients in cosmetics and oversees the design of poison labels, tamper-resistant packaging, and child-proof caps on medicines and household cleaning products.

In addition, the FDA demands that drug companies label their medicines clearly, so that consumers can easily determine the proper usage and dosage information for every OTC medicine sold in the United States. The FDA must approve all medicines, both prescription and OTC, before the drugs are released for public use. Medicines that are shown to be dangerous can be recalled by the agency and removed from the market.

Every OTC medicine has undergone scientific tests, first on animals and then in controlled human studies. The FDA continues to monitor medicines after they have been approved due to concerns about long-term use of certain substances and their link to diseases such as cancer or to health risks such as liver damage. Often, medicines will first be approved for prescription use. Some eventually become OTC drugs once they prove safe.

For example, in the early 1980s, the popular pain reliever ibuprofen (Advil and Motrin) was available only by prescription. In the 1990s, the allergy drug Claritin required a prescription. In the early twenty-first century, guaifenesin (an ingredient in many OTC cough and cold products such as Robitussin) entered the OTC market after a period of prescription-only use. All of these drugs received OTC approval by the FDA only after their safety had been established.

Substances Not Under FDA Control

Some substances sold over the counter are not reviewed by the FDA. In 1976 the Proxmire Amendments stopped the FDA from limiting the potency, or strength, of vitamins and minerals contained in food supplements and from classifying high doses of vitamins as drugs. Less than twenty years later, the 1994 Dietary Supplement Health and Education Act (DSHEA) declared that herbal supplements such as St. John's wort (*Hypericum perforatum*) and ginseng (JINN-sing; *Panax ginseng*) were foods rather than drugs. As such, herbal and

On occasion, the safety of over-the-counter drugs is called into question. Such was the case in 2000 when scientific researchers reported that products containing phenylpropanolamine were believed to cause an increased stroke risk in young women. *Photo by Robert King/Newsmakers.*

dietary supplements are not typically regulated by the FDA unless a problem is reported.

"About 60 percent of U.S. consumers believe that dietary supplements must be approved by a government agency like the Food and Drug Administration before they can be sold to the public," according to the Harris Poll's Nancy Wong, as quoted in the *Nutrition Action Healthletter*. But that is no longer the case. The *Healthletter* continued: "Before DSHEA, if the FDA questioned a supplement's safety, the manufacturer had to prove that it was safe." Bruce Silverglade of the Center for Science in the Public Interest told the *Healthletter*, "DSHEA shifted the burden of proof." He added, "[T]hanks to DSHEA, the FDA has to prove that supplements are dangerous."

In large pharmacies, hundreds of over-the-counter medications line the shelves. How do people know which ones are right for them? When in doubt, people can check with their doctors or pharmacists. *AP/Wide World Photos.*

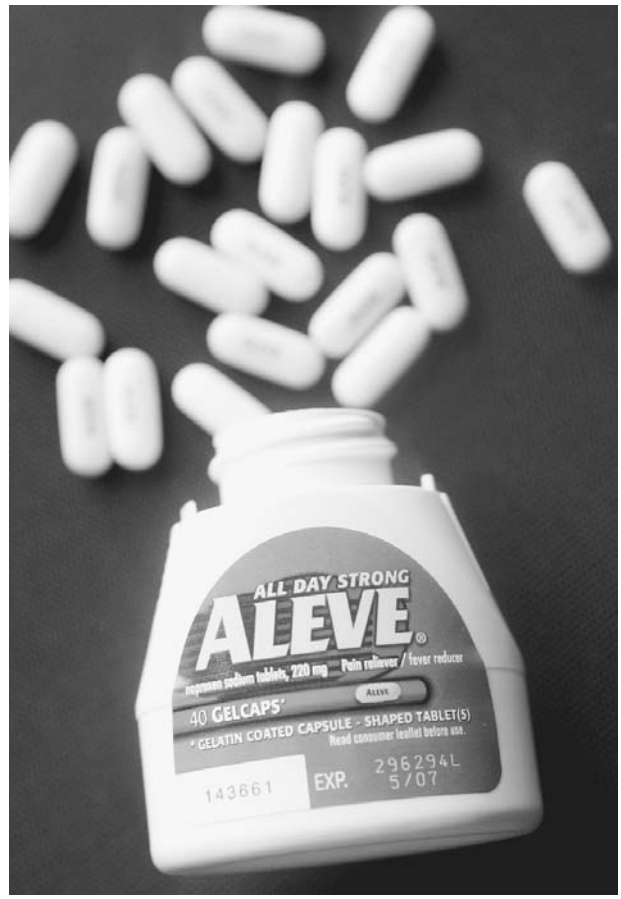
Although makers of herbal products cannot label them for medical use, the FDA cannot test them for safety until they are suspected to be unsafe for human use. In 2004 the FDA banned the sale of the herbal supplement ephedra (ih-FEH-druh; *Ephedra sinica*), but only after use of the substance had been tied to numerous deaths and health-related emergencies. (An entry on ephedra is available in this encyclopedia.)

Hundreds of OTC products line the shelves of drugstores and grocery store pharmacies. It is important to note that those marketed as *medicines for specific problems* are regulated by the FDA. Those marketed as vitamins or herbal dietary supplements have not received rigorous testing and review by the FDA.

What Is It Made Of?

In *From Chocolate to Morphine,* Weil and Rosen noted that cough syrups and cold remedies are "a mixed bag of different formulas and strengths." Many over-the-counter medicines are synthetic substances, meaning they are created in a lab from chemicals. Others, such as herbal supplements and caffeine, come from plants. (Separate entries on herbal drugs and caffeine are included in this encyclopedia.) Some OTC drugs contain DEPRESSANTS, while others contain STIMULANTS.

Quite often, the ingredients in these preparations were included in prescription-only medications for several years before being released for sale over the counter. In some cases, OTC drugs contain smaller amounts of an active ingredient—the chemical or substance in a compound known or believed to have a therapeutic, or healing, effect—than the prescription drug of the same type. Ibuprofen is a good example of this. The drug can be purchased in the nonprescription strength of 200 milligrams per tablet or capsule at any drug or grocery store. However, a prescription is needed for the more potent 800-milligram pills.



The popular over-the-counter painkiller Aleve made headlines in 2004 when a scientific report was issued linking use of the drug by elderly patients to an increase in strokes and heart attacks. *Photo illustration by Mario Tama/Getty Images.*

How Is It Taken?

Over-the-counter medicines are usually taken by mouth. They are available in pills, capsules, chewable tablets, liquids, powders to be mixed with water or juice, and lozenges (such as cough drops). Other over-the-counter drugs include nasal sprays, throat sprays, and creams and lotions that can be applied directly to the skin.

Are There Any Medical Reasons for Taking This Substance?

Over-the-counter preparations are taken as DIETARY SUPPLEMENTS or for temporary relief of a variety of symptoms. Medicines for allergies, pain relief, coughs, colds, flu symptoms, sore throats,

depressants: substances that slow down the activity of an organism or one of its parts

stimulants: substances that increase the activity of a living organism or one of its parts

dietary supplements: products including vitamins, herbal extractions, and synthetic amino acids sold for specific uses such as weight loss, muscle building, or prevention of disease

digestive troubles, motion sickness, sleeping problems, and weight loss are all available over the counter.

Usage Trends

Typically, over-the-counter drug use is not tracked in surveys of illicit drug abuse because these medicines are not considered illegal. But the Partnership for a Drug-Free America (PDFA) began including questions on OTC drug abuse in its 2003-2004 survey. Results of the 2004 Partnership Attitude Tracking Study (PATS) were released on April 21, 2005. According to the study's authors, "an alarming number of teenagers are abusing a variety of . . . over-the-counter (OTC) medications to get high." Results indicate that about 9 percent of teens, or around 2.2 million young people, had experimented with cough syrup and other over-the-counter products purely for their intoxicating effects. PATS researchers see this as a sign that "OTC medicine abuse has penetrated teen culture."

The Growing Problem of Dextromethorphan Abuse

The trend in experimental OTC drug use is riskier than it may sound. A twenty-year-old Texas man was found guilty of "intoxication manslaughter" after deliberately misusing an OTC drug. (Manslaughter refers to the unintentional killing of a human being.) The man testified in court that he had taken thirty Coricidin tablets in order to HALLUCINATE. While driving under the influence of the Coricidin, he struck and killed another driver. Beth Wilson reported in the *Amarillo Globe-News* that the driver was sentenced to seven years in prison and received a $7,000 fine.

Coricidin contains dextromethorphan, a common but potentially dangerous ingredient in multi-symptom cough, cold, and flu remedies. (An entry on dextromethorphan is included in this encyclopedia.) According to the 2004 "Pulse Check" report released by the Office of National Drug Control Policy (ONDCP), Coricidin HBP Cough & Cold is the "particular brand [that] contains the highest concentration of dextromethorphan, making it the most popular among users." Cough and cold tablets like Coricidin contain 30 milligrams of dextromethorphan hydrobromide and 4 milligrams of chlorpheniramine maleate.

Abuse of products containing these substances is especially high in the southern and western parts of the United States. "Pulse Check" researchers noted that "in Tampa/St. Petersburg, [Florida], incidents are reported of adolescents taking 20 to 43 tablets at a time, sometimes in combination with another over-the-counter medication, dimenhydrinate (Dramamine)." In addition, according to the

hallucinate: experience visions or other perceptions of things that are not really present

Many over-the-counter cough medicines contain dextromethorphan. Doctors recommend using measuring cups so that the proper dosage is taken. *Photograph by Leitha Etheridge-Sims.*

report, dextromethorphan-related "overdoses and thefts from groceries and pharmacies" were on the rise. By 2005, some pharmacies in Florida, Colorado, and Oregon had placed these products "behind the counter" and were limiting sales to one box per customer.

Dextromethorphan has generated considerable attention for its mind-altering effects. But the other active ingredient in Coricidin—chlorpheniramine maleate—has also been shown to impair judgment in users. The case of a mysterious plane crash in Florida in late 2003 was eventually linked to chlorpheniramine. After a lengthy investigation, it was determined that the engines and propellers of the twin Cessna 441 were in working order at the time of the crash. According to the National Transportation Safety Board (NTSB), the pilot had a high level of chlorpheniramine in his system at the time of the crash. According to the NTSB crash report: "Post accident toxicology testing of the pilot's blood revealed chlorpheniramine, an over-the-counter sedating antihistamine, at more than ten times higher than the level expected with a typical maximum over-the-counter dose."

The Pseudoephedrine/Methamphetamine Connection

Methamphetamine, one of the most dangerous illicit drugs of the early twenty-first century, is brewed from the active ingredient in some

OTC Abuse and the Elderly

OTC drug abuse is not just a teenage problem. It also affects adults, including the elderly. In general, many people overuse or misuse OTC drugs because they believe that they are safe to use. Some people think that OTC drugs are milder than prescription drugs, but fail to remember that some of those same OTC medications were once available by prescription only.

Drug abuse, or misuse, by the elderly occurs for a variety of reasons. As people age, they may require daily use of one or more prescription medications to treat a variety of ailments. According to Maura Conry in *Geriatric Times* in 2000, the elderly "use 30% of the prescriptions written and 40% of OTC drugs sold in the United States." Thus, seniors may be taking several prescriptions and OTC drugs that counteract with one another and not realize it.

"Since metabolism rates slow down considerably as we age, many prescription and OTC medications stay in the body longer and increase the likelihood of harmful drug interactions," note the authors of "Chemical Dependency and the Elderly." Such problems cause more than 100,000 deaths each year. "Patients have arrived at emergency rooms and hospitals after taking 15 or more drugs and OTC remedies," noted Conry. Emergency staff are hard-pressed to determine the cause of the problem when so many drugs are involved.

Many seniors may not realize that combining certain medications causes serious side effects, and they may be accidentally combining drugs with the same active ingredient. Some seniors have multiple doctors, such as a primary care physician and a cardiologist. On occasion, patients forget to tell each doctor what prescriptions they are already taking or what OTC drugs they use. Plus, many get their drugs from multiple sources: samples from the doctor's office, OTC drugs from the grocery store, and prescriptions from the local drugstore or by mail order. In such cases, no one source is checking whether the amount and type of drugs being used on a daily basis are safe.

The article "Abuse and Misuse of Medications in the Elderly" and other medical sources point out various problems that seniors face when using drugs. These problems include: 1) being unable to read the label; 2) being unable to hear the doctor or pharmacist's instructions; 3) being unable to understand the warnings on the label and how they apply to him or her; 4) being forgetful and taking too many or not enough doses at prescribed times; 5) taking more drugs than prescribed when chronic pain or conditions don't respond to the usual dosage; and 6) becoming confused about when to take the medicine and how much to take.

ephedrine: pronounced ih-FEH-drinn; a chemical substance that eases breathing problems

pseudoephedrine: a chemical used to relieve nasal congestion

over-the-counter cold products. (An entry on methamphetamine is available in this encyclopedia.) Amateur drug makers in home laboratories produce the drug by cooking EPHEDRINE or PSEUDOEPHEDRINE and mixing it with other easy-to-obtain chemicals. The FDA banned ephedrine-containing pills and powders in 2004, but as of mid-2005, illicit supplies were still available through the Internet. Pseudoephedrine remains a key ingredient in legal OTC cold medicines.

Some cold relief products containing pseudoephedrine are used in the illegal production of methamphetamine, a dangerous drug. Some pharmacies have taken steps to monitor closely the sales of such products, placing these over-the-counter medications behind the counter. *AP/Wide World Photos.*

In 2004 and 2005, lawmakers throughout the United States began efforts to restrict access to pseudoephedrine-containing OTC medicines. Several states, including Michigan, Oklahoma, and Oregon, passed laws that made it harder to purchase products like Sudafed (which contains pseudoephedrine hydrochloride). The restrictions include: 1) placing the product "behind the counter" in the pharmacy area of drugstores, where a careful count of the stock can be maintained; 2) requiring photo identification to prove the buyer is at least eighteen; 3) requiring buyers to sign a logbook at the time of purchase; and 4) limiting the number of pills that can be sold per transaction. In August of 2005, Oregon became the first state to pass legislation making pseudoephedrine a prescription-only drug. Oregon lawmakers hope that the new law, scheduled to take effect in mid-2006, will reduce the number of illegal meth labs operating in the state.

Effects on the Body

OTC drugs can affect the body in many ways, depending on the type of medicine being taken, the condition being treated, and the general health of the user.

Allergy Medicines

Allergic reactions stem from the body's reaction to irritants from the environment. Breathing pollen grains or pet dander causes stuffy nose and cough in people who are allergic to these substances. Touching poison ivy or being stung by a bee produces itching and swollen skin. Allergies can also cause watery eyes, sore throat, and digestive problems. People with severe allergies—to peanuts or shrimp, for instance—can have life-threatening reactions if they consume even a tiny amount of those foods.

Because allergies are chronic, or lasting conditions, a large number of medicines have been developed to treat them. Pharmacies stock skin rash ointments, nasal sprays, liquid medicines, and pills. Many of the liquid and pill preparations are multi-symptom formulas with more than one active ingredient.

The Role of Histamines. Allergy symptoms are caused by HISTAMINES, which are chemicals that are produced by the cells of the immune system. Histamines are like warning signals that alert an individual to the presence of an allergen—the pet dander, the pollen, or the substance that's causing the allergic reaction. The release of histamines produces uncomfortable symptoms that are hard to ignore—symptoms such as INFLAMMATION, sneezing, nasal congestion, and even dizziness or labored breathing.

histamines: pronounced HISS-tuh-meenz; chemicals released by the body during an allergic reaction; they cause 1) an increase in gastric secretions, 2) the dilation, or opening up, of capillaries, 3) constriction of the muscles around the airway, and 4) a decrease in blood pressure

inflammation: a physical reaction to injury, infection, or exposure to an allergen characterized by redness, pain, or swelling

antihistamines: drugs that block *histamine,* a chemical that causes nasal congestion related to allergies

Some allergy medicines contain ANTIHISTAMINES, chemicals that work to stop the body's production of histamines. The most common OTC antihistamines are diphenhydramine hydrochloride and brompheniramine maleate. Taken at regular doses, these drugs may cause mild drowsiness as they relieve allergy symptoms. At higher doses, they can bring on severe anxiety, which is the feeling of being extremely overwhelmed, restless, and worried; insomnia, or difficulty sleeping; muscle tremors; and even hallucinations, which are visions or other perceptions of things that are not really present.

Some people are so sensitive to diphenhydramine that the standard dose can make them feel nervous and uncomfortable. It is possible to overdose on diphenhydramine, and the consequences can be very serious. An overdose can lead to coma or death if emergency medical treatment is not obtained.

Relieving Stuffy Nose, Headache, and Itching. Other allergy medications function differently, targeting the symptoms of an allergic reaction rather than blocking the production of histamines. Medicines containing decongestants work by widening nasal passages and thinning MUCUS in order to relieve a stuffy nose and headache. Common decongestants include pseudoephedrine hydrochloride and chlorpheniramine maleate. These ingredients can cause intense anxiety, hallucinations, convulsions, vomiting, and irregular heartbeat if taken in higher doses than what is recommended. The decongestant guaifenesin is a mucus thinner that has fewer dangerous side effects, but it will cause nausea and vomiting if taken at overdose levels.

Nasal sprays are another popular form of treatment for allergy symptoms. These should be used with care, following the directions on the bottle. Overuse of nasal sprays can produce a rebound effect, which causes even more swelling in the nasal passages than the original allergen would have produced. Overdoses of certain nasal sprays can bring on symptoms such as an irregular heartbeat and high blood pressure.

Some poison ivy creams and lotions contain hydrocortisone. Hydrocortisone is a synthetic drug that counteracts the body's response to an allergen. It reduces itching and swelling, but overuse may lead to skin irritation. Hydrocortisone does not prevent the spread of poison ivy, so it is not recommended for use on unaffected skin.

Cough, Cold, and Flu Medicines

Irritating coughs have many sources. The most common reason for a cough is a post-nasal drip, or the draining of mucus from the nose down into the throat. The body reacts to this drip with a cough so that the mucus will not clog the trachea (TRAY-kee-uh) or move into the lungs. The trachea, commonly called the windpipe, is the tube in the throat that carries air to the lungs. Coughing also occurs when the body attempts to expel particles from the lungs or bronchial tubes. This kind of coughing is associated with several conditions: 1) bronchitis—an illness that affects the bronchial tubes in the lungs, leading to shortness of breath and coughing; and 2) pneumonia—a disease of the lung, usually brought on by infection, that causes inflammation of the lung tissue, fluid buildup inside the lungs, lowered oxygen levels in the blood, and difficulty breathing. Other coughs, known as "dry coughs," are simply a reaction to an irritation of the throat and can linger with no other symptoms present.

Persistent coughing—a cough that lasts for more than two weeks—may be a sign of a more serious problem, including pneumonia,

mucus: a secretion released by the body to prevent germs and allergens from entering the bloodstream

Influenza Pandemic of 1918

Many people experience bouts of colds and flu throughout their lives and receive relief from OTC drugs. But back in 1918, an uncommon influenza spread quickly around the world that was so deadly, no drugs could stop it. It was called a "pandemic," because it was an epidemic that affected the entire world.

The influenza struck toward the end of World War I (1914–1918). Some reports of the flu surfaced in March of 1918 at a military base in Kansas, and then again at a base near Boston, Massachusetts, in August of that year. The virus quickly spread throughout the United States, and made its way overseas. Many people became infected by this unusually deadly flu. The virus killed its victims quickly, some dying within two days to a week of becoming infected.

When the war ended in November of 1918, people throughout the world celebrated the news. In San Francisco, California, many residents headed into the streets to celebrate, wearing masks made of gauze to keep them from breathing in germs. The flu eventually faded. But by the time the epidemic was over, more than 600,000 Americans had died, with at least 25 million people perishing worldwide. The Centers for Disease Control and Prevention (CDC) notes that the final death toll may have actually reached 50 million people.

TUBERCULOSIS, or even lung or throat cancer. Over-the-counter cough medicines are designed for brief use. If a cough does not respond to an OTC product within a week, a doctor should be consulted.

When It's Good to Cough A cough that brings mucus from the throat to the mouth is called a "productive cough." Productive coughs—while annoying—prove that the body is working as it should to protect the lungs. Patients with productive coughs should not try to suppress them, except perhaps at night in order to get uninterrupted sleep. Taking cough suppressants during the day may actually prolong the time it takes to get rid of a productive cough.

Since the majority of minor coughs stem from colds, allergies, or the flu, most multi-symptom products contain ANTITUSSIVES along with medicines to thin or eliminate mucus. The most popular antitussive in OTC cough syrups is dextromethorphan, which is usually combined with other active ingredients. Dextromethorphan taken at higher-than-recommended doses can produce an hallucinogenic experience. Its abuse as a recreational drug has led several pharmacy chains to place certain cough products behind the counter or demand proof that the buyer is over the age of eighteen. Recreational use of high doses of dextromethorphan can lead to physical and psychological addiction. Physical addiction occurs when the body

tuberculosis: pronounced tuh-burk-yuh-LOH-siss; a highly contagious disease of the lungs

antitussives: pronounced an-ty-TUH-sivs; medicines that quiet coughs

Many particles are emitted from someone's nose and mouth during a sneeze as shown here. Various diseases are spread by coughing and sneezing. This image shows just how easy those germs can spread. *© Lester V. Bergman/Corbis.*

craves more of a drug; psychological addiction is the belief that a person needs to take a certain substance in order to function.

Flying Germs. Common colds are caused by viruses that pass easily from person to person through the air. The cold germ can also survive on surfaces such as doorknobs or light switches. So the virus can be passed if someone touches these germ-laden surfaces, then uses that finger or hand to touch one's eyes, nose, or mouth. When the virus invades the body, chemicals in the body's immune system attempt to fight off the infection. Symptoms such as stuffy nose, sneezing, sore throat, and cough are responses designed to keep the germs from reaching the bronchial tubes leading into the lungs. Cold symptoms that last for more than ten days, or that get worse rather than better over time, may indicate a more serious problem such as the development of bronchitis or pneumonia. A doctor should be consulted in such cases.

Acetylsalicylic acid, the active ingredient in aspirin, was discovered by a Bayer researcher in 1897. The finding led to the production of Bayer aspirin in 1899, first as a powder (shown here) and then later in pill and capsule form. *AP/Wide World Photos.*

Influenza, or the flu, is also caused by a variety of viruses. The flu is highly contagious and usually occurs in winter, when people spend more time indoors. Its symptoms are often more severe than those associated with an ordinary cold. Patients develop fever, body aches, cough or sore throat, and sometimes nausea, vomiting, and diarrhea. All of these symptoms arise from the body's immune system response, so older people or those with immune deficiencies run the risk of developing complications, especially pneumonia. For this reason, older individuals and people with immune problems, such as cancer patients and people living with acquired immunodeficiency syndrome (AIDS), are encouraged to get annual flu shots.

The Multi-Symptom Trap. Colds and flu bring on a host of symptoms, so most OTC cold and flu medications contain several active ingredients. Each active ingredient targets a specific symptom. ACETAMINOPHEN works on fever, body aches, and headaches. Dextromethorphan hydrobromide controls coughs. Pseudoephedrine hydrochloride and its related compounds are decongestants that open clogged nasal passages. Chlorpheniramine maleate is an antihistamine. Some "PM" or "overnight" remedies include alcohol. Some "stay alert" daytime remedies include caffeine. To complicate matters further, the liquid forms of these preparations contain sweeteners such as sucrose (SUE-krose; sugar) or the sugar substitutes saccharine (SAK-uh-rin) or aspartame (AH-spar-tame).

OTC cold and flu medicines are formulated to treat the symptoms of these illnesses once they occur. Such remedies are not effective in warding off colds or flu and should not be taken as preventative measures. For years the herbal dietary supplement echinacea (eck-inn-AY-shuh; *Echinacea purpurea* and *Echinacea angustifolia*), derived from the purple coneflower, was thought to

acetaminophen: pronounced uh-SEE-tuh-MINN-uh-fenn; a non-aspirin pain reliever, such as Tylenol

Some Tips on Avoiding Colds and Flu

According to the Centers for Disease Control and Prevention (CDC), "The most important thing that you can do to keep from getting sick is to wash your hands." That doesn't mean just running your hands under water. Proper hand washing requires soap and scrubbing action to help remove the germs from the skin. The CDC recommends that people wash their hands before handling food or eating, after handling animals or their waste, and after using the restroom.

Anyone who catches a cold or the flu needs plenty of rest to enable the body to fight the infection. In *From Chocolate to Morphine,* authors Andrew Weil and Winifred Rosen noted that OTC cold remedies "may actually prolong colds by making people less aware of their illness and less likely to take good care of themselves." Taking a few days off from school or work to rest also helps protect others from catching those germs. Frequent hand washing will minimize the spread of the germs at home.

No medication will cure a cold or flu. However, old-fashioned remedies such as warm tea with honey and lemon or a hot bowl of chicken soup can provide some relief from nasal congestion and throat irritation. Even sucking on a lollipop or a hard candy can be soothing. Those seeking relief in an OTC product should follow the package directions carefully, especially with any formula containing dextromethorphan.

have cold-prevention properties. However, scientific tests have shown that the herb does nothing to prevent colds from occurring and has no effect on cold symptoms that already exist. Results of a study led by Dr. Ronald B. Turner of the University of Virginia School of Medicine were published in the July 28, 2005 issue of the *New England Journal of Medicine.* Turner's study evaluated the effects of treatment with echinacea or a dummy pill on 399 patients who had been infected with a cold virus. The researchers saw no benefit in using echinacea to treat the colds.

OTC Pain Relievers: The Big Three

The three most common over-the-counter pain relievers are aspirin, acetaminophen (Tylenol), and ibuprofen (Advil and Motrin). All three products work well to control minor headaches, muscle aches, menstrual cramps, arthritis pain, and fever. Doctors even recommend small daily doses of aspirin for people with heart problems. Although these products are valuable painkillers when used correctly, they can produce dangerous side effects when overused.

Aspirin and Acetaminophen Can Kill More Than Just Pain. According to Daniel Carr in a 2002 bulletin from the American Pain Society,

about 22 percent of fatal poisonings in the United States each year involve an over-the-counter painkiller—especially aspirin and acetaminophen. Nearly nine out of ten of these deaths are suicides.

Acetaminophen overdose is one of the leading causes of calls to poison control hotlines every year. In a March 2004 article for the *New York Times,* William M. Lee noted that misuse of this drug leads to an estimated 56,000 emergency room visits annually, with some 450 deaths—usually from liver failure. Symptoms of acetaminophen overdose establish themselves slowly, with little stomach upset. Sometimes, by the time the patient reports pain, the damage cannot be repaired. Multiple organ failure follows.

Aspirin overdose shows symptoms more quickly, but it can kill faster. It causes thinning of the blood, and at the same time it irritates the stomach lining. Internal bleeding begins, especially throughout the digestive system. TOXIC doses of aspirin work on the part of the brain that controls breathing. The rate of breathing can be slowed to dangerously low levels, resulting in death. Seizures, or sudden violent spasms or convulsions, may also occur.

As Pamela Grim noted in a 1998 *Discover* article, "This 'harmless' little pill can have deadly effects. . . . The kidneys, the liver, and the brain . . . can shut down forever, depending on the amount ingested. Patients can . . . crash and burn in the blink of an eye." If caught in time, aspirin overdose can be treated with activated charcoal to induce vomiting. Still, a patient will often face a long period of recovery from internal injuries.

Fatal overdoses of ibuprofen occur less frequently, but when they occur they are usually caused by kidney failure. Interestingly, one of the symptoms of ibuprofen overdose is headache and abdominal pain—exactly what the drug is designed to treat.

Sore Throat: Is It Strep? Sore throats are common among children and adults. As with a cough, a sore throat can stem from post-nasal drip or from a minor infection. These kinds of sore throats usually subside after a few days, and the pain can often be relieved by gargling with a simple mixture of table salt, baking soda, and warm water.

The two main active ingredients in over-the-counter sore throat remedies are phenol (with or without menthol) and dyclonine hydrochloride. Sprays containing these substances act by temporarily blocking nerve irritation. Menthol-containing lozenges also act on nerve endings in the throat. Patients with DIABETES or allergies to artificial sweeteners should check the inactive ingredients in any sore throat preparation. Some products include sugar or artificial sweeteners to enhance the taste.

toxic: harmful, poisonous, or capable of causing death

diabetes: a serious disorder that causes problems with the normal breakdown of sugars in the body

A sore throat accompanied by fever or nausea may be a sign of bacterial infection, particularly *streptococcus* (strepp-toe-KOK-uss), better known as "strep throat." Left untreated, strep throat infections can lead to rheumatic fever (roo-MAT-ik FEE-ver), a severe infection that results in fever, a rash, pain and swelling in the joints, and sometimes permanent damage to the heart valves. Strep infections cannot be treated with OTC drugs, but they do respond to prescription antibiotics, which are medicines that kill bacteria in the body. Doctors can test for strep by swabbing the throat and examining the sample for the presence of streptococcal bacteria.

Surprising Discovery about Ibuprofen

Dr. Jon Sudbo of the Norwegian Radium Hospital in Oslo, Norway, led a study on ibuprofen use among smokers. Originally, Sudbo focused his research on whether ibuprofen might decrease the risk of mouth cancer in people who smoked. However, his results, which were released in 2005, led to significant findings on a completely different topic. In an article titled "Over-the-Counter Painkillers May Pose Risk," *MSNBC.com* reported that the Norwegian smokers who took over-the-counter pain relievers such as Advil and Motrin "for at least six months had twice the risk of dying of a heart attack, stroke or other heart-related problem."

Digestive Remedies: Antacids, Anti-Diarrhea Medicines, and Laxatives

Digestive system problems range from nausea and heartburn (a burning sensation in the stomach and esophagus) to diarrhea and constipation. In healthy people, most of these problems clear up in a day or two. More serious stomach problems include: 1) ulcers—the breakdown of mucus membranes, usually in the stomach; 2) cancers of the stomach or colon; and 3) irritable bowel syndrome (IBS)—an incapacitating condition, usually brought on by periods of extreme emotional stress, that causes abdominal pain and severe diarrhea, alternating with periods of constipation. These disorders require prompt medical treatment.

OTC Abuse and Eating Disorders. Another group of digestive ailments is connected with two psychological disorders: anorexia nervosa (an-nuh-REK-see-uh ner-VOH-sah) and bulimia nervosa (bull-EEM-eeh-yuh ner-VOH-sah). Men and women who suffer from these serious eating disorders have distorted views of their bodies. They see themselves as overweight no matter how thin they are. People with anorexia nervosa have an intense fear of gaining weight. As such, they deprive themselves of calories, either by eating too little or by abusing LAXATIVES. The use of laxatives causes food to move through their systems before it can be digested fully. People with bulimia nervosa engage in long periods of bingeing on food, then force themselves to vomit before the food can nourish them. These patients may also abuse laxatives.

laxatives: drugs that help produce bowel movements

Be a Careful Consumer

In August of 2005, the U.S. Food and Drug Administration updated its "Consumer Education: Over-the-Counter Medicine" Web page. Through posters, pamphlets, and public service announcements, "Consumer Education" encourages people to read the labels on every over-the-counter drug they take. The site also offers safety tips on medicating sick children, driving while taking OTC medicines, avoiding dangerous drug interactions, and preventing overdoses.

One poster featured on the Web page shows two bottles of medicine side by side with the caption: "Don't take me with him." The warning goes on to explain that "different over-the-counter or prescription medicines [may] contain the same active ingredient. So when you take more than one medicine at the same time, it's possible to take too much of the same active ingredient."

The FDA wants consumers to "take the time to be safe." The Web site reminds buyers that OTC medications should be used only as directed, and usually only for a few days. In addition, patients should choose medicines specific to their symptoms. For instance, some allergy medicines contain antitussives, or cough suppressants. Patients who have stuffy noses but who are not coughing do not need the antitussive ingredient. When in doubt about which medicine to use, the FDA advises consumers to ask their doctor or pharmacist for advice.

More about Laxatives: Rebound and Dependence. OTC laxatives are available as pills, liquids, or fibrous powders that are mixed with water or juice. Some of the active ingredients in laxatives include bisacodyl, docusate, magnesium hydroxide, psyllium, and senna, among others. Warning labels on these products caution users not to exceed the recommended dose and not to use the products for more than a week at a time, unless told to do so by a doctor.

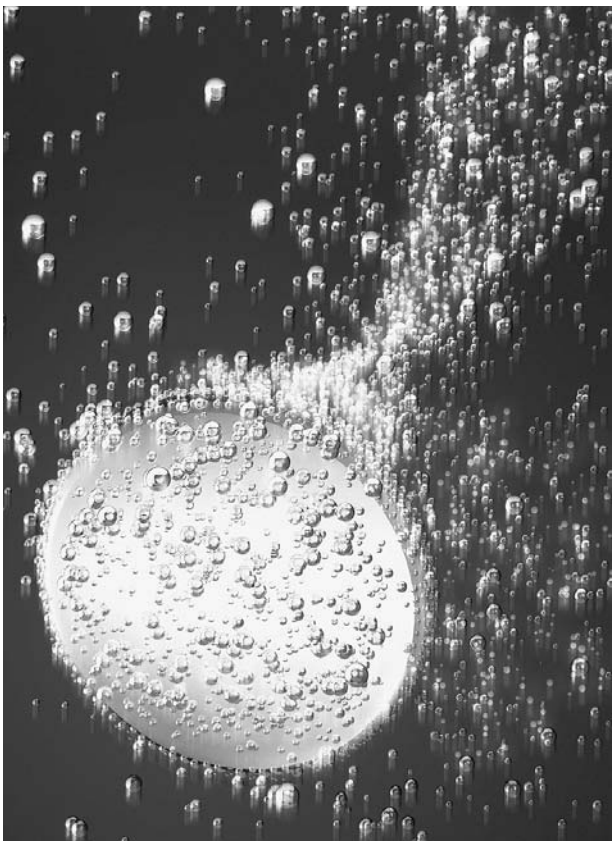
Overdose or long-term use of laxatives can disrupt the body's chemistry and undermine the body's natural ability to eliminate waste. Laxatives are habit-forming if used daily and can be very dangerous in overdose. They can deplete the body's potassium supply, leading to an irregular heartbeat. At higher doses they frequently cause diarrhea, severe cramps, and DEHYDRATION. People using laxatives for occasional constipation are advised to drink plenty of water along with the medication.

Overuse of laxatives causes a rebound effect in the user. People who suffer from rebounding notice a worsening of the very symptoms that they sought to relieve with the use of a medicine. When laxatives are taken for too long a period of time or in larger-than-recommended doses, severe constipation may result after the medicine is stopped.

dehydration: an abnormally low amount of fluid in the body

Anti-Diarrhea Meds. Anti-diarrhea medicines are often overused, but not for purposes of weight loss. Some people take them much longer than recommended as they try to end their diarrhea problems themselves, when they really should go to their doctor to find out what's causing the trouble. The active ingredient in the most often used OTC diarrhea remedies is loperamide hydrochloride. These medications should not be used for more than two days. If diarrhea persists beyond that period, or if a fever or blood in the stool develops, a doctor should be consulted. Loperamide should not be used in cases of suspected food poisoning from bacteria such as *salmonella, e-coli,* or *shigella.*

Taken as directed for a few days to treat mild diarrhea, most OTC diarrhea medicines are very safe. However, in cases of overdose, preparations containing loperamide hydrochloride, bismuth subsalicylate, or kaolin and pectin do present dangerous symptoms, including nervousness, drowsiness, and dizziness.



Some over-the-counter drugs are available in effervescent tablet form. Such drugs are dissolved in water before being consumed and begin to work instantly. © *Firefly Productions/Corbis.*

Antacids: They Aren't Candy. The most popular forms of antacid on the OTC market are chewable pills or tablets containing compounds of magnesium or calcium. Doctors may even recommend calcium-containing antacids for daily use in women who do not consume enough natural calcium in their diets. Taken in small, recommended doses, antacids are safe.

At overdose levels, though, they can cause both immediate and long-lasting problems. Antacids containing the ingredient simethicone can produce nausea, abdominal cramps, muscle aches, dehydration, and irregular heartbeat. Calcium-based antacids produce similar symptoms at overdose. These medicines carry another risk as well. Taken at high doses over a prolonged period of time, they can cause a buildup of calcium in the body that leads to painful calcium deposits in the kidneys known as kidney stones.

Because chewable antacids often look and taste like candy, children may want to eat them. Such medications should be kept in child-proof containers out of their reach. In case of an overdose, a doctor or poison control center should be contacted immediately.

Dietary Supplements: Vitamins, Minerals, and Herbal Drugs

"Dietary Supplements" is the catch-all term used to describe vitamins, minerals, and herbal drugs.

Vitamins and Minerals. Vitamins are compounds that are necessary for proper nutrition but, in most cases, cannot be produced by the body. The usual means of obtaining vitamins is from eating healthy foods. When people do not eat well, for whatever reason, they may need to supplement their vitamin intake. Marion Webb reported in the April 12, 2004 edition of the *San Diego Business Journal* that 40 percent of Americans consume at least one vitamin pill a week. As with other OTC drugs, it is wise to consult a doctor before beginning vitamin use.

The major vitamins include A, C, D, E, K, B-12, and seven B-complex vitamins. The body only requires small amounts of these nutrients to function properly. Fat-soluble vitamins such as A, D, E, and K are stored in fatty tissues. It is very difficult to deplete these stores of vitamins and very easy to suffer an overdose from their pill forms. Vitamins C, B-12, and the B-complex vitamins are water soluble. They exit the body quickly by way of the urine and must be replaced more often. This can be done by eating fresh fruits and vegetables, whole grains, beans, nuts, vitamin-fortified breakfast cereals, and meat.

Minerals, too, are substances derived from the diet that aid the body in its functions. Important minerals include calcium for bone strength, iron for maintaining red blood cell levels, and magnesium, which is essential for nerve and muscle action, bone formation, and ENZYME activity. Experts say that the best way to receive sufficient amounts of these nutrients is to eat foods containing them—dairy products and cheese for calcium, meats for iron, and green, leafy vegetables, nuts, and whole grains for magnesium.

More Is Not Better. It is possible to overdose on vitamins and minerals. Some specific symptoms are listed below.

- Too much vitamin A can cause headache, fatigue, nausea, diarrhea, dry skin, hair loss, bone pain, and enlargement of the liver and spleen. Extremely high overdoses cause swelling in the brain.
- Too much niacin (a B-complex vitamin) may result in liver damage.
- Too much vitamin D can bring on muscle weakness, excessive thirst and urination, digestive disturbances, bone pain, and high blood pressure.

enzyme: a substance that speeds up chemical reactions in the body

- Too much vitamin E can cause abdominal cramps, nausea and vomiting, diarrhea, and reduced absorption of other vitamins.
- Too much calcium can lead to diarrhea and the production of kidney stones.
- Too much iron can cause nausea, abdominal cramps, constipation, diarrhea, and liver damage.
- Too much magnesium can result in nausea, vomiting, diarrhea, dizziness, muscle weakness, and heart damage.
- Too much zinc leads to problems absorbing other vitamins.

The Herbal Craze. In the 1970s, many Americans became interested in alternative medicine, including the medical use of herbs. (An entry on herbal drugs is available in this encyclopedia.) Herbal preparations have been used by cultures worldwide for thousands of years to treat conditions ranging from arthritis pain and menstrual cramps to depression, memory loss, and anxiety. Most herbal dietary supplements are bottled the same way as OTC medicines and vitamins, with the active ingredients highly concentrated into pills. This, however, is not the way native cultures consume herbs. The doses in OTC herbals are much higher than those found in the leaves and teas consumed by those who first discovered the benefits of these products.

The *San Diego Business Journal* estimated that in 2004, herbal dietary supplements were a $4 billion-a-year market in the United States. Anyone of any age can purchase them. However, some of the products warn that they should not be used by children under the age of twelve.

Herbals: Safety Issues. Many people who use herbal supplements are not aware that these products do not meet the same FDA requirements as medicines. Technically, herbal supplements are considered foods. Their labels are carefully worded so they don't imply that they will relieve any specific symptoms. Highlighting the many unknowns connected with herbal drug use, California congressman Henry Waxman noted in *Nutrition Action Healthletter* in 2003: "The dietary

"Tastes Like Candy" But It's Not

Manufacturers of children's multivitamins strive to make their products taste like candy so that kids will take them willingly. Many children's chewable vitamins look and taste like gummies or sweet and sour candies. One company, Vitaball, even sells a vitamin-packed chewing gum ball.

Like many OTC medications, however, vitamin and mineral supplements can be life-threatening at overdose levels. Small children are especially at risk because of their low body weight. In fact, a common cause of emergency room visits for children is vitamin overdose.

A multiple-vitamin overdose is very serious and requires immediate attention. Parents, babysitters, or other caregivers who suspect an overdose in a child should seek emergency medical care. In order to treat the overdose properly, doctors will need to know the patient's age, weight, the type and number of multivitamins taken, and any other health problems the child may have. Caregivers should not attempt to induce vomiting at home.

supplement market is the Wild West. . . . There are no requirements that a company prove anything about either the safety or the effectiveness of its products before they go to market."

After nearly thirty years of unregulated human use of herbal supplements, drug researchers began to pinpoint the dangers of specific substances. In 2004, for instance, the FDA banned the use of the natural supplement ephedra, also called *ma huang* (ma-HWANG), in any product sold in the United States. Ephedra has been used in China for thousands of years as a treatment for asthma (AZ-muh), a lung disorder that interferes with normal breathing. It contains substances very similar to AMPHETAMINES that can have a powerful stimulating effect on the heart. (A separate entry on amphetamines is available in this encyclopedia.) The FDA's ban came after research revealed that numerous deaths and injuries were linked to the use and abuse of the herbal supplement.

According to the *Nutrition Action Healthletter,* other herbal dietary supplements have been shown to produce serious side effects as well. For example, echinacea can cause stomach cramps, skin irritations, and other allergic reactions. Guarana (gwah-rah-NAH; *Paullinia cupana*), a plant that contains natural caffeine, causes the same symptoms as caffeine in use and overdose. Caffeine affects the brain, digestive system, heart and breathing rates, kidneys, body temperature, and other body functions.

St. John's wort may cause upset stomach, rash, fatigue, or restlessness. It should not be used in combination with any other PSYCHOACTIVE SUBSTANCES, including antidepressants, caffeine, anti-anxiety medicines, or drugs for ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) or SCHIZOPHRENIA. St. John's wort also reacts badly with certain prescription heart pills, drugs for high cholesterol (kuh-LESS-tuh-rol), oral contraceptives (birth control pills), blood thinners, and antacids.

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

psychoactive substances: substances that alter the user's mental state or change behavior

attention-deficit/hyperactivity disorder (ADHD): a disorder characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning

schizophrenia: a mental disease characterized by a withdrawal from reality and other intellectual and emotional disturbances

Weight Loss Preparations

Obesity and its related health problems were major concerns for doctors and patients in the early twenty-first century. Obese individuals weigh at least 20 percent more than their ideal body weight. The CDC's Division of Nutrition and Physical Activity (DNPA) noted that in 2005, more than 60 million Americans were obese. And since the 1980s, obesity has become more and more of a problem for children in the United States. According to the DNPA's "Overweight and Obesity" home page, "the percentage of young people who are overweight has more than tripled since

1980. Among children and teens aged 6-19 years, 16 percent (over 9 million young people) are considered overweight."

Weight gain usually occurs when people eat too much and/or exercise too little. In some cases, however, obesity is linked to serious health problems. The condition can be hereditary, which means it is passed on genetically from parent to child. It can also be a result of hormone imbalances. Whatever the cause, overweight or obese individuals face higher risks of heart trouble, high blood pressure, and diabetes than people who maintain an ideal weight.

Over-the-counter fad diet products rarely, if ever, fulfill their promises. Still, the diet pill industry reaps huge profits. In 2004, *Forbes* magazine estimated that Americans spend about $27 billion each year on "miracle" diet pills, powders, and other products. But weight loss is one health problem for which no quick fix exists. Through its food pyramid and other programs, the U.S. Department of Agriculture urges Americans to seek realistic weight loss solutions. The food pyramid shows the types of foods one should include in his or her daily diet, including dairy, grains, fruits, vegetables, meats, and beans. In 2005, the famous food pyramid was revised to include a little stick figure running up a flight of steps. This is a reminder that a balanced diet and daily exercise are the most effective ways to achieve a healthy personal weight.

OTC Pills and Herbals for Weight Control. Weight loss pills and herbal supplements both work by speeding up the body's METABOLISM. Diet pills generally contain some kind of amphetamine, and herbal supplements rely on plants that either contain caffeine or mimic caffeine's behavior in the body. Individuals who take diet pills may notice a "speedy" or "peppy" feeling, even at normal doses. In overdose, FDA-approved diet pills can cause agitation, anxiety, insomnia, hallucinations, heart palpitations, and high blood pressure. In 2004 the FDA banned the sale of the herbal weight loss supplement ephedra. Producers of herbal supplements have responded by creating a vast array of ephedra-free items for sale over-the-counter.

The manufacturer's label on most diet pills recommends using the products only for a few months. Some people ignore this important warning and continue taking the pills. Diet pills can be habit-forming and may produce WITHDRAWAL symptoms when discontinued. The most frequent withdrawal symptom is rapid weight gain. People who begin a program of OTC diet pills may find themselves hooked on the pills both physically and psychologically as they convince themselves that they will become obese again if they quit.

metabolism: the process by which food is converted to energy that the body uses to function

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

OTC Herbal Weight Loss Aids

Herbal supplements do not undergo the same kind of safety testing required for over-the-counter and prescription medications. Not much is known about the various herbs used for weight loss. What *is* known, say researchers, is that some of them may be dangerous. Popular herbal weight-loss preparations may include the following ingredients:

- *Bitter orange (Citrus aurantium)* contains a stimulant called synephrine (sinn-EFF-rinn) that mimics the behavior of adrenaline (uh-DREN-uh-linn) in the body. Synephrine is similar to ephedrine and pseudoephedrine in its chemical structure. The herb can, in some instances, boost heart rate and blood pressure, especially when taken in high doses.
- *Chitosan* is made of the fiber from the shells of lobsters and shrimp. It can cause death in individuals with seafood allergies and has not been proven to promote weight loss.
- *Chromium* is poisonous at high doses.
- *Garcinia cambogia* has not been proven effective in reducing weight, but it has been linked to breathing and digestive problems.
- *Usnic acid* can cause liver damage with prolonged use.

Motion Sickness Pills

Motion sickness, sometimes known as vertigo, does not affect everyone. For those who suffer from it, however, a car ride or an airplane flight can trigger a variety of uncomfortable symptoms, including sweating, dizziness, an increased heart rate, nausea, vomiting, and trembling. The disorder seems to be hereditary, passed down from parent to child. It stems from the way unpredictable movement affects an organ in the inner ear that controls balance. Anxiety about the symptoms can make the condition worse.

People who suffer mild cases of motion sickness can usually control the symptoms by breathing fresh air and by concentrating on a fixed point on the horizon. The symptoms end quickly when the car, boat, or plane trip ends.

OTC motion sickness pills contain antiemetics (an-tee-ih-MEH-tiks), compounds with the same active ingredients as antihistamines. Antiemetics are drugs that reduce nausea and vomiting. The FDA has approved two antiemetics for use in motion sickness medicines: dimenhydrinate (Dramamine) and meclizine hydrochloride (Antivert). It is important to note that the FDA has not approved the use of meclizine hydrochloride in children under twelve years of age.

Nonprescription Drugs Have More Side Effects Than You Might Think

Just because OTC drugs are available without a prescription doesn't make them safe for everyone. Dosage instructions must be followed exactly to avoid possible overdose, allergic reactions, and dangerous drug interactions. Consider these facts:

- *Acetaminophen* can damage the liver.
- *Caffeine* can cause increased heart rate, nervousness, and high blood pressure.
- *Chlorpheniramine maleate,* an antihistamine, can cause drowsiness, dizziness, nervousness, nausea, and irregular heartbeat.
- *Dextromethorphan hydrobromide* and related compounds can cause hallucinations, psychotic behavior (behavior associated with a dangerous loss of contact with reality, sometimes leading to violence against oneself or others), and an inability to move.
- *Diphenhydramine hydrochloride* can cause nervousness, anxiety, hallucinations, muscle tremors, and irregular heartbeat.
- *Pseudoephedrine hydrochloride* and related decongestants can cause nervousness, sleeplessness, dizziness, and anxiety.
- *Sucrose* can bring on a coma in people suffering from diabetes.

Bad Trips. From time to time, abusers of motion sickness medicine appear in clusters in various parts of the United States. At high doses, dimenhydrinate can cause intense and long-lasting hallucinations. It also affects the memory center in the brain, so sometimes the abuser cannot recall what has happened during the experience. Dimenhydrinate hallucinations are often frighteningly real to the user. The hallucinations may be visual, making everything seem liquid or producing visions of monsters, insects, or snakes. They may also manifest themselves as distorted sounds. Some users have even reported hearing voices. At very high doses, dimenhydrinate causes PARANOIA, difficulty breathing, convulsions, and coma.

Once the symptoms of a dimenhydrinate TRIP begin, it can take up to twelve hours for them to subside. The other motion sickness medicine available over the counter is a nondrowsy formula called meclizine hydrochloride. Like dimenhydrinate, overdoses of meclizine can cause hallucinations, muscle tremors, blurred vision, difficulty breathing, and in worse cases, convulsions and coma.

Users of motion sickness preparations need to take certain precautions. The drugs do not work after motion sickness symptoms start, so it is necessary to take the medication at least fifteen to thirty minutes before the bothersome motion begins. The pills usually work for eight to ten hours. Pregnant women and nursing mothers should consult a doctor before taking these drugs.

paranoia: abnormal feelings of suspicion and fear

trip: an intense and usually very visual experience produced by an hallucinogenic drug

Sleep Aids

Over-the-counter sleeping pills are intended for use by people who usually fall asleep easily. Every box of OTC sleep aids bears the warning: "For occasional use only." Individuals who suffer from a recurring inability to fall asleep—or stay asleep—should consult a doctor. Since one of the main causes of insomnia, or the inability to sleep, is pain, some OTC sleep aids contain ANALGESICS as well as active sleep-inducing compounds. Other products are formulated to bring on sleep during colds and flu.

The most common OTC sleep aids are antihistamines, including diphenhydramine hydrochloride and doxylamine succinate. These are the same ingredients in cold and allergy formulas that cause mild drowsiness. In long-term use or abuse as sleep aids, both compounds can actually make insomnia worse. In addition, they can increase agitation and nervousness in the user. As with other OTC drugs, it is important to treat only the symptoms of insomnia, and not medicate for cold, flu, or pain if those problems are not present.

Stimulants

Just as people sometimes have trouble falling asleep, others sometimes have trouble staying awake. OTC stimulants usually contain caffeine and are designed for occasional use only. Even at recommended doses, OTC stimulant products can cause nervousness and irritability. With regular use, OTC stimulants become habit-forming. Users quickly develop a TOLERANCE to these drugs. Extreme drowsiness and lack of energy may occur when OTC stimulants are discontinued.

Overdose symptoms of OTC stimulants include nervousness, insomnia, irregular or rapid heartbeat, convulsions, and coma. Stimulants that come in time-release preparations should never be crushed and consumed as powder. This increases the possibility of overdose and possibly fatal poisoning.

Reactions with Other Drugs or Substances

Mixing OTC and prescription drugs can have many adverse reactions, or negative side effects, depending on the medications being combined, the condition being treated, and the person taking the drugs. Certain combinations can affect blood pressure and breathing, alter one's heartbeat or heart rate, cause drowsiness or dizziness, and lead to nausea, diarrhea, and various other complications. In cases of pregnancy, many OTC and prescription drugs not only work on the mother, but can affect the baby as well.

analgesics: pain relievers or the qualities of pain relief

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

As such, people should always check with their doctor or pharmacist before starting any new medications and/or combining drugs. In addition, drug manufacturers include various warnings about drug interactions. The warnings are listed on the drug's box, bottle, or on paper instructions inside the package. Also, many pharmacies provide information for customers noting possible drug interactions. Before taking any drug, it's important to read all the warnings. People should also be aware of any effects associated with combining OTC drugs with alcohol, caffeinated beverages, herbal and dietary supplements, and various illegal drugs.

Anxiety, Allergy, and Cold/Flu Remedies

Anyone taking a prescription medication, particularly one for anxiety or depression, should ask a doctor before taking any OTC allergy preparation. Pregnant women and nursing mothers should avoid OTC allergy medicines altogether.

Manufacturers' labels on multi-symptom cold and flu medicines warn users not to drink alcohol—and sometimes even beverages containing caffeine—while taking these medicines. Alcohol can cause dizziness and disorientation, and it also dehydrates the body, possibly causing cold symptoms to last longer. In addition, patients taking prescription medicines should consult a doctor before adding cold and flu remedies to their mix of drugs. Substances such as diphenhydramine, dextromethorphan, and caffeine can react badly with prescription medicines for depression, anxiety, and liver problems.

Dextromethorphan may increase the effects of other drugs that cause drowsiness, including antidepressants, alcohol, antihistamines, SEDATIVES, pain relievers, anxiety medicines, seizure medicines, and muscle relaxants. Likewise, chlorpheniramine maleate and pseudoephedrine hydrochloride should not be mixed with other medications for colds or allergies, or with any type of TRANQUILIZER, sedative, or sleeping pill.

People with diabetes or allergies to artificial sweeteners should check the ingredients listed on any sore throat medication, cough syrup, or cough drop, since many of these substances contain some form of sugar or sweetener. Some cough syrups also contain alcohol.

sedatives: drugs used to treat anxiety and calm people down

tranquilizer: a drug such as Valium and Librium that treats anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens)

Motion Sickness, Diet Pills, and Sleep Aids

Mixing motion sickness medicines with alcohol, sedatives, tranquilizers, or other antihistamines can cause extreme drowsiness.

Diet pills should not be combined with antihistamines, certain prescription antidepressants, coffee or caffeinated soft drinks, or heart medications. Mixing diet pills with other drugs and substances can lead to high blood pressure and an irregular or rapid heartbeat.

Sleep aids should not be combined with alcohol, caffeine, or prescription medications for anxiety or depression. For OTC sleeping pills that contain the active ingredient diphenhydramine, use of Benadryl or any other diphenhydramine-containing medication should be stopped—even if it is only applied to the skin.

Stimulants and Laxatives

OTC stimulants should not be taken with coffee, tea, or other beverages containing caffeine because caffeine is a stimulant too.

Some laxatives can interfere with the absorption of other medicines. Anyone taking a prescription medication, or even an OTC preparation, should check with a doctor before using a laxative.

Treatment for Habitual Users

Although over-the-counter medications are legal, users can still become addicted to them, both psychologically and physically. In cases of overdose, a doctor or poison control center should be contacted immediately. Counseling with a licensed therapist or psychiatrist can help recovering abusers identify the underlying reasons for their attraction to the drugs.

Consequences

Over-the-counter drugs are capable of altering a user's judgment. Driving skills may become impaired, thus increasing the chance of a crash. Mixing alcohol with OTC medications typically intensifies the effects of a product's active ingredients, stripping users of their ability to reason and make levelheaded decisions. Abuse of nonprescription drugs also puts the user's general health at risk. Breathing difficulties, organ failure, and even death may result in cases of overdose.

The Law

OTC drugs are often the subject of research studies and make news headlines when people experience problems when taking certain drugs. Here's a look at some past and recent issues involving OTC drugs and the law.

Product Tampering

It is against the law to tamper with the packaging of any OTC medicine in order to change its ingredients or misrepresent its contents. Anyone who purchases an OTC preparation and finds the box open or the safety seals removed should return the medicine to the place of purchase immediately and report the discovery to both the store and the police.

Product tampering became a major issue in the early 1980s when someone poisoned several bottles of Tylenol capsules with cyanide. Several people in the Chicago, Illinois, area purchased the capsules and later died after taking the tainted pills. It was believed that someone had tampered with the bottles on the store's shelves. This tragedy led the makers of Tylenol and other products to create new safety seals—special wrappings placed securely over bottle tops, boxes, and other packaging that will clearly show any evidence of tampering. If the safety seal is broken, customers are advised to return the product to the store.

A worker is shown checking new bottles of the over-the-counter painkiller Tylenol in 1982. The bottles feature tamper-resistance packing, which was new at that time. The safety seals were added after seven people in the Chicago area were killed when they took Tylenol that had been poisoned with cyanide. *© Leif Skoogfors/Corbis.*

Intoxication

The word intoxication is most often used when describing someone who is drunk. When intoxicated, people lose physical and mental control. For example, their speech becomes slurred, they can't operate their cars safely, and they don't think clearly. Drugs, both legal and illegal, can cause intoxication, too. Individuals who abuse OTC drugs and cause crashes or injuries while under the influence of such drugs face charges similar to those imposed for driving drunk.

Over the Counter or Behind It?

As of 2005, some "over-the-counter" medications were being reclassified as "behind-the-counter" medications because of growing patterns of their misuse. The U.S. government had

not yet passed any laws against possession of dextromethorphan by the summer of 2005, even though the OTC ingredient has been linked to recreational substance abuse. Some large chain pharmacies have placed cold, cough, and allergy medicines containing dextromethorphan behind the counter. Other stores require proof of age before the product can be purchased. If recreational abuse of dextromethorphan continues or becomes more widespread, the FDA may decide to reclassify it as a prescription-only medicine.

Pseudoephedrine, the active ingredient in over-the-counter cold medicines such as Sudafed, caused a considerable legal stir in 2005. More and more states sought to limit sales of pseudoephedrine because it is used in the manufacture of the highly addictive drug methamphetamine. Pseudoephedrine became a "behind-the-counter drug" in more than a dozen U.S. states.

However, in August of 2005, Oregon became the first state to take it one step further. Oregon lawmakers introduced and passed a bill that would make cold and allergy medications containing pseudoephedrine available by prescription only. This action came after Oregon representatives put the "behind-the-counter" system to the test. According to Charles E. Beggs in an article on *KGW.com, Northwest NewsChannel 8,* Democratic representative Greg MacPherson and three of his colleagues "shopped for cold medicines . . . and easily bought enough in an hour to make several weeks' supply of meth for four users." Oregon's groundbreaking bill is scheduled to go into effect in mid-2006.

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See also: Alcohol; Amphetamines; Caffeine; Designer Drugs; Dextromethorphan; Diet Pills; Ephedra; Herbal Drugs; Methamphetamine

Oxycodone

Official Drug Name: Oxycodone hydrochloride (OKS-ee-COH-dohn high-droh-KLOR-ide); Percodan; Percocet; OxyContin
Also Known As: Hillbilly heroin, killers, OCs, oxies, oxycons, percs (perks), pink spoons, poor man's heroin
Drug Classifications: Schedule II, opiate

What Kind of Drug Is It?

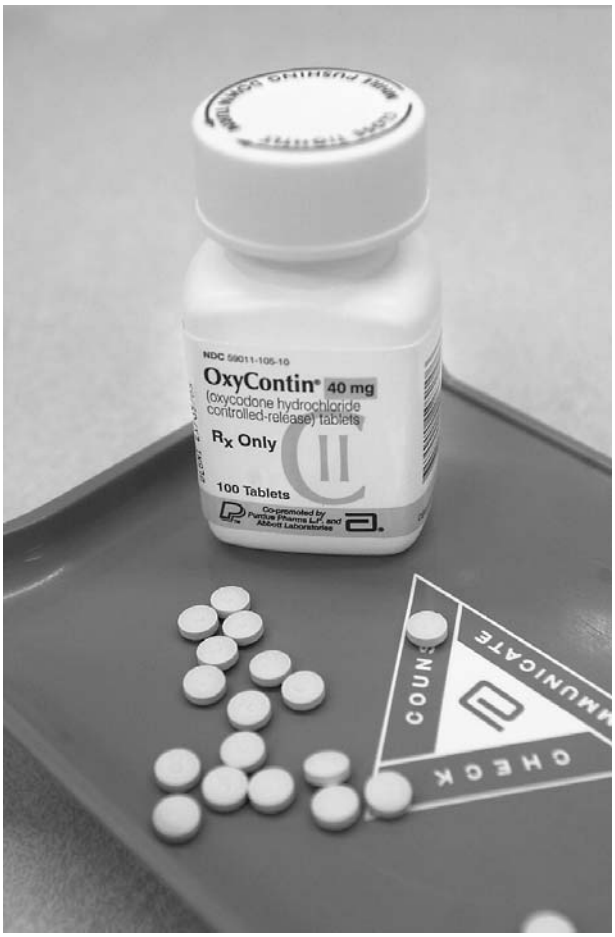
Oxycodone is a painkiller derived from the opium poppy plant. It is a synthetic drug, meaning that it is chemically altered in the laboratory. Sold mostly in prescription pill form, oxycodone is meant to be used by people suffering moderate to severe pain that is expected to last for more than a few weeks. The drug must be used with great care, since it can be habit-forming even for people who take it as directed. For those who use it illegally, it can be as addictive—and every bit as dangerous—as heroin. (An entry on heroin is available in this encyclopedia.)

Oxycodone can be found in many prescription painkillers. But it is mainly associated with three brand-name drugs: 1) Percocet, a combination of oxycodone hydrochloride and acetaminophen (Tylenol); 2) Percodan, a combination of oxycodone hydrochloride and aspirin; and 3) OxyContin, a time-release formula of oxycodone hydrochloride. These prescription medicines also find their way into drug dealers' hands and are sold to users who want to get high. Since its introduction in the mid-1990s, OxyContin, in particular, has become a widely abused drug in some parts of the United States. The federal government and the maker of the drug, Purdue Pharma, are working together to reduce OxyContin abuse.

Overview

For many thousands of years, people have used the dried sap of the opium poppy plant to ease pain and to experience a feeling of well-being. (An entry on opium is available in this encyclopedia.) Ancient writings from Greece, Egypt, and Rome all describe many uses for opium, including its ability to poison and kill people. In 1524 Swiss doctor Paracelsus (1493-1541) mixed opium with alcohol and called it *laudanum,* the Latin word for "to be praised." In the nineteenth century, chemists figured out how to separate opium into its three main components or active ingredients: morphine, codeine, and THEBAINE. (Entries for morphine and codeine are available in this encyclopedia.)

thebaine: pronounced thee-BAIN; one of the active alkaloids in opium, used to create synthetic painkillers



The federal government and Purdue Pharma, the makers of OxyContin, are working together to reduce abuse of the drug, which is available legally by prescription. *Photo by Darren McCollester/Getty Images.*

Oxycodone is created in laboratories using thebaine. It was first developed in Germany in 1916, in one of many attempts to formulate a painkiller that would not be habit-forming. Earlier attempts to isolate the painkilling features of opium from its mind-altering and addictive traits were unsuccessful. Oxycodone proved to be no different. It worked as an analgesic, or painkiller. However, it also created euphoria, a state of extreme happiness or feelings of well-being. Euphoria occurs with all OPIATES.

In the twentieth century, oxycodone was used primarily as a short-term pain reliever in cases where aspirin or acetaminophen (Tylenol) did not produce enough relief. People who had dental surgery, minor injuries, or post-childbirth discomfort would typically take Percodan or Percocet for a few days or weeks. Then they stopped the medicine without side effects when the pain went away. Percodan was usually prescribed for pain accompanied by swelling or inflammation.

Typically, Percodan and Percocet tablets work for about four to six hours. They can cause upset stomach or nausea. Therefore, they are not very useful for people suffering from long-term pain caused by cancer, osteoarthritis (ARTHRITIS of the bones), severe back injuries, and certain neurological (nerve) disorders. Patients with these disorders might find themselves waking up in the middle of the night, in pain, with the medicine having worn off. Many pharmaceutical companies worked to find strong pain relievers that would last twelve hours or longer, so people could take fewer doses of medicine during the day and sleep through the night.

opiates: drugs derived from the opium poppy or synthetically produced to mimic the effects of the opium poppy; opiates tend to decrease restlessness, bring on sleep, and relieve pain

arthritis: painful swelling of joints caused by abnormal bone growth or wear and tear on the joint

Viewed as a Breakthrough in Pain Management

When Purdue Pharma introduced OxyContin in 1995, the company was confident that it had created a product to help the millions of people suffering chronic (ongoing) moderate to severe pain. OxyContin pills were formulated to dissolve slowly and release

oxycodone into the bloodstream at a regular rate. One OxyContin tablet is meant to last twelve hours. When used properly, it does not cause major mind-altering effects. In terms of strength, OxyContin falls between morphine, a powerful painkiller, and codeine, a milder variation usually used in cough medicines. The chemists at Purdue Pharma thought they had created a safe product that, when used correctly, could help people in pain to function normally and to sleep at night.

OxyContin was released as a Schedule II controlled substance requiring a prescription from a doctor certified by the U.S. Drug Enforcement Administration (DEA). It was originally available in doses of 10 milligrams (mg), 20 mg, 40 mg, 80 mg, and 160 mg. The lower doses could be prescribed to people who had never used opiate painkillers before. The higher doses—80 and 160 mg—were recommended only for people with some tolerance, or prior use, of opiates. Tolerance occurs when users need more and more of a drug to create the medication's original effect. The scientists at Purdue Pharma also believed that, in some cases, OxyContin could be prescribed for use "as needed" for flare-ups of pain that were not constant, or for minor post-surgical pain.

Beginning in 1996, Purdue Pharma started an aggressive campaign of marketing and education about OxyContin. The company sought to teach not only pain specialists about the drug, but also primary care doctors ("family doctors") who might not know as much about opiate medicines. At the same time, the Food and Drug Administration (FDA) required that every OxyContin prescription contain a warning that crushing or chewing the pills would release a massive dose of oxycodone all at once, with possible deadly results.

Sales and Misuse Skyrocket

What happened over the next four years took both the FDA and Purdue Pharma by surprise. Legal sales of OxyContin skyrocketed. "By 2001, sales had exceeded $1 billion annually, and OxyContin had become the most frequently prescribed brand-name NARCOTIC medication for treating moderate-to-severe pain in the United States," noted researchers for the U.S. Government Accountability Office (GAO) in *America's Intelligence Wire.* At the same time, the GAO report stated, drug abusers quickly learned that crushing and snorting, eating, or injecting OxyContin could produce a fast high similar to that of heroin. "The safety warning on the label that advised patients not to crush the tablets . . . may have inadvertently alerted abusers to a possible method for misusing the drug," the report concluded.

narcotic: a painkiller that may become habit-forming; in a broader sense, any illegally purchased drug

Steven Steiner Sr. sits next to a photo of his son, Stevie, who died of an OxyContin overdose in Florida. Steiner founded DAMMADD (Dads and Moms Against Drug Dealers) in 2001 to raise drug awareness and get drug dealers off the streets. *AP/Wide World Photos.*

Within three years of OxyContin's release, abuse of the drug was reported in Appalachia, the mountainous parts of the states of Virginia, West Virginia, Maryland, Kentucky, and Pennsylvania. Illegal use also occurred in Maine, Ohio, Florida, and some of the large cities in the northeastern United States. The DEA confirmed 146 deaths from OxyContin overdose between 2000 and 2001. Some of these deaths occurred in patients who were prescribed the product legally for relief of pain. However, most of the deaths were related to recreational use, which is using the drug to get high, not for medical reasons. During the same period, drug abuse clinics in rural areas began to see many more patients suffering from addiction to OxyContin.

In 2001, the FDA and Purdue Pharma introduced a "risk management plan" to try to stop OxyContin from entering the illegal drug market. The highest dose of the medication was removed from the market. Purdue launched a Web site aimed at teens called *painfullyobvious.com* to alert abusers to the dangers of addiction and sudden death from improper use. The FDA also strengthened the language in the warning labels placed on OxyContin products. Even so, in 2001 and 2002, sales of OxyContin exceeded $1 billion per year, according to the GAO report. The 2004 Monitoring the Future survey reported a "significant increase" in OxyContin abuse among teenagers between 2002 and 2004.

Ruining Lives

"I got a doctor who was sold on the drug and didn't know what he was doing. I lost my job, my home, my health care and my once hard-earned future plans."

—Betty Tully, age 41, at an Orlando, Florida, protest against Purdue Pharma, the maker of OxyContin. (This quote appeared in a November 17, 2003 article in the *Orlando Sentinel*.)

The Problems of Abuse

The fallout from abuse of OxyContin has been devastating for legal users and abusers alike. Patients suffering from real pain find it difficult to get prescriptions for the product because doctors fear being seen as lawbreakers. People who have used OxyContin recreationally face all the difficult physical and psychological issues of addiction and withdrawal. People undergoing withdrawal experience various physical and psychological symptoms as they gradually reduce the amount of drug taken until they can stop all use. Purdue Pharma is working on variations of OxyContin that will not be suitable for abuse. However, the company predicts it may be years before such a product finds its way into pharmacies.

While overall use of illegal drugs is down in the young adult population, the misuse of prescription painkillers is on the rise. National drug task forces and "risk management plans" seek to educate all users about the dangers of strong opiate medications and the harmful effects their misuse can have.

What Is It Made Of?

Oxycodone is created from thebaine, one of twenty ALKALOID compounds in the opium poppy plant. Of the various alkaloids in opium, the most important are morphine, codeine, and thebaine. Thebaine does relieve pain, but it also causes the opposite of euphoria, better known as *dysphoria* (diss-FOR-ee-yuh), a feeling of depression and anxiety. Thebaine is altered to form oxycodone.

alkaloid: nitrogen-containing substances found in plants

The drug works more like morphine and codeine. At comparable doses, oxycodone is not as strong as morphine but is stronger than codeine.

When mixed with over-the-counter analgesics such as aspirin or acetaminophen, oxycodone provides a boost of pain relief beyond the power of the over-the-counter drugs. These products come in pill or liquid form. OxyContin, which also comes in pill form, is simply oxycodone hydrochloride with no other active ingredients. The oxycodone is embedded in a slow-dissolving, inactive compound that releases the medicine into the bloodstream at regular intervals. Because the drug releases slowly, each OxyContin pill has a high dose of the drug, much more than the patient needs hour by hour.

How Is It Taken?

The immediately acting forms of oxycodone are best known under the brand names Percodan, which contains aspirin, and Percocet, which contains acetaminophen. They come in pill or liquid form and are meant to be taken every four to six hours as needed for pain. Doctors prescribe Percodan for patients who have swelling or inflammation because aspirin reduces swelling. The pills generally begin working within thirty minutes and wear off slowly. Patients using Percodan and Percocet need to follow doctors' orders, as an overdose of aspirin can lead to internal bleeding, and an overdose of acetaminophen can cause liver damage. (An entry for over-the-counter drugs is available in this encyclopedia.)

OxyContin comes in pill form and begins working within minutes of being swallowed. Its continuous-release formula sends small amounts of the painkiller into the bloodstream regularly, so that patients do not feel the return of pain or "breakthrough" pain during the twelve hours when the dose is in the body. (Breakthrough pain is a bout of intense pain that occurs rapidly and lasts several hours, despite the patient's use of longer-acting pain medicine.) Because the oxycodone releases slowly, patients using the medication properly also do not feel the side effects of opiate use, or feel the effects only slightly as a bit of dizziness or drowsiness. Upset stomach sometimes occurs with Percodan and Percocet, but is usually not seen with OxyContin.

Are There Any Medical Reasons for Taking This Substance?

Almost everyone will experience a period of pain sometime in life. Doctors deliver babies, remove wisdom teeth, set broken bones, and perform surgery on the internal organs. In almost all

of these cases, recovering patients receive some sort of opiate or OPIOID painkiller for various periods of time after a medical procedure. Usually patients in these cases are eager to quit using the pain pills as they start feeling better. These patients either cease using the prescription drugs and move to over-the-counter drugs, or they just stop all pain medication.

OxyContin was released to the U.S. market at a time when patients and medical providers were voicing concerns about the need for better pain management for a number of chronic, or ongoing, pain disorders. Cancer patients often suffer a great deal of long-lasting pain as growing tumors press on nerves and vital organs. People with back injuries and HERNIATED DISKS suffer constant pain that disrupts sleep and activity. Arthritis is a condition of abnormal bone growth that can cause intense pain, stiffness in joints, and difficulty in movement. Some types of nerve damage result in pain or numbness in the limbs, hands, and feet. Patients with these illnesses sometimes cannot function very well or at all without a treatment program of prescription pain relief.

When properly administered by a doctor who understands the properties of opiates, oxycodone products provide relief for moderate to severe pain without the more sedating side effects of morphine-derived medications. The products have a legitimate medical use.

No Relief for Those in True Need

"I went to pharmacies all up and down Broad Street, and none of them would fill my prescription. I say to the pharmacist, 'You know me. You know I have cancer. You know I need this.' But the pharmacist just looked at me and said, 'Can't do it, Joe. There's too much heat on us right now.'"

—Lung cancer patient Joseph Cassada, age 41, on his inability to fill a valid prescription for OxyContin in Philadelphia, Pennsylvania. (This quote appeared in a September 4, 2001 *Philadelphia Inquirer* article by Elisa Ung.)

Usage Trends

Shortly after its introduction into the prescription market in the mid-1990s, OxyContin became one of the most popular medications for moderate to severe pain. By 2001 it was the nation's top-selling prescription pain reliever, according to the GAO report. More than 7 million prescriptions were being written for the drug each year. This success provided 90 percent of Purdue Pharma's sales income for the year 2002. The drug was being marketed not only to cancer, arthritis, and back pain patients, but also to those with acquired immunodeficiency syndrome (AIDS), people injured in automobile crashes or sporting events, and people with many kinds of moderate pain.

opioid: a substance created in a laboratory to mimic the effects of naturally occurring opiates such as heroin and morphine

herniated disk: a rupture of a spinal disk that puts painful pressure on nerves in the spinal column

Due to two break-ins in two weeks, the owners of this pharmacy in Kentucky added several security devices, including a glass partition and steel vault. The rise of prescription drug abuse, especially of painkillers like OxyContin, has made pharmacies a target for drug theft. *AP/Wide World Photos.*

Abuse on the Rise

Beginning in the rural areas of Appalachia, law enforcement officers saw OxyContin falling into illegal use. Some sources claim that the Appalachian region has physically difficult jobs in coal mining and timber production. Thus, many people there need pain pills. Some of the area's people are also poor. Some patients discovered that they could get a prescription for OxyContin at a cost of two to four dollars per pill and then sell the drug illegally for as much as forty dollars per pill. Theft of prescriptions from homes, and theft of OxyContin from pharmacies, followed.

Illegal use of OxyContin only accounts for a small percentage of its users, however. Doctors prescribe the vast majority of the medicine to people who report pain. Of course, some doctors are dishonest, and

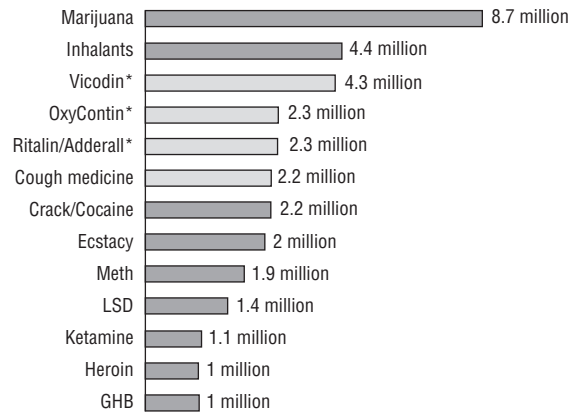
some patients are not honest either. Some patients "doctor shop," moving from one doctor to another, reporting the same symptoms, and getting prescriptions from each doctor. A number of doctors have been arrested and jailed for writing too many prescriptions for narcotics such as OxyContin. Sometimes thieves steal prescription pads and write their own orders for drugs.

According to the Monitoring the Future survey, OxyContin abuse is now widespread throughout the United States, and it is growing. The report noted that 5 percent of twelfth graders, 3.5 percent of tenth graders, and 1.7 percent of eighth graders had used OxyContin at least once in 2003. A 2004 *Newsweek* story declared that illegal OxyContin use had spread to twenty-three states, including areas of New England, the Mid-Atlantic, the Southeast, Ohio, and Alaska. The hardest-hit state is Kentucky.

In 2005, the Partnership for a Drug-Free America released the results of its study on teens and substance abuse. The survey found that teens were increasingly abusing prescription drugs such as OxyContin, Vicodin, Ritalin, and Adderall (see chart). As a result of this trend, youth were called "Generation Rx." However, oxycodone is not just abused by teens. Use of the drug reaches all segments of society—young and old, rich and poor, males and females. In 2003, the *Orlando Sentinel* reported that most of the deaths in Florida from oxycodone "were middle-age white men." As such, the drug's nickname "hillybilly heroin" is misleading.

New trends in substance abuse, 2004

Number of teens who have ever tried (in millions)



*That a doctor did not prescribe them
Note: Light gray graphs indicate the new category of drugs (Rx and OTC medications) that teens are using increasingly to get high.

SOURCE: Table 2, "Generation Rx: National Study Reveals New Category of Substance Abuse Emerging: Teens Abusing Rx and OTC Medications Intentionally to Get High," *The Partnership for a Drug-Free America Web site,* New York, NY [Online] http://www.drugfree.org/Portal/About/NewsReleases/Generation _Rx_Teens_Abusing_Rx_and_OTC_Medications [accessed May 25, 2005].

Effects on the Body

Pain relievers such as aspirin and ibuprofen work at the site of the pain to reduce irritation. Oxycodone works differently. It moves into the brain and central nervous system and binds to receptors (nerve endings) that seek pleasure-enhancing and painkilling NEUROTRANSMITTERS. Once the brain receives the medicine's message in its receptors, the patient no longer feels the pain. The condition causing the pain does not change, but the patient relaxes and the sensation of the pain is gone.

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

Taken as directed, oxycodone-containing medicines generally cause few side effects. Patients may feel slightly nauseous, drowsy or dizzy, or have a little less energy. They may also experience constipation, the inability to have a bowel movement, which is a common side effect of all opiate medicines. When the patient's pain improves, the doctor may slowly taper the dose of painkiller so that the patient does not experience any symptoms of withdrawal from the medicine. Gradually the dose is lowered until it is no longer needed. The recovery is complete.

For patients with ongoing or chronic pain, such as those suffering from cancer, the doctor may increase the dose of oxycodone over time as the pain worsens. The patient may also develop a tolerance to the drug and need more medicine to achieve the same results. This can be done safely if the patient has been taking opiate medications for some time.

A Dangerous Addiction

When oxycodone painkillers are abused, their effects are similar to the heroin high. This is because each extended-release dose of oxycodone contains a large amount of the drug. It is designed to be taken slowly, not to flood the body all at once. When crushed and eaten, snorted, or injected, a high dose of oxycodone floods the body and causes a rush of euphoria. The drug literally overwhelms all of the brain's receptors that search for ENDORPHINS (natural pleasure-enhancing molecules) and ENKEPHALINS (molecules that act to relieve pain and to produce drowsiness). The user feels free of pain, anxiety, and unhappiness.

After a few minutes of this intense euphoria, the user settles into a longer period of general pleasurable drowsiness and a dream-like state. A mild allergic reaction may cause the skin to itch or to break out in a rash. Gradually, as the drug exits the brain, the heightened pleasure is replaced by a sensation of unease—a return to "normal" that may send the user in search of another dose of the drug.

OxyContin is particularly dangerous in abuse situations because crushing it releases a very high dose of the drug. All opiates work on the part of the brain that controls breathing. An overdose of any of them can cause a user to stop breathing. If the user is alone at the time, he or she could die of suffocation. The inability to breathe is one of the leading causes of death in oxycodone overdose cases. (Warning labels on each bottle alert the user to this possibility.) In the case of an oxycodone overdose, which leads to coma and irregular breathing, the patient should be rushed to an emergency room,

endorphins: a group of naturally occurring substances in the body that relieve pain and promote a sense of well-being

enkephalins: pronounced en-KEFF-uh-linz; naturally occurring brain chemicals that produce drowsiness and dull pain

Since its introduction in 1996, OxyContin has become a widely abused drug in the United States. As of 2004, some 2.3 million teens had tried the drug illegally.

where doctors will administer the drug naloxone (Narcan), a chemical that quickly rids the body of opiates.

More Dangers

Some drugs need to "build up" in the body before the user suffers a fatal overdose. That is not the case with opiates. They can be fatal with the first use, or at any time. Even people with a high tolerance for oxycodone can experience breathing problems if they take the medicine improperly. Abusers run a high risk of fatal breathing problems each time they mishandle a pill.

Repeated use of oxycodone, especially to get high, causes tolerance and addiction. Users will need higher and higher doses of the medicine to achieve the high. As the drug wears off, the body will react with uncomfortable withdrawal symptoms. These include

Three Types of Doctor Shoppers

"Doctor shoppers" are people who visit more than one doctor so they can get multiple prescriptions for the same medication. Fred Gebhart, in *Drug Topics,* identified three different kinds of doctor shoppers, with three different reasons for engaging in this illegal activity:

- *Intentional Diverters* are people who visit several doctors to obtain pills that they can sell illegally for profit.
- *Accidental Shoppers* are people who see a number of different specialists for various ailments. They do not let the doctors know when they are prescribed a drug by a different physician. Accidental shoppers run the risk of having bad drug interactions or even an overdose if more than one doctor issues a prescription for pain.
- *Productive Shoppers* are people who cannot get enough pain relief from one doctor. They keep going to other doctors until they receive enough medication to manage their pain. These shoppers engage in this activity because some doctors under-prescribe painkillers for people in real need of relief.

yawning, restlessness and anxiety, insomnia, "goose bumps," cold sweats, sharp pains in the stomach, vomiting, diarrhea, muscle aches and tremors, and runny nose. As the abuser faces these uncomfortable symptoms, he or she is aware that more of the drug will ease these effects. The knowledge that the drug can make one feel better, even if only for a short period, becomes the greatest difficulty facing the recovering addict. Users sometimes forget that the short-lived high will again be followed by uncomfortable withdrawal symptoms.

Even after the immediate withdrawal symptoms ease, the addict will feel irritable, depressed, and dissatisfied with life—a syndrome called dysphoria. This general awareness of just feeling bad makes addicts want to return to drug use. And some are unable to fight off their addiction to the drug. A former OxyContin abuser told the *Washington Times* that the drug "put me on a path straight for hell with no exit ramps. . . . That pill was made by the devil himself. It ruins your family and your relationships, your children's lives, your closest family to you, your job. One day you try to quit and two or three days later, you're puking your brains out."

Reactions with Other Drugs or Substances

Patients who receive a prescription for a drug containing oxycodone should talk to their doctors about all other medicines they are taking. Since oxycodone is a painkiller, it is dangerous to combine it

with over-the-counter pain relievers, cold and flu remedies, allergy medications, sleep aids, and even some herbal dietary supplements. This is particularly true of the Percodan and Percocet combinations, since they already contain over-the-counter pain relievers. Overdose of aspirin and acetaminophen can be life-threatening.

Oxycodone causes drowsiness and slows breathing, so it should not be combined with antidepressants, antihistamines (allergy ingredients), SEDATIVES, TRANQUILIZERS, anti-anxiety drugs, prescription sleeping pills, or muscle relaxants. Mixing alcohol and oxycodone can be deadly, as both substances depress the central nervous system and can lead to breathing problems, loss of coordination, and coma.

Emergency room visits for drug overdose often involve more than one substance. Needless to say, it is highly dangerous to mix oxycodone with any illegal drug, including marijuana, cocaine, hallucinogens such as LSD, ecstasy, or especially heroin.

People being treated for the following conditions should avoid medicines containing oxycodone: 1) liver or kidney disease; 2) thyroid problems (the thyroid is a gland in the neck that produces many hormones that help regulate the body's chemical balance); 3) Addison's disease (a disease of the adrenal glands, which release hormones that are found on top of the kidneys); 4) prostate problems (the prostate is a gland found in men, resting under the bladder, that contributes to the formation of semen); 5) gallbladder disease (the gallbladder is a small sac under the liver that stores bile used in digestion). In addition, anyone who has been treated for a mental disorder, or anyone with a past history of substance abuse, should tell his or her doctor of these issues before beginning oxycodone therapy.

Treatment for Habitual Users

Recovery from opiate addiction is an ongoing process. It cannot be achieved without the help of medical professionals and the support of counselors or programs such as Narcotics Anonymous. Often the drug abuser must face a whole change in lifestyle, in order to avoid the friends, places, and situations associated with the drug abuse originally.

Treatment for oxycodone addiction usually begins in a clinical setting, in a rehabilitation center or hospital. There, the addict is given medications to soothe the withdrawal symptoms and counseling to understand what will happen when he or she returns to daily life. If the rehabilitation is mandatory as a result of a drug arrest, the addict may also have to attend "drug education" classes and take urine tests to prove he or she is remaining drug-free.

sedatives: drugs used to treat anxiety and calm people down

tranquilizers: drugs such as Valium and Librium that treat anxiety; also called benzodiazepines (pronounced ben-zoh-die-AZ-uh-peens)

Rush Limbaugh

In October of 2003, radio personality and political commentator Rush Limbaugh publicly admitted that he had become addicted to OxyContin. Limbaugh's confession occurred after his housekeeper claimed that Limbaugh had purchased more than 30,000 prescription painkillers, including OxyContin. Evan Thomas reported in *Newsweek* that the housekeeper claimed that Limbaugh took as many as thirty OxyContin tablets a day.

Limbaugh has a history of back problems dating to his youth. To deal with his addiction, he checked himself into a thirty-day rehabilitation center. He returned to his radio work when the rehab concluded.

Sometimes addicts will undergo several rounds of rehab before finally ending all drug abuse. Self-help groups such as Narcotics Anonymous can be very supportive because the members of the group understand how difficult it is to be drug-free after having a habit. Narcotics Anonymous offers group talk therapy, a "buddy system" that pairs new members with older members, and telephone hotlines for those wishing to end destructive drug use.

In some parts of the country, certain clinics have tried "rapid detox" for opiate addiction. This highly controversial DETOXIFICATION procedure involves putting a patient to sleep and then administering a dose of naloxone to rid the body of opiates. The procedure has not been proven to keep opiate abusers drug-free, and it has potentially dangerous side effects. Most health care workers do not approve of this treatment, and it has been outlawed in the state of New Jersey.

Dependency

People who take oxycodone for pain relief may also develop a DEPENDENCE on the drug. It is necessary to have an honest and trusting relationship with the prescribing doctor and to keep that doctor informed of any changes in the level of pain or the mind-altering effects of the oxycodone. Elderly patients in particular should be closely monitored for any dizziness or changes in motor control that may lead to a fall or other injury. Anyone taking oxycodone products should be completely honest with the prescribing doctor about all other prescription medicines being taken and all other doctors and specialists being consulted for ailments. This reduces the risk of drug interactions and dependency.

detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

dependence: a physical need for a drug in order to ward off withdrawal symptoms

Consequences

One of the consequences of oxycodone abuse is that people in real severe pain often cannot get enough medicine to treat their conditions. Cautious doctors sometimes under-prescribe pain medicines, fearful that the government will arrest them if they are seen as too

Prosecutor Theodore Romankow informs reporters in New Jersey in November 2004 about the bust of a major drug ring that dealt OxyContin. As part of "Operation Dr. Feelgood," authorities nabbed suspected drug dealers and suppliers in several states. *AP/Wide World Photos.*

generous with Schedule II narcotics. Doctors are also aware that some patients might take the painkillers improperly, leading to sudden death. As a result, many people have to live with levels of pain that could be treated effectively. For cancer and AIDS patients, for instance, this can be very frustrating. For some sufferers, it can lead to desperate doctor shopping and, ultimately, the wrong dosage being taken.

The consequences of oxycodone abuse are similar to those of heroin abuse. In periods of heavy use, people become consumed by the drug and spend all their money and time trying to find more of it. Some oxycodone addicts resort to theft or robbery to obtain money and drugs. They might turn to drug dealing to support their habits. They may also engage in prostitution to earn money for drugs. All of these criminal activities put people at risk for arrest and imprisonment.

One consequence of oxycodone abuse may come back to haunt the recreational user years later. If it is difficult for cancer patients with no history of drug abuse or mental illness to receive prescriptions for oxycodone, it is far more difficult for past drug users to receive pain prescriptions when they actually need the medicine. A drug conviction as a youth may lead to suffering from untreated pain as a senior citizen.

Dangers

People who crush OxyContin tablets and dissolve them in water to inject the drug run several risks. Small, undissolved particles of a pill can lodge in blood vessels and cause damage or blockage. The use of shared hypodermic needles is one of the major ways that people contract human immunodeficiency virus (HIV), the virus that can lead to AIDS, as well as several types of hepatitis, a contagious liver disease.

It should never be assumed that because OxyContin is a prescription drug, it is somehow "safer" to abuse than heroin. Both substances work the same way in the brain. Both lead to addiction and withdrawal symptoms. And both can lead to long-lasting health, legal, financial, and social consequences for individuals and their families.

The Law

The drugs in the oxycodone family are Schedule II substances as defined by the U.S. Controlled Substances Act of 1970. The U.S. government deems these medicines useful, but also dangerous due to their high potential for addiction and overdose.

It is against state and federal law to obtain a prescription for oxycodone when not in pain. It is illegal to seek multiple prescriptions from different doctors. That is called "doctor shopping." It is unlawful to sell or give a prescription to someone else, even if that person is sick and in pain. It is also against the law to forge a prescription or to alter a prescription—for instance, adding another "0" to 30, in order to make it 300. An alert pharmacist can usually spot forged or altered prescriptions and will telephone the prescribing doctor for confirmation.

The DEA monitors doctors who dispense prescriptions for Schedule II drugs. Some doctors have been convicted and imprisoned for writing too many prescriptions for oxycodone drugs, or for selling the drugs on site. In 2002, a Florida doctor was sentenced to more than sixty years in prison after four of his patients overdosed

on OxyContin. Florida prosecutors proved that the doctor was running a "pill mill," selling to addicts and drug dealers.

Legal Consequences

Sentences for possession and sale of Schedule II controlled substances vary from state to state and can be harsh. First-time offenders are usually ordered into rehab programs, placed on probation, and given fines and random drug tests for up to a year after the court date. Dealers often face jail time and criminal records that can forever alter their ability to find good jobs, obtain college loans, and sometimes even hold a valid driver's license.

The U.S. government is working closely with state and local law enforcement, and with the pharmaceutical companies, to curb the illegal use of oxycodone-containing medications. Their goal is to make these substances available only to those who really need them for their intended purpose—the relief of pain.

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See also: Codeine; Heroin; Hydromorphone; Methadone; Morphine; Opium; Over-the-Counter Drugs

PCP (Phencyclidine)

Official Drug Name: Phencyclidine (fenn-SY-kluh-deen), phencyclidine hydrochloride, phenyl cyclohexyl piperidine (FENN-uhl SY-kloh-HEK-suhl py-PEH-ruh-deen), Sernylan, Sernyl
Also Known As: Angel dust, boat, dust, elephant, hog, ozone, PCE, PCP, rocket fuel, sherm, shermans, tic tac, wack; (when combined with marijuana) killer joints, killer weed, lovelies, supergrass, superweed, wets
Drug Classifications: Schedule II, hallucinogen

What Kind of Drug Is It?

Phencyclidine, commonly known as PCP, can be classified both as an hallucinogen and as an anesthetic. For legal purposes, the U.S. Drug Enforcement Administration (DEA) considers PCP an hallucinogen, meaning it can make people see, hear, feel, and otherwise sense things that are not real. Scientists classify it as a DISSOCIATIVE ANESTHETIC. Dissociative refers to a feeling of being disconnected from one's body. An anesthetic is a substance that causes a loss of sensation in the body.

Depending on the dosage, PCP also acts as a depressant or as a stimulant, slowing down or speeding up normal body functions. PCP can do all of these things, and in addition, it can have many other weird, unpredictable, and dangerous side effects.

PCP is a synthetic substance, meaning that it is made in a laboratory. The ingredients used in its manufacture are completely artificial and not found in nature. The only way to create it is to use industrial chemicals. Many authorities on drug use consider PCP among the most dangerous substances of abuse. What is sold on the street as pure PCP is usually quite impure.

Typically, PCP is mixed with other substances, which can have their own harmful effects and can add to the drug's risks. Furthermore, because many people know how harmful and unpleasant the effects of PCP can be, drug dealers will often come up with a new name for their product in order to convince potential buyers to try it. Thus, someone who is actually trying to buy PCP may end up with something else, while someone trying to buy another drug may really be given PCP.

Overview

PCP was developed in the 1950s as an anesthetic. It showed promise for use in humans during surgery because of its strong numbing effect. However, the drug also has a dissociative effect, meaning it causes users to feel disconnected from their bodies. During the 1960s, PCP's dangerous side effects began to be noticed. The authors of the National Institute on Drug Abuse (NIDA)

dissociative anesthetic: pronounced dih-SOH-shee-uh-tiv ANN-ess-THET-ik; a drug that causes users to feel as if their minds are separated from their bodies

PCP's primary action is dissociative, meaning that it makes the mind feel separated from the body. This can be very scary for some people, and they tend to panic as a result. *Victor Habbick Visions/Photo Researchers, Inc.*

research report titled "Hallucinogens and Dissociative Drugs" explained, "PCP was used in veterinary medicine but was never approved for human use because of problems that arose during clinical studies, including DELIRIUM and extreme agitation experienced by patients emerging from anesthesia." Frequently, patients who had been given the drug became violently upset and imagined terrible things were happening to them when the dose began to wear off.

In 1978, all legal manufacture of PCP was stopped in the United States because street use was becoming too widespread. Illegal laboratories still continued to produce the drug because it is fairly easy and cheap to make. According to "DEA Briefs &

delirium: a mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating

Background: Phencyclidine (PCP)," its manufacture is centered in the Los Angeles area in California, although illegal laboratories have been found in other places around the country.

Illicit Drug Manufacturers "Pass Off" PCP as Other Drugs

Street use of PCP was fairly widespread during the middle and late 1960s. However, the many horror stories associated with its use caused its first wave of popularity to be rather short-lived. It continues to reappear on the street decade after decade, going by a wide variety of names. Experienced drug users know that PCP has very dangerous and frightening effects. Yet, drug dealers keep selling it because of the huge profits they can make.

What Is It Made Of?

PCP has no links to anything that is found in nature. The only way to make it is to combine dangerous industrial chemicals. One ingredient is cyanide (SY-uh-nide), a deadly poison. Other ingredients are chemicals that may otherwise be used to make plastics, paint remover, motor fuels, and other products. In fact, one of the clues that frequently leads to the discovery of an illegal PCP laboratory is the strong odor of chemicals. Labs are also found due to explosions or fires caused by careless handling of these chemicals by the illegal drug manufacturers. When found in large amounts, PCP gives off a powerful odor like that of ammonia.

Use of Dangerous Fillers

In its purest form, PCP is a white, crystalline powder. When mixed with water, it dissolves quickly and produces a clear liquid. Absolutely pure PCP is considered very rare on the street, however. Even though it is inexpensive to make, dealers usually cut it, or blend it, with other substances, so that they can turn a higher profit. PCP manufacturers sometimes cut their product until there is as little as 5 percent of PCP in the mixture. The added substances can alter the appearance of the drug, making it tan, orange, or brownish in color. The extra ingredients may change it from a powdery form into something more like sludge. Many substances are used to cut PCP, and some of them have their own harmful effects on the body.

In addition to intentionally blending PCP with other materials in order to increase dealers' profits, the drug is frequently contaminated. This happens simply because it is manufactured by people who do not really know what they are doing. They are unable, or unwilling, to purify the final product or to test it properly. One

A young woman is shown smoking a cigarette loaded with PCP. Such cigarettes are nicknamed "dips." *© Scott Houston/Corbis.*

common contaminant in PCP is PCC, a substance that gives off cyanide when burned.

How Is It Taken?

PCP is produced in liquid, powder, and tablet form. There are numerous methods of taking it. It is smoked, snorted, injected, or swallowed.

Smoking: The Most Popular Method

The most common way users take PCP is by smoking it, either in a pipe or in cigarette form. Liquid PCP is sprayed or sprinkled onto some kind of leafy material. Marijuana is used, but so are common herbs such as mint, oregano, and parsley. Commercially sold tobacco cigarettes are sometimes dipped in a solution of PCP. Menthol cigarettes are often preferred for this purpose because PCP smoke

is extremely hot. Users believe that using mentholated cigarettes or mint leaves will help to cool the smoke and keep the mouth and tongue from becoming irritated. (Separate entries on marijuana and nicotine are available in this encyclopedia.)

PCP is sometimes used to disguise poor-quality marijuana, or even to make common herbs such as parsley seem like powerful marijuana. Users may not be told that PCP is the real active ingredient in the plant matter. When applied to marijuana or other leafy matter in this way, PCP is referred to as killer joints, killer weed, lovelies, supergrass, superweed, and wets, among other names. PCP is also frequently sold as *delta-9-tetrahydrocannabinol* (THC), which is the active ingredient in marijuana. Genuine THC is almost impossible to buy on the street, so almost anything called THC is likely to be PCP instead.

When PCP is sprayed or sprinkled onto any leafy material, it is most likely spread around unevenly. Therefore, two cigarettes from the same batch of PCP-treated leaf material may contain vastly different amounts of PCP, with one having as little as 1 milligram of PCP and another as much as 20 or more milligrams. Tablets, powders, and liquid forms of PCP may also vary widely in strength and purity, adding to the difficulty of knowing how much is really being taken.

Snorting and Swallowing PCP

The powdered form of PCP is snorted, or inhaled, often through a straw or tube. Snorting PCP is far less common than smoking it. If PCP is taken by swallowing, it is usually in the form of tablets. The PCP and the tablets are made by illegal drug manufacturers. Therefore, there is no standard color, size, or shape by which to identify them. While PCP itself is usually white, yellow, or brownish, tablets can easily be dyed any color. Knowing that PCP has a bad reputation, drug dealers frequently try to make PCP tablets look like other, more popular drugs.

Injecting Liquid PCP

Far less common than smoking, snorting, or swallowing PCP is the practice of injecting it into the bloodstream with a syringe. While taking PCP in any manner is very dangerous, injecting it exposes the user to even more hazards than other methods of taking it. If users who are smoking the drug begin to overdose, they will frequently pass out before they reach critical TOXIC levels. Those who snort or eat the drug will often vomit if they take an overdose, which quickly removes some of the poison from their bodies.

toxic: harmful, poisonous, or capable of causing death

But if the drug is injected, there is no easy way to get the excess out of the person's system. Death is more likely than it would be if a person overdosed using another method of ingestion. In addition, the use of dirty needles by PCP users increases their risk of contracting HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome), and other viruses.

PCP is frequently added to other drugs such as amphetamines, cocaine, ecstasy (MDMA), heroin, ketamine, and LSD (lysergic acid diethylamide) in order to produce more intense or strange effects. (Entries on all of these drugs are available in this encyclopedia.)

Are There Any Medical Reasons for Taking This Substance?

Some researchers are investigating a possible medical use for PCP. Giving the drug to patients immediately after they have suffered a heart attack or STROKE may protect them from suffering permanent brain damage. If this proves to be true, a less dangerous form of the drug might be developed that would give the brain the same protection without causing the serious side effects connected with PCP.

Researchers also continue to study the effect of PCP on animal brains in the hope that they will learn more about mental illnesses such as SCHIZOPHRENIA. People suffering from schizophrenia show many of the same symptoms common among PCP users, including: 1) paranoia—abnormal feelings of suspicion and fear; 2) hallucinations—visions or other perceptions of things that are not really present; 3) confused thinking; 4) detachment from reality; and 5) a generally twisted view of the world. Some scientists think they may be able to figure out more effective treatments for schizophrenia by studying the effects of PCP on animal subjects.

Usage Trends

PCP's effects are so unpredictable and frequently so unpleasant that it has a well-deserved bad reputation, even among drug abusers. According to a *NIDA InfoFacts* report titled "PCP (Phencyclidine)," most people who try it once say they would never want to use it again. The drug is addictive, however. If it is used regularly, the body becomes dependent on it. Dependence occurs when a user has a physical or psychological need to take a certain substance in order

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

schizophrenia: a mental disease characterized by a withdrawal from reality and other intellectual and emotional disturbances

to function. As such, addicts will suffer physically if they don't take the drug.

Some people use PCP regularly. The slang term for PCP addicts is "dusters." Some dusters say the only reason they continue to seek out the drug is because of their physical addiction, while others crave the physical and emotional numbness the drug brings. Dusters often go on what they call "runs" or "sprees," using the drug for two or three days in a row, hardly eating or sleeping during that time. When the spree ends, they may sleep for a long time, then wake up feeling depressed, confused, and very sick.

The 1960s Drug Culture

The first reports of PCP's use as a RECREATIONAL DRUG came from the Haight-Ashbury district of San Francisco, California, during the mid-1960s. Initially, the drug was seen in tablet form. It was said to cause feelings of great peacefulness. For this reason it was called the Peace Pill. Yet, as more people tried the drug, it became obvious how inaccurate this nickname was. At times the drug caused euphoria (yu-FOR-ee-yuh), which is a state of extreme happiness and enhanced well-being. But along with these powerfully good feelings came negative experiences with the drug that were very common as well.

By the summer of 1968, PCP use had fallen dramatically in San Francisco due to the many horror stories related to the drug. PCP use did spread to other areas in the United States, mainly large cities such as New York and Washington, D.C. As in San Francisco, after the first wave of street use passed, PCP abuse dropped sharply, because users had experienced the bad effects of the drug themselves.

Nevertheless, as time passed, PCP emerged again on the street drug market. In the early 1970s it was sold in tablet form, as a liquid, and as a crystalline powder. Even though users tended to avoid the drug, dealers continued to manufacture it because it was cheap, easy to make, and very powerful. To overcome the lack of demand for the product, dealers began the practice of giving PCP new names and pretending that it was something other than what it really was. It was most commonly sold as THC, the active ingredient in marijuana.

PCP Resurfaces as a Club Drug

recreational drug: a drug used solely to achieve a high, not to treat a medical condition

PCP use has gone through rises and dips since the 1970s. After climbing in the mid-1970s and early 1980s, PCP use dropped off, most likely because of the popularity of another powerful, very

As shown here, hippies gathered, danced, and discussed politics in the Haight-Ashbury district of San Francisco during the 1960s. The first reports of illicit use of PCP occurred in this area in 1967.

inexpensive drug—crack cocaine. The 1990s saw another upswing in PCP use, along with the many so-called CLUB DRUGS being used at certain dance clubs and all-night dance parties called RAVES. Most PCP users abuse a variety of drugs, and many of the other club drugs are closely related to PCP in chemical makeup.

PCP is frequently used along with other drugs in order to produce stronger, different effects than either substance would produce alone. PCP is often taken with amphetamines, cocaine, crack cocaine, ecstasy, ketamine, LSD, marijuana, or methamphetamine. Users who have taken some sort of PCP drug cocktail at a rave frequently follow up the next day with a tranquilizer called benzodiazepine (ben-zoh-die-AZ-uh-peen) in order to help them cope with the terrible feelings of coming down from their high.

club drugs: mostly synthetic, illegal substances found at raves and nightclubs, including the drugs ecstasy, GHB, ketamine, LSD, methamphetamine, PCP, and Rohypnol

raves: wild overnight dance parties that typically involve huge crowds of people, loud techno music, and illegal drug use

Typical Users

Much of the manufacture of PCP is controlled and carried out by Los Angeles street gangs. Overall, big cities tend to have a higher percentage of PCP use than more rural areas. Traditionally, males have been the most frequent users, but this pattern appeared to be changing in the early 2000s.

(Entries on benzodiazepines and tranquilizers are included in this encyclopedia.)

Tracking Users

Since 1975, NIDA has provided funds to the University of Michigan to conduct a yearly survey of American students. This survey, known as Monitoring the Future (MTF), includes questions on students' drug use and their attitudes toward drugs. MTF results indicate that PCP use among high school seniors has generally declined in the United States since 1979. In that year, 7 percent of twelfth graders reported having used PCP in the previous year. By 1990, only 1.2 percent said that they had used PCP in the past year. In 2004, 0.7 percent of twelfth graders reported having used PCP in the previous year, although 1.6 percent said they had used it at some point in their lives.

According to the "2003 National Survey on Drug Use and Health (NSDUH)," 3 percent of Americans age 12 or older had used PCP at least once in their lifetimes. Use was highest among those older than the age of thirty-five. In that age group, 3.6 percent reported ever having used PCP, compared to 3.3 percent in the age range between twenty-six and thirty-five, 3 percent of those between the ages of eighteen and twenty-five, and 0.8 percent of those age twelve to seventeen.

Emergency Department (ED) Visits

The Drug Abuse Warning Network (DAWN) tracks hospital emergency department (ED) visits caused by drug use. The latest DAWN statistics published as of mid-2005 were from the last two quarters of 2003. During those six months, 4,581 ED visits were reported for PCP poisoning.

"Pulse Check" data published in 2004 show that PCP is considered a growing threat according to drug officials in Houston, Texas; Minneapolis/St. Paul, Minnesota; Phoenix, Arizona; Philadelphia, Pennsylvania; St. Louis, Missouri; San Diego, California; and Washington, D.C. The authors of the "Pulse Check" report note that "in Philadelphia, emergency department episodes involving PCP have increased, particularly for individuals in their late teens, [and] in St. Louis, it is used by an emerging group of young Black users, particularly females."

Effects on the Body

One of the most unique and dangerous aspects of PCP is the wide array of unpredictable effects it can have on people. The effect depends on the amount taken, the method of taking it, and the user's mental state.

At low doses of 1 to 5 milligrams, PCP tends to act as a stimulant, causing an increase in breathing rate and blood pressure. As the effects kick in, the user's face may become flushed and sweaty. In addition, muscular coordination decreases, and parts of the user's body, especially the hands and feet, may start to feel numb.

This ecstasy pill is laced with PCP. It is stamped with an image of a Pokeman character. *AP/Wide World Photos.*

PCP also produces a mental sense of being detached, or disconnected, from one's body and environment. Most users find this effect very frightening and disturbing. For example, people may stare at their hands and not be able to recognize them as their hands. This altered awareness of the body and the feeling of dissociation, or separation from body parts, is similar to what people experience when they are put in sensory deprivation chambers. (Such chambers, also called isolation tanks, keep the body from receiving any outside stimuli. Dark and soundproof, the tanks are used by people wanting to relax, meditate, and achieve an out-of-body experience. However, some people who have used the tanks for long periods of time end up hallucinating and feeling depressed.) PCP users experience similar negative effects.

PCP use has also been described as being similar to the delirious, dreamlike state sometimes experienced during a high fever. Panic is a common response to these unpleasant feelings. Such panic frequently leads to dangerous actions that can cause serious injury to the user or other people.

Feeling No Pain

PCP users frequently display signs of confusion, a decrease in reasoning power, and poor judgment. An inability to reason properly can lead to serious accidents, especially when combined with an inability to feel pain. Individuals on PCP may injure themselves and not even feel it. There have been reports of people setting themselves on fire, banging their heads into walls, pulling out their own teeth,

A PCP dealer lies on the floor as he is arrested in Washington, D.C., by the Violent Crime Response Team of the Metropolitan Police Department. PCP is classified as a Schedule II hallucinogen. *© Shepard Sherbell/Corbis SABA.*

and gouging and cutting themselves, yet not responding to the pain. More people die as a result of the bizarre, dangerous behavior brought on by PCP use than by the drug's effects on the body itself.

The most frightening stories about PCP intoxication—losing physical and mental control—are those that involve people who explode into violent behavior. They may feel that they have superhuman strength or that other people are plotting against them. Because they are temporarily numb to pain, PCP users may aggressively attack large groups of people or even armed police. People have jumped from windows or cliffs, believing that nothing can hurt them.

delusions: false, unshakable beliefs indicating severe mental difficulties; "delusional" refers to the inability to distinguish between what is real and what seems to be real

Hospital records show instances of normally peaceful individuals attacking their families because of some paranoid DELUSIONS brought on by PCP. In most cases, however, extremely violent behavior due to PCP use is more likely to occur in individuals who already have a history of violence.

Mimics Mental Illness

On a chemical level, PCP affects behavior by acting on substances in the brain called NEUROTRANSMITTERS. Alterations in neurotransmitter levels often result in extreme mood swings, emotional instability, and an inability to organize thoughts logically. PCP scrambles the normal transmission of information in the nerves that run to and from the brain. Scientific studies on animals have shown that the change in brain chemistry typically caused by PCP is similar to changes caused by schizophrenia, a serious mental illness. A person who is suffering from schizophrenia, like a person who has taken PCP, may experience hallucinations, delusions, paranoia, and confused thinking.

The effects of PCP are felt most rapidly when the drug is smoked—usually within minutes of the first inhalation. The high typically peaks within thirty minutes and wears off after four to six hours. If the drug is swallowed, the effects are not felt as quickly, but they take longer to subside. Generally, it takes about twenty-four hours for someone who has taken PCP to begin to feel normal again. PCP remains in the body tissues for considerably longer than most other drugs, making it especially dangerous.

Higher Doses

At higher doses, from 5 to 15 milligrams, PCP begins to act like a depressant. The side effects become more numerous. The NIDA research report "Hallucinogens and Dissociative Drugs" notes that PCP's "sedative and anesthetic effects are trance-like." Users remain conscious but are barely able to move or speak. Blood pressure usually drops, although in some cases it may surge even higher. The pulse rate also decreases, and breathing becomes more shallow. Nausea, vomiting, wheezing, and drooling may occur as well.

Some users run a fever, accompanied by dizziness, shivering, blurred vision, and jerky movements of the body. Spasms and secretions in the lungs can affect the breathing process. Muscles often become so rigid that the body may take on strange poses. Users' eyeballs may flick up and down in rapid, uncontrolled movements. At this dosage level, users typically lose the ability to feel pain. They may also find it difficult to remember simple information about themselves or even recognize familiar surroundings.

At very high doses of 15 milligrams or more, PCP can cause users to act very much like schizophrenics. They may actually hear voices threatening them with death. As the heartbeat becomes irregular and blood pressure shoots up and then falls back down, seizures, convulsions, or coma may result. If a user's body temperature

neurotransmitters: substances that help spread nerve impulses from one nerve cell to another

reaches 108°F, he or she runs the risk of permanent damage to the liver, kidneys, or brain.

Addiction and Withdrawal

PCP is an addictive substance, meaning that repeated use is habit-forming. The body becomes dependent on the drug. If the user fails to get a dose, the body will react with withdrawal symptoms. Withdrawal is the physical and mental effects that the user experiences when he or she stops taking the drug.

Withdrawal symptoms include aggressive behavior, DEPRESSION, anxiety, trembling, lack of emotion, upset stomach, and cold sweats. Regular PCP use causes addicts to develop a tolerance to the drug. This means that the user must take higher and higher doses of the drug to produce the original effect or high experienced. This makes it extremely easy for a long-term user to end up overdosing.

PCP can bring on some of the longest-lasting toxic reactions caused by any street drug. Deaths from overdoses are usually attributed to respiratory failure, meaning the user stops breathing. Death may also result from heart attacks, strokes, seizures, or damage to the vital organs from high fever. In addition to deaths from overdose, there is also a high risk of death resulting from dangerous behavior carried out in highly unstable mental states.

Bad Trips and Aftershocks

Users of all types of hallucinogens sometimes speak of having a "bad TRIP," or a very negative, nightmarish experience with the drug. Anyone using PCP is at significant risk of having a bad trip. Reactions can include intense fear and panic, paranoia, delirium, and feelings of being cut off from one's own body and from reality in general. The most likely candidates for bad trips are people who have previously experienced them or people who do not realize they are taking PCP. Those taking a very impure product or an extremely large dose are also at great risk for a bad trip. Such experiences can cause lasting psychological problems.

Regular use of PCP leads to many physical and mental health problems, including loss of memory, depression, mood disorders, difficulty forming thoughts and speaking, weight loss, rage, and suicidal thoughts. The "memory loss and depression may persist for as long as a year after a chronic user stops taking PCP," according to the "Hallucinogens and Dissociative Drugs" report. Some researchers suggest that the long-term problems with memory, speech, and thought may be caused by small strokes brought on by PCP use. The effects of the drug greatly increase the

depression: a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts

trip: an intense and usually very visual experience produced by an hallucinogenic drug

likelihood of a stroke. It causes blood vessels in the brain to constrict, or get smaller, while simultaneously sparking a dangerous rise in blood pressure.

People who use PCP can experience "aftershocks." These events are similar to the flashbacks that sometimes occur in users of LSD and other hallucinogens. An aftershock can hit weeks or even months after a user's last dose of PCP. Plus, it can happen to someone who has taken the drug only once. In an aftershock, some or all of the drug's effects are felt again, even though no fresh dose was taken. This occurs because PCP can be stored in the body in areas such as the liver and brain that are high in fat. The stored PCP can be released from these areas by chemical changes in the body that occur due to stress, fatigue, exercise, or the use of certain drugs.

Dangers for Teens

Teenagers who use PCP may have problems with normal physical growth, because the drug seems to disrupt the hormones that control the growth process. In addition, teenage users are at a high risk for problems related to normal brain development and learning processes.

Additional Dangers

If a pregnant woman takes PCP, the drug will pass from her bloodstream into the baby's system. A baby whose mother was addicted to PCP may show signs of withdrawal from the drug soon after birth. These symptoms include irritability, nervousness, and muscle tension. Babies who are breast-fed are also at risk if their mothers use PCP. The drug will quickly pass into the mother's milk and be transmitted to the child when it nurses.

Reactions with Other Drugs or Substances

PCP is a powerful and dangerous drug when used alone. Among hard-core drug users, however, PCP is often used along with other drugs, both legal and illegal. Popular "club drugs" such as ecstasy and ketamine are closely related to PCP and are sometimes taken with it. The combination intensifies the effects of each of the drugs taken. PCP forms an especially deadly mixture when taken with sedatives, or depressants, such as alcohol, nitrous oxide, and tranquilizers. (Entries on these drugs are available in this encyclopedia.) A user's body can quickly become overwhelmed by the onset of a double sedative effect, and the chance of an overdose increases dramatically. Overdose symptoms in such cases would involve seizures, convulsions, coma, and respiratory failure.

PCP Use Is No Legal Defense for Murder

One of the most shocking and grisly stories connected with PCP use was the murder case involving Antron Singleton, an up-and-coming rap artist from Texas who went by the stage name of Big Lurch. Singleton had moved from Texas and was living in the Los Angeles area with a young woman named Tynisha Ysais. On April 10, 2002, police spotted Singleton walking down the street near his apartment. He was completely naked, staring up at the sky, and had blood covering his mouth, chest, and abdomen.

Investigating his apartment, the authorities found that Ysais had been stabbed multiple times. She had teeth marks on her face and on some of her internal organs. A medical examination of Singleton revealed that he had consumed human flesh.

Singleton was charged with the crime and did not deny it. In his defense, however, he said that he and a friend had been on a five-day PCP binge. He claimed that he was not responsible for his behavior because he had been made psychotic by the drug. The jury did not agree with this argument, and in 2003 California judge Jack W. Morgan sentenced Singleton to life in prison without the possibility of parole.

A similar scenario was played out on the television series *CSI: Crime Scene Investigation* in 2002. In the episode titled "Let the Seller Beware," a cheerleader is found dead on a soccer field with similar wounds. The killer, another cheerleader, was under the influence of PCP-laced marijuana when she committed the crime.

PCP is often applied to marijuana or used along with marijuana. PCP may interact with THC, the active ingredient in marijuana, to produce a more intense and dangerous high.

Treatment for Habitual Users

An overdose of PCP brings on extreme fear and agitation in users. They frequently become violent. Tranquilizers may need to be administered until the effects of the drug wear off, so emergency medical attention is required. The *NIDA InfoFacts* report states, "Many PCP users are brought to emergency rooms because of PCP overdose or because of the drug's unpleasant psychological effects. In a hospital or detention setting, these people often become violent or suicidal and are very dangerous to themselves and others. They should be kept in a calm setting and not be left alone."

Because PCP makes users emotionally unstable and fearful, an addicted user must be treated with great care and understanding. One of the most effective types of therapies is the twelve-step program pioneered by Alcoholics Anonymous. Such programs are run

by former users and allow people struggling with the same addiction to meet and give each other support in a non-confrontational, nonjudgmental manner.

Consequences

PCP is a dangerous drug. Just one use can trigger bizarre behavior that could lead to the serious injury or death of the user or someone else. The health risks are numerous as well. Longtime users have shown multiple mental, emotional, and physical difficulties. They have trouble organizing their thoughts; their attention spans may be very limited; and their moods and emotions are unstable. They may become incapable of interacting normally with other people. In adolescents, the use of this drug can cloud the development of normal self-identity and awareness of others. At any age, PCP use will interfere with the user's family life, friendships, and school or job performance. Users typically end up isolated and depressed.

The Law

Under the terms of the U.S. Controlled Substances Act (CSA) of 1970, PCP is classified as a Schedule II hallucinogen. This classification means the drug carries a high potential for abuse and may only be used legally in certain, tightly restricted medical settings—usually in cases involving drug research. In the United Kingdom, PCP is listed as a Class A drug under the Misuse of Drugs Act. This means that PCP is not legal for any medical use, and it is illegal to possess or supply the substance to anyone.

The manufacture, sale, use, and possession of PCP are illegal in the United States and the United Kingdom. In the United States, first-time offenders may end up in prison for five to forty years and be fined up to $4 million. Repeat offenders can face a penalty of twenty years to life in prison and fines of up to $8 million. In the United Kingdom, possession of the drug is punishable with a fine, and up to seven years in prison, while supplying the drug can lead to larger fines and life imprisonment.

There are more than thirty substances that are chemically very similar to PCP, including PCPy, TCP, and PCE. These are often sold on the street as PCP, and perhaps are even accidentally manufactured by illegal drug makers. All of these substances are classified as Schedule I hallucinogens by the DEA. Schedule I drugs have no recognized medical uses.

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See also: Designer Drugs; Ecstasy (MDMA); Ketamine; LSD (Lysergic Acid Diethylamide); Marijuana

PMA and PMMA

Official Drug Name: Paramethoxyamphetamine (PAH-ruh-meth-AHK-see-am-FETT-uh-meen) p-methoxyamphetamine, 4-methoxyamphetamine (all names for PMA); paramethoxymethamphetamine (PAH-ruh-meth-AHK-see-METH-am-fett-uh-meen; PMMA)
Also Known As: Chicken powder, chicken yellow, death, double-stacked, killer, mitsubishi, mitsubishi double-stack, red death, red mitsubishi, white mitsubishi
Drug Classifications: Schedule I, hallucinogen

What Kind of Drug Is It?

PMA and PMMA are strong and dangerous drugs that have been linked to a number of deaths in North America, Australia, and Europe. PMA and PMMA are nearly identical in chemical makeup, and their effects on the body are essentially the same. For the purpose of this entry, PMA and PMMA will be discussed as one.

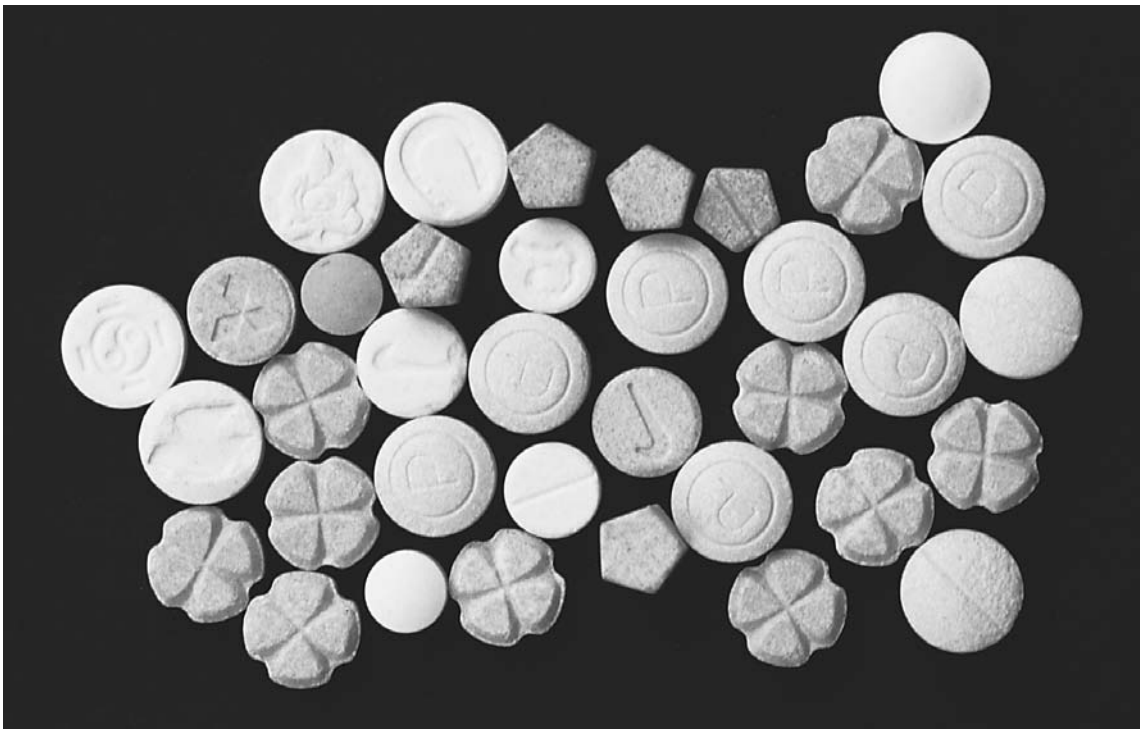
PMA is a synthetic hallucinogen, meaning that it is made in a laboratory and is a mind-altering drug. Derived from the Latin word *allucinari,* which means "to wander in the mind," hallucinogenic drugs alter the user's perception of reality, thought, or emotion, and can result in alternate states of consciousness or HALLUCINATIONS. PMA was known to have been used for a short time in the early 1970s in the United States and Canada and saw a comeback in the 1990s.

Deadly Deception

PMA is often sold as another synthetic hallucinogen called ecstasy (MDMA). Illegal drug makers often pass off PMA for ecstasy for several reasons: 1) Ecstasy is a popular party drug among teenagers and young adults; 2) PMA is cheaper to produce than ecstasy; and 3) PMA is similar in appearance, cost, and effect. (An entry on ecstasy is available in this encyclopedia.) However, PMA is far more dangerous than ecstasy. Its initial slow effect on the body sometimes causes users to take more of the drug because they think they have taken weak ecstasy. More drug can lead to overdose.

Combining PMA with other drugs, alcohol, or caffeine increases the risk of overdose. (Entries on alcohol and caffeine are available in this encyclopedia.) Those who have ingested PMA have reported breathing difficulties, nausea, vomiting, muscle spasms, and increased blood pressure and temperature. Those suffering from PMA overdose experience high body temperatures, sometimes resulting in convulsions, coma, and a complete shutdown of the organs of the body. This fact has led to the drug's street name "death." Since PMA is sometimes sold as ecstasy, unsuspecting users are unprepared for the potential side effects of the more deadly drug.

hallucinations: visions or other perceptions of things that are not really present



PMA and PMMA are often designed to look like ecstasy (pictured here). The difference is that it is much easier to overdose on PMA and PMMA. Teens have taken the drug thinking it was ecstasy with deadly results.

Overview

Paramethoxyamphetamine (PMA) was first produced by a Canadian laboratory in 1973. In that year alone, the drug was associated with nearly a dozen deaths in both Canada and the United States. Then the drug all but disappeared until the mid-1990s. At that time, six people in Australia died after taking what they thought was ecstasy. A later investigation found that the victims had various amounts of PMA in their systems, sometimes combined with ecstasy, AMPHETAMINES, or prescription drugs. (An entry on amphetamines is available in this encyclopedia.) In the early 2000s PMA made its way back into Canada and the United States. It also showed up in Europe, mainly in Austria, Denmark, and Germany. Additional PMA-related deaths occurred in these countries, the victims dying after taking what they believed was ecstasy.

amphetamines: pronounced am-FETT-uh-meens; stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake

Is It Ecstasy or PMA/PMMA?

Because PMA is cheaper to produce than ecstasy, manufacturers sometimes mix the two drugs, or they may sell PMA as a substitute for ecstasy. The pills are sold as ecstasy to drug dealers, who may not know of the PMA content. Because PMA and ecstasy have similar effects on the user and the pill size and color may be the same, PMA can easily be passed off as ecstasy. Many pills have a logo stamped on them that acts as a brand name for a particular illegal, underground drug laboratory. Those passing off PMA as ecstasy may use an established lab's logo, like the three-diamond symbol of the mitsubishi "brand" of ecstasy.

It has been found, in fact, that most of the pills that caused death in the United States carried the mitsubishi logo (but PMA has been found in pills with other logos as well). Using a known source of ecstasy is not a safeguard against PMA poisoning, since the drug dealers themselves are often unaware of PMA in their supplies.

The popularity of RECREATIONAL DRUGS such as ecstasy was seen among young people who frequent the nightclub or rave scene. Such drug use has increased the risk of mistakenly taking toxic, or poisonous, substances such as PMA. A rave is a dance party, sometimes lasting all night, where DJs play electronic music and colorful lights flash to the pulsating beat. Raves are sometimes promoted as alcohol-free events, giving parents a false sense of security that their children will be safe attending these parties. In reality, raves may be havens for the illegal sale and abuse of club drugs such as ecstasy. The dangerous substitution of PMA in ecstasy tablets is an added risk, and it is causing alarm around the world.

What Is It Made Of?

PMA and PMMA are produced from amphetamines, drugs that stimulate the body's central nervous system. Often called "uppers" or "speed," amphetamines increase energy and decrease appetite. PMA is said to be twenty times more powerful than amphetamines. One of the substances found in PMA is anethole (ANN-uh-tholl), a component of the aromatic herbs anise (AN-iss) or fennel.

Chemically speaking, PMMA and PMA are very similar, and their effects on the human body are virtually identical. Of the two, PMA is the one most often found in the blood samples of overdose victims. PMA has been found in pill and powder form, and it is sold in pills mixed with other drugs such as ecstasy. PMA is extremely toxic to the human body. Although some of the PMA pills that caused death

recreational drugs: drugs used solely to achieve a high, not to treat a medical condition

contained no ecstasy, they have been made to look identical to ecstasy in size, color, and logos. Pure PMA is beige, white, yellow, or pink. The color of the pills being sold on the street varies; most commonly they are beige, white, or red and may have the three-diamond mitsubishi logo stamped on them. In 2004 a small amount of light purple pills with no logo on them were found to contain PMMA.

How Is It Taken?

PMA is most frequently found in pill form, masked as ecstasy, and is taken orally. However, in parts of the United States, an increasing number of users have been snorting or injecting a powdered form of the drug. In some areas it is used in mixed beverages. The drugs can also be inserted rectally.

Are There Any Medical Reasons for Taking This Substance?

There are no known medical uses for PMA.

Usage Trends

PMA was first manufactured in Canadian drug labs in the 1970s and resulted in a number of deaths in both Canada and the United States. There was no sign of the drug again until the mid-1990s, when it popped up on the Australian nightclub scene. Since then PMA distributors have targeted "club drug" dealers—those who sell to teenagers or young adults attending raves. Reports from the Office of National Drug Control Policy (ONDCP) show that club drugs have been increasingly available, and the most widely available club drug is ecstasy. The substance is thought to enhance the rave experience by allowing partygoers to dance longer, while feeling dreamy and entranced by the music and lights. Other frequent places of use are college campuses, private parties, shopping malls, schools, and concerts.

Ecstasy and PMA Tracked Together

Because PMA is disguised as ecstasy—and is mistakenly used by people who think they are taking ecstasy—the trends of PMA abuse mirror the trends of ecstasy abuse. Ecstasy users tend to be between thirteen and thirty years of age. Because the drug is fairly easy to get, younger and younger people are starting to use ecstasy. In fact, in Honolulu, Hawaii, an emerging group of ecstasy users in treatment

Ravers often dance with glow-in-the-dark accessories to enhance their drug-induced visual stimulation.

are pre-adolescent (approximately nine to twelve years old). Users tend to be male and female middle-class whites living in both central cities and suburbs.

In the twenty-first century, ecstasy use began expanding to non-white and Hispanic populations across the United States. The use of ecstasy by those of African American descent has dramatically increased in the Southeast United States. And in places like Houston, Texas, the drug is becoming common among a subculture of young gay men.

According to the Substance Abuse and Mental Health Services Administration (SAMHSA), overall levels of availability and abuse of ecstasy are beginning to decrease in the United States after peaking in 2001. The 2005 National Drug Threat Assessment shows that the estimated number of people twelve or older who used ecstasy decreased from 3.2 million in 2002 to 2.1 million in 2003. Young people have begun to understand the risks associated with the drug, likely a result of prevention programs and antidrug campaigns.

Monitoring the Future

In the 2004 Monitoring the Future (MTF) survey, high school students reported a 3-percent increase in perceived harmfulness of occasional ecstasy use from 2003 to 2004. The number of ecstasy tablets seized arriving from foreign sources also decreased, from 6.9 millions tablets in 2001 to fewer than a million tablets in 2003. And the number of ecstasy arrests made by the U.S. Drug Enforcement Administration (DEA) dropped from 2,105 in 2001 to 1,124 in 2003. It is thought that, overall, there is a decrease in the availability of the drug. This may be due to the discovery and dismantling of several large ecstasy distributors, namely Israeli and Asian groups that were distributing the drug throughout the United States.

Ecstasy in Europe

Europe is one of the world's most important areas for the manufacture of ecstasy. Belgium and the Netherlands are the countries producing the most. For many years there, amphetamines were the second most commonly used drug behind marijuana. The "Annual Report 2004: The State of the Drugs Problem in the European Union and Norway," however, indicates that the use of ecstasy may be exceeding that of amphetamines. About two-thirds of European Union (EU) countries reported recent ecstasy use to be more common than that of amphetamines among young people age fifteen to thirty-four years.

Overall, the increase in use of ecstasy that occurred during the 1990s now appears to have leveled off a bit in Europe, with only a few countries still reporting increasing numbers. At first, like in the United States, the drug was connected to the rave scene. However, in the twenty-first century, it has been increasingly spreading across a broader section of society.

Effects on the Body

PMA and ecstasy have a similar effect on the body. Taking fewer than 50 milligrams of PMA without other drugs, alcohol, or caffeine brings on mild symptoms similar to those of ecstasy. These include heightened visual stimulation and rapid and irregular eye movements, an increase in heart rate and blood pressure, motion sickness, muscle spasms, difficulty breathing, and an increase in body temperature.

This dose may also provide extra energy and a general feeling of well-being by blocking the NEUROTRANSMITTER serotonin in nerve endings. SEROTONIN plays an important role in regulating mood,

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

PMA History: Decades of "Death"

PMA use can be deadly. In fact, one of the drug's street names is "death." The following chronicles various problems associated with the drug since the 1970s.

1970s

In 1972 and 1973, nearly a dozen deaths are attributed to ecstasy use in the United States and Canada. Some appeared to have been caused by PMA sold as ecstasy. PMA itself is sold as a recreational psychoactive drug under the names "chicken yellow" and "chicken powder." (Psychoactive drugs alter the user's mental state or change the person's behavior.) PMA is placed in Schedule I of the Controlled Substances Act (CSA), making it illegal to buy, sell, or possess the drug in the United States.

1980s

PMA is no longer found on the street market. There are few, if any, reported cases of PMA-related deaths during the decade.

1990s

The rave phenomenon begins feeding the demand for and supply of club drugs such as ecstasy. In Australia, a twenty-six-year-old woman dies after taking what she thought was ecstasy. A search of historical files at the country's coroners' offices brings up cases of similar deaths. In total, six deaths in Australia originally reported as ecstasy-related deaths are determined to have been caused by PMA sold as ecstasy.

2000s

By 2005, the drug is associated with more than twenty deaths internationally. Three PMA-related deaths in Chicago and seven in Florida are reported after the drug is again sold as ecstasy. White mitsubishi pills that contain PMA cause deaths in Europe: one in Norway, one in Austria, and at least four in Denmark. Another four people are reported to have died from PMA tablets in Belgium.

Small amounts of PMA are found in Canada, and at least one drug-related death in the Toronto area is linked to PMA use. In June 2005, twelve people in Australia overdose on what they think is ecstasy. Some of those taking the drug suffer strokes after taking the pills. One nineteen-year-old girl dies after taking only half of a tablet. Later tests reveal that the pills contained PMA.

sleep, and sensitivity to pain. A person taking this same dose of PMA along with other drugs, alcohol, or caffeine may experience a more intense effect, and the danger of the drug increases. The dose of PMA by itself may not be deadly, but it could become lethal when taken along with other drugs.

Nicknamed "Death" for a Reason

PMA doses of 50 milligrams or more are potentially deadly, especially when taken with other drugs. High doses may cause vomiting, heart failure, kidney failure, brain seizures, hallucinations, sudden collapse, and an extreme rise in body temperature—up to

PMA is most often sold on the illicit drug market as ecstasy. As a result, when police confiscate ecstasy pills during drug raids, they may also be taking the dangerous PMA off the street. *© Australian Federal Police/Handout/Reuters/Corbis.*

115°F (46°C). This increase in temperature sometimes results in convulsions, coma, and a complete shutdown of the organs of the body, leading to death.

Because the victims thought that what they took was actually ecstasy, it is first believed that their symptoms came from ecstasy poisoning, which is dangerous but not necessarily deadly. PMA, however, is a far more toxic drug and has a much higher rate of lethal complications than ecstasy. Whenever a user has unusually severe reactions to ecstasy, PMA is suspected. But it is only confirmed through urine tests.

In a suburb of Chicago in May of 2000, eighteen-year-old Sara Aeschlimann was partying with friends just five minutes from her house when she decided to take a form of ecstasy called mitsubishi double-stack. Within hours she went into convulsions and fell into a coma. Her body temperature reached 108°F (42°C) and with her blood cells erupting, she was bleeding

internally and from her mouth. By the following day she was dead. Later testing determined that Sara had mistakenly overdosed on PMA.

Two others died of PMA overdose around Chicago that month as well, and dozens of people around the world have suffered the same fate. According to *Fox News,* Michael Hillebrand, of the Chicago branch of the DEA, compared PMA with ecstasy: "With PMA, taking the same dosage amount [as ecstasy], you receive a less-intensive feeling within your system. People then think that they're getting weak ecstasy and then they take two more. Now it's too late. Ecstasy is bad," he added, but "PMA is death."

Other Effects

The Australian drug and alcohol clinic Turning Point interviewed 100 regular ecstasy users age seventeen to forty-five who had taken ecstasy at least once a month during the previous six months. It was found that 84 percent suffered from confusion, 73 percent from appetite loss, and 66 percent from blurred vision.

Other effects associated with ecstasy and PMA use are: 1) recurring paranoia, or abnormal feelings of suspicion and fear; 2) hallucinations or flashbacks, which occur when someone re-experiences the effects of a drug after the user has stopped taking it; and 3) psychotic behavior, which is the dangerous loss of contact with reality, sometimes leading to violence against self or others, long after taking the drug. Regular users of PMA or ecstasy may develop a PSYCHOLOGICAL DEPENDENCE on these drugs.

The most dangerous effect of ecstasy, however, is related to hyperthermia, or a dangerous rise in body temperature. After taking ecstasy, some people drink a lot of water and take rests and cold showers to help keep their temperatures down. However, when hyperthermia is a result of PMA, these means are not an effective treatment.

Research on Lasting Effects

Although little research has been done on the long-term effects of PMA, it is assumed to be very similar to effects of ecstasy. In 2001 the National Institute of Mental Health (NIMH) found that ecstasy damages the brain's nerve cells, or NEURONS, that use the chemical serotonin to communicate with other neurons. Neuron damage may bring on depression, a mood disorder; anxiety; loss of memory; learning problems; lack of self-control; sleep disorders; and sexual problems.

psychological dependence: the belief that a person needs to take a certain substance in order to function

neuron: a cell in the central nervous system that carries nerve impulses

Fact or Fiction?

Lots of stories and myths surround the use of ecstasy and PMA. It can be hard to distinguish fact from fiction. Here are a few examples of the myths and whether there is any truth to them.

- Ravers often wear baby pacifiers around their necks as pendants. **Fact**—Yes, some do. The use of ecstasy and/or PMA creates excessive jaw muscle tension, which makes users grind their teeth involuntarily. So, ravers often chew on baby pacifiers or lollipops to calm this unwanted side effect.
- Club drugs such as ecstasy and GHB have gained popularity because users think they are not as harmful as mainstream drugs such as cocaine or heroin. **Fact**—Some users do believe that club drugs are less harmful. However, all of these drugs are dangerous at any dose, particularly PMA. Club drugs are potentially fatal if a user takes too much and overdoses. Plus, some club drugs are associated with date rape. Psychological dependence can occur with any of these drugs. All club drugs have negative long-term effects on the brain.
- Some ecstasy (and PMA) users take breaks from physical activity and use cold showers to cool down. Ecstasy and PMA use combined with intense dancing can elevate body temperature to dangerous levels. Drug users have tried cold showers as a way to safeguard against rising temperatures caused by these drugs. **Fact**—A cold shower does not help a person suffering from a high body temperature due to PMA poisoning. If the brain reaches 108°F, no shower can fix that. If PMA poisoning is suspected, emergency medical help is needed immediately.
- The Marquis Reagent Testing Kit can be used to test if a pill contains ecstasy or PMA. **Fact**—The kit produces a dark blue-purple color if the substance is ecstasy but produces no color change if the substance is PMA. However, some pills containing PMA also contain ecstasy, so a positive result for ecstasy does not mean the pill is free of PMA.

When a toxin or poisonous substance such as ecstasy or PMA is taken, neuron death occurs immediately, but the effects might not be noticed until months or years later. According to the National Institute on Drug Abuse (NIDA), research in animals indicates that ecstasy causes long-term damage to neurons. Dr. Alan I. Leshner, former director of NIDA, was quoted on the *Drug-Rehabs.org* Web site as saying: "People who take ecstasy, even just a few times, are risking long-term, perhaps permanent, problems with learning and memory."

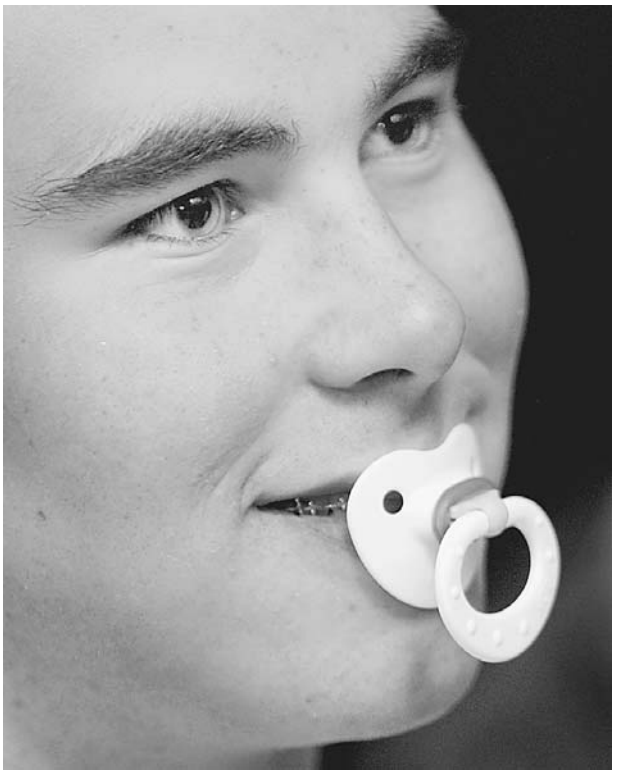
Researchers at Johns Hopkins University studied the effects of the drug on red squirrel monkeys. They found that just four days of exposure to the drug caused damage to serotonin nerve endings that was evident up to seven years later. This supports earlier findings done by the research team that indicated that people who had taken ecstasy scored lower on memory tests.

PMA's effects on the body are believed to be similar to those of ecstasy. Long-term health effects may include depression, anxiety, loss of memory, learning and logical reasoning deficits, and sleep disorders, among other problems.

More Long-Term Problems

A person's memory consists of all that has been experienced in one's life, including sounds, sights, smells, tastes, and emotions. Drugs like PMA and ecstasy can distort these memories and emotions, causing the user to lose touch with reality and changing his or her impression of time and space. Over time, the drugs tend to damage a person's natural ability to feel good. This results in severe depression—and a craving for more of the drug to bring back the good feelings again.

According to the Centre for Addiction and Mental Health of Canada, there are other long-term problems that may come up long after taking ecstasy. These problems may or may not also occur during ecstasy usage. They include muscle spasms in the jaw, neck, and lower back; low blood pressure; changes in blood flow to the brain; and persistent problems with involuntary teeth grinding. Researchers suspect that PMA use may cause similar effects, but long-term data are not yet available.



A youth is shown sucking on a pacifier at a rave. Drugs like ecstasy and PMA cause excessive jaw muscle tension, which can lead users to grind their teeth involuntarily. The pacifiers help to stop this unwanted side effect. *Photo by John Gress/Liaison.*

Reactions with Other Drugs or Substances

Because PMA is sold on the illicit, or illegal, drug market as ecstasy, it is not deliberately used recreationally in its pure form. PMA is usually found in combination with ecstasy, and ecstasy users often take others drugs at the same time. Such drugs include LSD (lysergic acid diethylamide), GHB, ketamine, and nitrous oxide. (Entries on all of these drugs are available in this encyclopedia.) Ecstasy is also used with marijuana, methamphetamine, heroin, cocaine, and the prescription drug Viagra. The risk of overdose or death is greatly increased when mixing PMA with these other drugs or with alcohol or caffeine. Small doses of PMA that are not normally lethal become deadly in the presence of these other drugs.

As with all drugs, the strength and quality of PMA pills may differ greatly from one batch to another. Different pills may contain varying amounts of the drug. Moreover, the secret labs that make these drugs are often very dirty, and the pills they produce may contain many dangerous chemicals in addition to PMA.

An example of PMA poisoning in the presence of other drugs is a victim who died in the late 1990s. She died after ingesting what she believed to be an ecstasy tablet. Testing of her blood revealed high but not deadly levels of PMA, coupled with the prescription drug Prozac. (Information on Prozac can be found in the entry on antidepressants in this encyclopedia.) Ecstasy was not detected in her

blood samples at all. Drug users often abuse Prozac to enhance the energizing effects of ecstasy. This patient died from a brain hemorrhage despite the low levels of PMA she had taken.

Treatment for Habitual Users

Due to the fact that PMA is taken by mistake by those who think they are consuming ecstasy, there is no official treatment program solely for PMA abuse. There are treatment facilities for ecstasy abusers, however. These are usually located around large cities where ecstasy use is common. The Narconon organization, which is used by many types of drug addicts in the United States, is one of many groups that has a specific treatment program for those overcoming ecstasy addiction. While ecstasy users are not known to develop physical addictions, psychological addictions are common. Therefore, recovery programs for drugs like ecstasy work with the psychological nature of the addiction. In addition to organizations with recovery programs, peer support groups are available as well.

Consequences

Because PMA is found mixed with or as a replacement for ecstasy, the social consequences of PMA usage go along with those of ecstasy usage. The individual consequences of PMA contamination of ecstasy pills, however, are far more dangerous. Unknowing ecstasy or PMA users may find themselves in great danger: they could experience an uncontrollable rise in body temperature, convulsions, coma, and death. Ecstasy alone has caused accidental overdoses and deaths in the past. However, with the emergence of PMA, the death rate has increased steadily.

Ecstasy, and PMA through the disguise of ecstasy, are social drugs. They are perceived to be harmless, "feel good" drugs that are most often used by teenagers and young adults at parties and nightclubs. Studies have shown that a large number of people who use ecstasy tend to be attracted to the techno-style rave scene. Raves have become a major source of illegal ecstasy distribution and are likely one of the main sources of the ecstasy "epidemic." There is scientific proof that ecstasy is not a safe drug, however. A number of experiments in both animals and more recently in humans have confirmed that club drugs, particularly ecstasy, are not harmless, "feel good" drugs at all. They pose serious health risks and long-term effects.

Club drug users often have difficulty coping with life situations, anger, depression, or low self-esteem prior to drug usage. These problems often cause individuals to seek an escape or relief from their troubles. Drug use supplies an escape route by allowing the users to forget their worries and experience positive sensations instead. After the drug's initial high, users can be sent into extreme depression, resulting in social withdrawal and cravings for more of the drug. This could result in financial problems and drug-related crime. The use of these drugs is also associated with an increase in sexual activity. Those in a drug-induced state may engage in sexual activities they would otherwise avoid. Moreover, individuals who use ecstasy risk serious psychological and physical damage, such as panic attacks, hallucinations, paranoia, and loss of memory and sense of reality. And when PMA comes into the picture, users risk even more serious complications and possible death.

Aussie Overdoses

In June 2005, twelve people in Australia overdosed on what they thought was ecstasy. All of the victims took a form of the drug called red mitsubishi or orange CK. Some of those taking the drug had suffered strokes after taking the pills. One nineteen-year-old girl died after taking only half of a tablet. Although the popularity of ecstasy is beginning to wane, its use is still a threat, especially because PMA is being used as a supplement to or substitution for ecstasy.

The negative effects of club drugs such as ecstasy are not limited to the user alone. Findings released in 2001 in the *Journal of Neuroscience* found the first evidence that prenatal (before birth) effects of ecstasy used by the mother could include memory loss and other impairments in offspring. Rodents exposed to the drug during critical stages of brain development were found to have memory and learning problems.

The Law

Making, selling, and buying PMA and ecstasy is illegal. There are tough laws and penalties tied to them. PMA and ecstasy, as well as other club drugs such as LSD and GHB, have been categorized under the U.S. Controlled Substances Act (CSA) of 1970. The CSA ruled that federally regulated drugs must be categorized into one of five schedules. The schedules are based on a substance's medicinal value, possible harmfulness, and potential for abuse and addiction.

PMA has been listed as a Schedule I drug since 1973. Ecstasy has been listed as a Schedule I drug since 1985. Schedule I controlled substances are defined as having a high potential for abuse, no accepted medical use in the United States, and a lack of accepted safety for use under medical supervision. However, PMA is

produced legally in the United States for limited commercial applications, and a small quantity is allocated for Schedule I drug research.

Because PMA is so similar to ecstasy, it is regulated under the Ecstasy Anti-Proliferation Act of 2000. The act gave authority for stiffer sentencing for those involved in the manufacture, import, export, and trafficking of ecstasy and ecstasy-like substances. The increase in ecstasy users, the drug's potential for causing permanent brain damage, and the deaths associated with ecstasy usage led to the passage of the Ecstasy Prevention Act of 2001. This act enhanced the Ecstasy Anti-Proliferation Act of 2000 by providing funds for the education of law enforcement officials and the public, and for medical research done by the National Institute on Drug Abuse (NIDA).

In 2002 the DEA began a program called Operation X-Out, which focused on identifying and dismantling organizations that make and distribute club drugs like ecstasy. Investigations involving ecstasy and club drugs increased, new task forces were created in cities like Miami and New York, and cooperation with international law enforcement was expanded. Some law enforcement agencies have begun to work with communities to form anti-rave initiatives to try to minimize the use of club drugs. They have passed new ordinances that deal with licensing requirements for large public gatherings and have been enforcing existing fire codes and health, safety, and liquor laws. In some areas juvenile curfews have been put in place.

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See also: Amphetamines; Designer Drugs; Ecstasy (MDMA); Methamphetamine

Psilocybin

Official Drug Name: Psilocybin (sill-o-SIGH-bin), mushrooms of the *Psilocybe, Panaeolus,* and *Conocybe* genera
Also Known As: boomers, caps, cubes, fungus, hippy flip (with ecstasy), liberty caps, MX missile (with ecstasy), magic mushrooms, Mexican mushrooms, mushies, mushrooms, psychedelic mushrooms, psilocydes, purple passion, shrooms, sillies, silly putty, simple Simon
Drug Classifications: Schedule I, hallucinogen

What Kind of Drug Is It?

Many species of mushroom throughout the world produce mind-altering effects when eaten. The mushrooms in the genus *Psilocybe* are perhaps best known for their PSYCHEDELIC properties. Called "magic mushrooms," or just "shrooms," psilocybin-containing mushrooms can produce a wide variety of experiences for the user, from extreme mood swings to visions of bright colors, even to a feeling of time standing still.

For thousands of years, Native American priests used psilocybin in religious ceremonies, under carefully controlled conditions. In the last half of the twentieth century, however, "shrooms" gained popularity as a recreational drug—a drug used solely to get high, not to treat a medical condition. Magic mushrooms remained popular in the early 2000s, even though they are illegal.

In the 1950s and early 1960s, scientists conducted research on psilocybin, hoping that it could help people with schizophrenia and other mental disorders. Schizophrenia is a severe mental disorder that makes it difficult for people to behave normally and function adequately in their everyday lives. Some researchers thought psilocybin might even make criminals less likely to commit violence.

None of this research proved to have positive results. In fact, the naturally occurring chemicals in *Psilocybe* mushrooms have unpredictable effects, even on people who use them frequently. Psilocybin has no medical uses, and the U.S. government has named it a Schedule I controlled substance. As such, these mushrooms carry the highest penalties for users and dealers.

Overview

About 5,000 species of mushrooms have been discovered and named by scientists. Of these, about 100 species contain psilocybin. How and why did these plants evolve this way? Most botanists think the mind-altering chemicals serve as a defense for the plant. Animals eat the mushrooms, have a bad reaction to the psilocybin, and avoid these types of mushrooms after that.

psychedelic: the ability to produce hallucinations or other altered mental states

These magic shrooms were grown indoors. Whether consumed fresh or dried, the mushrooms have a strong, unpleasant, dirt-like flavor that can produce nausea. *© The Cover Story/Corbis.*

Experimentation and Religious Ritual

Throughout history, human beings have experimented with altering their mental states. In both the Eastern and Western Hemispheres, in fact, cults of HALLUCINOGEN use can be traced back many thousands of years. The ancient *Vedas* (texts of India) mention a bright red mushroom, believed to be *Amanita muscaria,* that could be used to connect with the gods. The Greeks made a hallucinogen from a mold called ergot. In the Americas, the indigenous, or native, peoples created religious rituals around mushrooms, toad venom, and other plants that could bring on a variety of psychedelic, or mind-altering, experiences.

hallucinogen: a substance that brings on hallucinations, which alter the user's perception of reality

Psilocybin use in the Americas can be traced back to the Aztecs, although they were probably not the first to use it. Archaeologists found a statue dating to the year 100 that shows a shaman, or medicine man, seated under a mushroom. Most indigenous cultures approached

magic mushroom use with great care. They chose only certain candidates for the experience and guided those individuals through the process. Mushrooms were used only on the most sacred holidays and only by the shamans and their students. Native cultures believed that psilocybin helped them talk to the gods, tell the future, and communicate with the spirits of the dead.

Although psilocybin use is illegal in the United States, some Native American groups are allowed to continue to use *Psilocybe* mushrooms in their religious ceremonies.

Europeans Ban It

When Europeans began settling the New World in the 1500s, they brought Christianity with them. Spanish, French, and British missionaries hoped to convert the native peoples to their religion. They viewed the use of psilocybin as being contrary to Christian practices, and they severely punished Native Americans who used the drug. However, mushroom use survived underground as the indigenous peoples conducted their rituals in secret.

In 1957, an amateur MYCOLOGIST named R. Gordon Wasson (1898–1986) published a story about his experiences with psilocybin use among the Native Americans of Mexico. The story ran in 1958 in *Life,* one of the most popular monthly magazines of that era.

Dangers Lead to Restricted Use

The timing of Wasson's magazine article was important. A new, rebellious generation of young Americans had emerged after World War II (1939–1945). They were eager to try mind-altering drugs. Serious scientists such as Swiss chemist Albert Hofmann (1906–) were busy synthesizing hallucinogens in the laboratory. Hofmann isolated psilocybin and found a way of making it without using the mushrooms. He also discovered LSD (lysergic acid diethylamide). (An entry on LSD is available in this encyclopedia.) Some people believed that substances such as psilocybin might be fun to try. Others thought the substance might be an effective treatment for mental illness. Still others, including the U.S. government, began experiments with mind control using hallucinogens.

What all of these people discovered was that hallucinogens such as psilocybin and LSD do not act predictably. A person's reaction to the substance depends on many factors, including family history of mental illness and the expectations that the person has when taking the drug. Even people who have taken psilocybin many times could suddenly have a "bad trip"—an intense negative experience where the user has hallucinations or visions or other perceptions of

mycologist: a person who studies mushrooms

About 5,000 species of mushrooms have been discovered and named by scientists. Of these, about 100 species contain psilocybin, including these growing on a tree.

things that are not really present. Bad trips create a heightened sense of danger; paranoia or abnormal feelings of suspicion and fear; and panic.

Researchers abandoned psilocybin for use with mental patients and criminals. Even so, its use as a recreational drug increased among young people in the 1960s. In 1965, President Lyndon Johnson (1908–1973) recommended altering the existing drug laws to make all hallucinogens illegal. The law was passed as the Drug Abuse Control Amendment (DACA) of 1965.

More Restrictions

The DACA bill, however, did not name psilocybin or its related compound, psilocin. Therefore, use of these two substances remained legal for another three years. In 1968, psilocybin and psilocin were specifically made illegal. Keeping "magic mushrooms" off the BLACK MARKET has never been easy, though.

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

The mushrooms grow wild in the Pacific Northwest and in the warmer regions of the South—especially Florida. Trained spotters can find them. A network of black market growers exchange spores (seeds), which are still legal. They grow mushrooms in homes and greenhouses. Even today, several hundred arrests are made each year, in every part of the United States, for possession of *Psilocybe* mushrooms.

Objects of Adoration

The Aztec culture in Mexico worshipped magic mushrooms as *teonanacatl* ("the flesh of the gods"). *Teonanacatl* use was restricted to the holiest ceremonies and given only to the high priests and their students.

Milder in their effects than LSD, "magic mushrooms" appeared on the RAVE scene in the 1990s and enjoyed a brief surge in popularity. According to the "2003 National Survey on Drug Use and Health (NSDUH)," however, overall hallucinogen use was down in the early part of the twenty-first century in the United States. Various personal accounts of psilocybin use are available on the Internet. Such testimonies document both the "enjoyable" aspects of the drug *and* its ability to cause panic and frightening episodes.

What Is It Made Of?

Psilocybin's full chemical name is phosphorylated 4-hydroxy-dimethyltryptamine (FOSS-FOR-ih-lay-tid 4-high-DROK-see-dy-meth-uhl-TRIP-tuh-meen). It is a naturally occurring compound found in mushrooms of the genus *Psilocybe,* the genus *Panaeolus,* and the genus *Conocybe.* About 100 species contain psilocybin. The most widely used psilocybin-containing mushrooms in the United States are *Psilocybe mexicana, Psilocybe cyanescens* (also known as "wavy caps"), and *Psilocybe cubensis.*

Within the mushroom, psilocybin is an indole ALKALOID. It is often accompanied by other alkaloid compounds with mind-altering properties, including psilocin, baeocystin, and norbaeocystin. The amounts of these compounds vary widely from species to species, and even from one individual mushroom to another. The psilocybin content of a single mushroom can range from 0.03 percent to 1.3 percent of the weight of the mushroom.

Almost all mushrooms are composed of 80 to 90 percent water. Drying the mushrooms and removing the water concentrates the psilocybin. Therefore, dried mushrooms have a higher potency, or strength, than fresh mushrooms. Whether consumed fresh or dried, however, the mushrooms have a strong, unpleasant, dirt-like flavor that can produce nausea.

rave: a wild overnight dance party that typically involves huge crowds of people, loud techno music, and illegal drug use

alkaloid: a nitrogen-containing substance found in plants

In the 1950s, scientists produced a SYNTHETIC version of psilocybin in the form of powder and pills. These products are no longer available. They would be highly dangerous if used recreationally because of their potency.

How Is It Taken?

Archaeologists have found evidence that ancient native cultures took psilocybin by inserting tubes into their rectums and having liquid preparations poured through the tubes. Modern people simply chew and eat small pieces of the dried mushroom. Since the mushrooms have an unpleasant taste, users sometimes pour boiling water over the mushroom, mix in honey or sugar, and drink the "tea" that results. The mushrooms are also eaten in combination with honey or other more pleasant-tasting foods. The most dedicated users chew the foul-tasting mushrooms longer, knowing that the psilocybin will reach the bloodstream faster through the tissues of the mouth than it will if swallowed and digested.

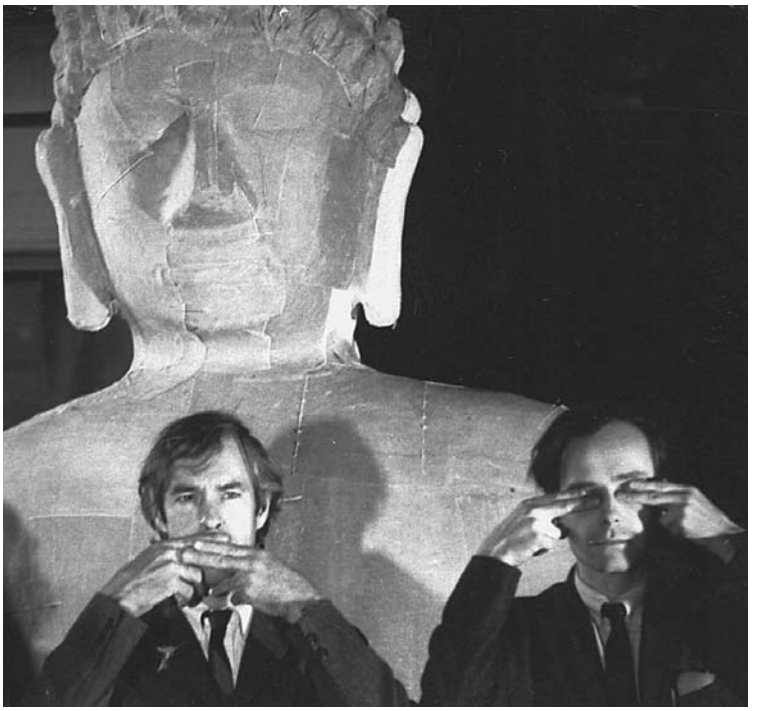
Typically, psilocybin is not injected, smoked, or snorted. Users of magic mushrooms tend to seek a more natural experience and do not resort to needles or other drug paraphernalia.

Are There Any Medical Reasons for Taking This Substance?

Psilocybin and other hallucinogens have been studied for use in psychotherapy and the treatment of mental illness. At one time researchers thought that psilocybin might help to make criminals less violent. In a study conducted between 1961 and 1963 by Professor Timothy Leary (1920–1996) and Ralph Metzner, this theory was put to the test. The researchers attempted to prove that psilocybin could be used to reform criminals at the Massachusetts Correctional Institute in Concord.

As part of the study, a group of inmates was given two high doses of psilocybin over six weeks, along with several sessions of therapy. It was hoped that in the drug-induced state, inmates would gain new insights about themselves, understand what they wanted out of life, and decide to leave the life of crime. The real test came when the inmates were released from prison. The researchers found that their test subjects had the same rate of returning to prison for new crimes as the inmates who were not part of the study. In addition, the test inmates ended up having more parole violations than the average parolee.

synthetic: made in a laboratory



Timothy Leary (left) and Ralph Metzner (right) conducted studies of psilocybin's effects on prisoners. *AP/Wide World Photos.*

Other researchers looked into whether psilocybin might lessen the symptoms of OBSESSIVE-COMPULSIVE DISORDER (OCD), since some users reported that the drug eased their compulsions. This had not been widely studied as of 2005. Since the effects of psilocybin vary so much from dose to dose, and since so little is known about how it actually works in the brain, it is not considered a good candidate for treatment of any illness.

Usage Trends

Psilocybin has never been widely used, but it has never been ignored, either. From the days in the 1500s when Spanish missionaries tried to stamp out its use among the indigenous peoples of the Americas, to the 1957 *Life* magazine article that popularized "magic mushrooms," people have experimented with psilocybin. Mushrooms continued to be used in the 1960s and early 1970s as part of the "hippie era," and their effects were praised by such

obsessive-compulsive disorder (OCD): an anxiety disorder that causes people to dwell on unwanted thoughts, act on unusual urges, and perform repetitive rituals such as frequent hand washing

Psilocybin Chronology

c. 9,000 BCE A religious cult living in what is now the Sahara Desert creates carvings of gods shaped like mushrooms.

2000-1400 BCE Priests in India compile the *Vedas,* a series of writings that mention the use of psychedelic mushrooms in religious ceremonies. The authors call the drug *Soma.*

100 CE Aztec artists carve statues in which gods are depicted with mushrooms.

1502 A *Psilocybe* mushroom called *teonanacatl* is used by Native American priests during the coronation of the Aztec king Montezuma.

1958 R. Gordon Wasson writes a story about psychedelic mushroom use for *Life* magazine. The story is titled "Magic Mushrooms."

1958 Albert Hofmann makes the psilocybin compound in a laboratory, leading to the drug's use in treating mental disorders.

1968 Psilocybin and its related compound, psilocin, are made illegal in the United States.

1970 The Controlled Substances Act names psilocybin and psilocin Schedule I controlled substances.

well-known drug gurus as Timothy Leary and Richard Alpert (1931–). In fact, Leary described his first experience with magic mushrooms as a religious experience.

By the end of the 1980s, psilocybin use had dropped considerably. Some drug users were reluctant to try magic mushrooms because various species of mushrooms are poisonous. It can be hard to tell which ones are poisonous and which ones are not. Also, reports of fatalities—not from overdose but from bizarre behavior while under the influence—have helped to curb the desire for magic mushrooms.

Raves Renew Mushrooms' Popularity

The rave scene of the 1990s revived interest in psilocybin, however. Since raves typically involve loud music and frantic dancing in crowded spaces, drugs that cause excitement to the nervous system are more popular in this setting than drugs that calm people down. As an hallucinogen, psilocybin was of interest to some partygoers.

The National Household Survey on Drug Abuse (NHSDA) reported in 1997 that 10.2 million people had tried psilocybin at least once. Other reports suggested that even more people might have tried the drug without knowing its scientific name.

In 2003, the National Survey on Drug Use and Health showed a decrease in all hallucinogen use, across all ages and both genders. Psilocybin is most popular among young adults, age eighteen to

Prior to June 2002, Magic Mushrooms were sold legally in Japan. Packs such as this were for sale at shops and stores. © *Haruyoshi Yamagushi/Corbis.*

twenty-four, and use continues to be reported sporadically on college campuses. Even so, the survey revealed that only about 2 in every 100 young Americans reported hallucinogen use, and that sampling included other more popular hallucinogens such as LSD and PCP (phencyclidine). (Entries on both drugs are available in this encyclopedia.)

Legal Use

Some people can use psilocybin legally. These include certain Native American groups who use the mushrooms for religious reasons. In addition, due to a legal loophole, psilocybin mushrooms were sold legally in Japan up until mid-2002. Vendors could sell the shrooms for "non-consumptive" uses. Shop owners peddled them as "decorations" and for "aroma therapy," but once the mushrooms were purchased, buyers often did as they pleased with them. According to *BBC News,* in 2002 the Japanese government put a stop to all buying and selling of magic mushrooms. "[T]hose found in possession of magic mushrooms could face up to seven years in prison," which is the same sentence given for those convicted of cocaine possession.

Effects on the Body

Psilocybin enters the central nervous system and disrupts the levels of SEROTONIN in the brain and body. Serotonin is an important NEUROTRANSMITTER. In normal balance, serotonin controls moods, regulates anxiety, and helps the brain process information from the five senses. It also influences digestion, blood flow, and other organ performance. When a user eats a psilocybin-containing mushroom, the psilocybin activates serotonin receptors in the place of serotonin. This brings on changes in perception and mood swings. It can cause tremors, nausea, and sleeplessness.

A Strange and Risky Experience

A psilocybin user will typically eat 1 to 5 grams of the drug, or the equivalent of two to four mushrooms. If the user chews on the mushrooms or holds them in his or her mouth for several minutes, the effects of the drug begin in about ten minutes. Eating and swallowing the mushrooms delay the effects for about thirty to forty-five minutes. When the psilocybin passes through the digestive system and into the liver, it is changed into psilocin, the active TRYPTAMINE COMPOUND. The psilocin moves through the bloodstream to the brain.

At the onset of a psilocybin experience, the user may feel a tingling throughout the body. Some people experience anxiety at this point. As the drug's effects heighten over the next two hours, the user may undergo extreme mood swings, feeling EUPHORIA and an urge to laugh, or feeling frightened or deeply depressed. Changes occur in all of the senses. Users might "see" sounds or "taste" colors. Vision is altered. Although the user does not see things that aren't there—the true meaning of "hallucination"—the user will perceive that colors become more brilliant, that boundaries are distorted, and that his or her own body has changed significantly. Sometimes these distortions of vision become permanent, and people discover that they have become overly sensitive to all movement and to the behavior of light.

The drug alters the sense of time as well. Users report feeling that time is standing still, or moving backward. They may feel that the boundaries between their bodies and the earth have dissolved. This loss of sense of self is called "ego dissolution." Researchers think it plays an important role in the religious uses of the drug, but it can be frightening for people who use psilocybin just to get high.

Since serotonin plays a role in the thinking process, users on a psilocybin trip may experience distortions in thinking. These can be positive, leading to a sort of religious ecstasy and sense of

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

tryptamine compound: a crystalline chemical compound of carbon, hydrogen, and nitrogen that is made in plant and animal tissues

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

communication with higher powers. The distortion can just as easily be negative, leading to panic, fear of self and others, and misunderstanding when others try to help. Whether the sensations are pleasant or nightmarish, little can be done to ease them. The user must simply wait for the drug to exit the brain. This usually occurs within two to six hours.

What's in a Name?

The word *psilocybin* is a combination of two Greek words, *psilo* ("bald") and *cybe* ("head"). Psychedelic mushrooms are most commonly called "shrooms."

Psilocybin Dangers and Mental Disorders

Psilocybin users have reported that, after using mushrooms, they often experience mood swings over the following days. People who suffer from schizophrenia or other mood disorders can trigger lasting episodes of mental illness by taking psilocybin. Anyone with a family history of schizophrenia or other psychiatric conditions should never take psilocybin.

Scientists note that psilocybin is not habit-forming, but it does quickly produce TOLERANCE. This increases the danger of panic reaction and also introduces the danger of overdose. While not fatal, overdoses of psilocybin can bring on mental illness in otherwise healthy people. Psilocybin may also damage the heart.

Psilocybin has been linked to flashbacks, which occur when a user re-lives experiences of a drug trip after the drug has worn off. Flashbacks are more common in people who suffered from mental disorders before they took the drug.

Some people are allergic to psilocybin. For these people, eating "magic mushrooms" can lead to: 1) coma—a state of unconsciousness from which a person cannot be aroused by noise or other stimuli; 2) convulsions—the twitching of limbs and the involuntary contracting of muscles while in a state of unconsciousness; and 3) seizures—brain disturbances that cause loss of consciousness and uncontrolled movements in the limbs and tongue. For young children, a single dose of psilocybin can cause fatal heart problems, seizures, and coma.

Reactions with Other Drugs or Substances

One of the greatest dangers of psilocybin use is the possibility that the mushrooms in question are not *Psilocybe* at all. Drug dealers sometimes take ordinary supermarket mushrooms and inject them with LSD, which is far stronger than psilocybin. Mushroom hunters can misidentify the mushrooms in the wild and pick poisonous

tolerance: a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced

Psilocybin mushrooms grow wild in the Pacific Northwest and in the warmer regions of the South—especially Florida. They also grow in Europe. Trained spotters can find them.

mushrooms instead. Even an outdoor plot that is mostly *Psilocybe* can contain random mushrooms of other types.

Some drugs, both legal and illegal, increase the effects of psilocybin. These include monoamine oxidase inhibitors (MAOIs), usually prescribed for depression. Ecstasy (MDMA) will also intensify the effects of psilocybin. LSD is very similar to psilocybin, only far more powerful. Combining the two can cause rapid heartbeat and panic attacks. Serious side effects may also occur when psilocybin is taken with alcohol; opium-based drugs such as heroin or OxyContin; or amphetamines. Over-the-counter drugs containing dextromethorphan should also be avoided by psilocybin users. (Entries on alcohol, amphetamines, dextromethorphan, ecstasy [MDMA], heroin, LSD [lysergic acid diethylamide], oxycodone, and over-the-counter drugs are also available in this encyclopedia. Information on MAOIs is available in the antidepressants entry.)

Treatment for Habitual Users

Psilocybin is not habit-forming, but frequent users develop a tolerance to its effects. Tolerance is when a user needs more and more of the drug to achieve the same result. This tolerance will decrease over time, so most users space their use of psilocybin so that they will not become tolerant to its effects.

Long-term use of psilocybin can cause mental and physical changes related to serotonin levels in the brain and body. These can include mood swings, tremors, digestive problems, and eventually, seizures and coma. As with other hallucinogens, the longer the period of use, the more difficult normal life becomes when the drug is discontinued.

Nightmares and Terror

London *Independent* writer David McCandless interviewed a psilocybin user who described one of his negative experiences with the drug:

"I thought that the more mushrooms you took, the better," said Anthony Goodman. "I ended up plunging into a nightmare. Reality was disintegrating. I lost all track of time. Of what time meant. Of what my life meant. I ended up crying my eyes out."

Abusers of hallucinogens can find help with groups such as Narcotics Anonymous, where they can meet and talk with other recovering drug abusers. Narcotics Anonymous is an international nonprofit organization with a telephone hotline, regular meetings in most cities and towns across the United States, and a "buddy system" that teams new members with older members who have been successful at beating addiction. Recovering drug users are encouraged to end friendships and change lifestyle habits that led to the drug use. With a non-addictive substance such as psilocybin, this transition can be made fairly easily.

Emergency Visits

Most of the hospital emergency room visits related to psilocybin use involve panic attacks brought on by HALLUCINATIONS or distortions in thinking. There is no known antidote to psilocybin, so hospital staff will typically try to calm the patient down with medications such as sedatives. They will also try to reassure the patient that the hallucinations will wear off and things will return to normal. The symptoms usually go away within six hours.

Consequences

Psilocybin is not as strong as LSD, is not habit-forming, and is a product of nature. However, it is still hazardous. Although the drug rarely produces a dangerous overdose situation, it does produce, regularly, a state of mind that is out of touch with reality. Users do

hallucinations: visions or other perceptions of things that are not really present

not think clearly. Their ability to move is impaired. This can—and does—lead to accidents.

Before magic mushrooms were banned in Japan, a writer for the *Chicago Tribune* studied the legal trade of such shrooms in Japan in 2001. Vendors could sell mushrooms containing psilocybin as long as they did not sell them as food. Some people in Japan bought the mushrooms and ate them anyway. The *Tribune* documented two Japanese deaths related to psilocybin—one of them being a man who jumped off a building while high on the substance. The Japanese government took steps to ban the substance in 2002 after the number of deaths linked to the mushrooms climbed significantly.

Other incidents involved American tourists in Mexico who jumped off cliffs, thinking they could fly, after ingesting fresh *Psilocybe* mushrooms. Psilocybin users may become paranoid and attack family members and health care workers. Medical literature documents the fact that psilocybin overdose can cause heart attacks.

The Law

In the United States, psilocybin and psilocin—the active ingredients in "magic mushrooms"—are Schedule I controlled substances. It is against the law to possess these mushrooms, either fresh or dried. It is *not* against the law to possess or sell the spores from the mushrooms, as these do not contain psilocybin. However, once the spores are planted and the young fungi begin to develop (called the "mycelium stage"), this level of growth is deemed illegal. As soon as psilocybin can be detected in the mushrooms, they become controlled substances.

As of 2005, California was the only state to have enacted laws making it illegal to possess or sell spores that develop into psychedelic mushrooms.

It is difficult to regulate a naturally occurring substance like a mushroom. *Psilocybe* mushrooms grow wild in many parts of the United States, and people do hunt for them. This can be dangerous for several reasons: 1) If caught with the mushrooms, people can be arrested and prosecuted; 2) Mushrooms that resemble *Psilocybe* are poisonous; 3) Some mushroom hunters get lost in the wilderness and have to be rescued by police and emergency rescue staff.

As a Schedule I substance, psilocybin carries the highest penalties for possession and sale. Users can lose driver's licenses and federal college loans. They may also face stiff fines and even jail time for a first offense. Repeat offenders commonly wind up in prison.

The only people who can legally use magic mushrooms are certain Native American groups who consider the fungi central to their religious beliefs. They continue to use the mushrooms as their ancestors did in various rituals and take steps to provide a safe environment for that use.

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See also: Dimethyltryptamine (DMT); LSD (Lysergic Acid Diethylamide); PCP (Phencyclidine)

Ritalin and Other Methylphenidates

Official Drug Name: Methylphenidate (METH-uhl-FENN-ih-date), methylphenidate hydrochloride, Ritalin, Ritalin SR, Concerta, Metadate CD, Metadate ER, Methylin, Methylin ER; dexmethylphenidate (DEKS-meth-uhl-FENN-ih-date; Focalin)
Also Known As: Vitamin R, West Coast, R-ball
Drug Classifications: Schedule II, stimulant

What Kind of Drug Is It?

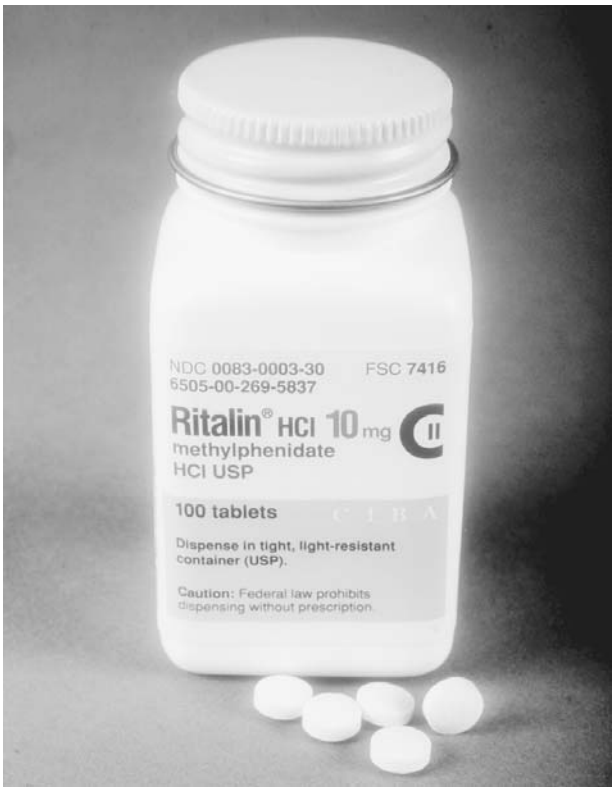
Ritalin and other methylphenidates belong to a class of drugs called stimulants, which typically excite or speed up the brain and body. Stimulants increase endurance, reduce hunger, make the user feel less tired, and produce feelings of well-being and happiness. Many substances, both legal and illegal, are considered stimulants. Caffeine is a mild stimulant found naturally in coffee, tea, and chocolate. Amphetamines (am-FETT-uh-meens) are powerful stimulant drugs available only by prescription. Methylphenidates are chemically related to amphetamines, but their effects are not as intense. They, too, are available only by prescription. Cocaine and crack are examples of illegal stimulants. (Entries on caffeine, amphetamines, and cocaine are also available in this encyclopedia.)

Methylphenidates, such as Ritalin, are primarily prescribed to treat attention-deficit/hyperactivity disorder (ADHD). People with ADHD usually have difficulty focusing and controlling their actions. For example, they might speak or act rashly before thinking about the consequences of such behavior. The main symptom of ADHD is hyperactivity, which means that an individual is noticeably more active than his or her peers. Children with ADHD often have trouble paying attention in school, sitting still, and waiting their turn. They may have difficulty concentrating or focusing on certain tasks, including tests and assignments. These difficulties sometimes interfere with social development and building lasting relationships.

ADHD is frequently diagnosed in childhood, but it can continue into adulthood. As such, it really affects individuals of all ages. Methylphenidate can help ADHD sufferers even though it is a stimulant. It does not produce a stimulant effect in people diagnosed with ADHD. Instead, it works by helping the user's brain filter out distractions, thus improving his or her ability to focus on a given task.

Narcolepsy and Depression

Methylphenidate is also used to treat narcolepsy, a disorder that causes people to become sleepy during the daytime and experience uncontrollable episodes of sleep. In narcoleptic patients, the stimulating effects of the drug help to control daytime



According to a study released by the Partnership for a Drug-Free America, 2.3 million teens used the prescription stimulants Ritalin or Adderall illegally in 2004. *Photo by Yvonne Hemsey/Getty Images.*

drowsiness. Physicians sometimes prescribe methylphenidate for other purposes, such as enhancing the effects of antidepressants in people suffering from severe depression. In these cases, doses are typically lower than doses used in the treatment of ADHD.

Overview

Methylphenidate is one of the most commonly prescribed medications for the treatment of ADHD. Ritalin is among the most frequently prescribed brands of methylphenidate and is probably the most familiar medication for ADHD. Other methylphenidate brand names include Concerta and Metadate. There are also generic (non-brand name) forms of the drug. A related medicine, dexmethylphenidate, is sold under the brand name Focalin.

Methylphenidate was patented in 1950 by the CIBA Pharmaceutical Company, a Swiss company that later became part of Novartis. A global pharmaceutical company, Novartis is the maker of Ritalin. In 1955 the U.S. Food and Drug Administration (FDA) approved methylphenidate for various psychological disorders. A 2004 article on methylphenidate in the *Journal of Child and Adolescent Psychiatric Nursing* noted that treating children who have ADHD with stimulants such as methylphenidate and amphetamines is 80 to 90 percent effective. Methylphenidate treatment can decrease symptoms by 50 percent in some patients.

Abuse of Ritalin and Other Methylphenidates

Some people take Ritalin and other methylphenidates without a prescription for nonmedical purposes. High school and college students have been known to take the drug to stay awake and increase their attention span when studying. The drug is also used recreationally in combination with alcohol. "Recreational" refers to using drugs solely to get high, not to treat a medical condition. Alcohol is a depressant and drinking too much of it slows people down and makes them feel tired. So some people combine methylphenidate and alcohol because it

How the Knowledge of ADHD Evolved

Attention-deficit/hyperactivity disorder was first described in print in an 1845 children's book written by Dr. Heinrich Hoffman. The author wrote scholarly articles on psychiatry, as well as poems and books for young people. One of his most famous children's books, written for his three-year-old son, was *The Story of Fidgety Philip*. The story's main character is a young boy who displays ADHD-like symptoms.

ADHD was officially recognized in 1902, when British scientist George F. Still published a series of lectures. The lectures described children with behavioral problems. Many of these problems were caused by the fact that the children were easily distracted and acted very impulsively. Dr. Still thought that the children's problems were biological and not related to how they were raised. Their symptoms matched the definition of ADHD in 2005.

In the 1950s, children with ADHD were labeled as having "minimal brain dysfunction." This rather clinical term suggested that the children's brains were not working properly. However, it failed to describe their condition correctly. After further study, researchers learned the causes and symptoms of the disorder were quite complex.

In 1968, a paper on a disorder resembling ADHD was issued in the *Diagnostic and Statistical Manual of Mental Disorders,* published by the American Psychiatric Association. The name given to the disorder was "hyperkinetic reaction of childhood." Hyperkinetic means having an unusually high or uncontrollable activity level. Symptoms of the condition included: a short attention span, excessive fidgeting, and general restlessness. The disorder was given different names over the years, but medical professionals eventually settled on the term "attention-deficit/hyperactivity disorder (ADHD)." Another common name still used in the United States and many parts of the world is attention deficit disorder (ADD).

allows them to stay awake and interact with others while continuing to drink. Other abusers mix Ritalin with heroin, cocaine, or both for a stronger stimulating effect. The abuse of methylphenidate, with or without other substances in the mix, can cause serious psychological and physical harm to the user.

Who Has ADHD

ADHD affects both males and females of all races and ethnicities. It is one of the most commonly diagnosed mental disorders in children and adolescents. In May of 2000, Terrance Woodworth, then-deputy director of the Office of Diversion Control at the U.S. Drug Enforcement Administration (DEA), testified before Congress on Ritalin use. He noted that about

80 percent of the prescriptions written for the two major drugs used to treat ADHD (methylphenidate and amphetamine) were for children. Woodworth also noted that between 1991 and 1999, U.S. sales of methylphenidate increased by nearly 500 percent. And that trend has continued. According to the article "ADHD Drugs Move into the Workplace" on *MSNBC.com,* "U.S. retail sales of the total ADHD drug market more than tripled between 2000 and 2004."

Who has ADHD is a matter of debate. Many studies indicate that the condition occurs much more frequently in boys. However, some believe that this is no longer the case. The organization Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD) released a fact sheet titled "Evidence-Based Medication Management for Children and Adolescents with ADHD." According to that fact sheet, "recent research shows that the . . . numbers [of boys and girls with ADHD] may be nearly equal." In all, about 3 to 7 percent of the school-age population in the United States has ADHD.

In a study conducted by researchers at the Mayo Clinic, however, more boys were found to have ADHD than girls. But the study also indicated that parents' education plays a role. "Our [study's] results confirm that male sex and low parental education significantly increase ADHD risk," according to researcher Jennifer St. Sauver, as quoted on *CBS News.* In the report, issued in 2002, the scientists commented on their findings about the parents in their study sample. "Less educated parents may have less effective parenting styles and may provide a less structured environment" that could cause the ADHD to intensify. Plus, it's possible that the parents had difficulty in school themselves because they had ADHD as well.

ADHD begins during the preschool years, and it is usually diagnosed by the time a child is in kindergarten or early elementary school. However, the disorder continues into adulthood, and sometimes it is not even diagnosed until later in life. Although the exact causes of ADHD are unknown, research indicates that it runs in families, meaning it is an inherited condition. According to the CHADD fact sheet, "problems in parenting or life situations may make ADHD better or worse, but they do not cause the disorder."

Diagnosing ADHD

ADHD is a condition that becomes apparent in some children in the preschool and early school years. It is hard for these children to control their behavior, pay attention to a teacher, or focus

The Positive Side of ADHD

ADHD is often seen in a negative light. Teachers might view ADHD kids as students who are disruptive or act in a confrontational manner. Adults and children sometimes think that those who have the disorder lack intelligence. But this is usually not the case. ADHD affects people in a wide variety of ways. Although it is generally agreed that the symptoms of ADHD can cause problems for children and adults, especially in work and school settings, some researchers have talked about the benefits of having the disorder.

According to these researchers, the benefits of ADHD include creativity, energy, and a willingness to take risks. ADHD can also cause a person to combine ideas in new ways and think "outside the box." Consider kids in an elementary or middle school science class. A psychologist at Santa Clara University, Dr. Lara Honos-Webb, was quoted in a 2005 *Newsweek* article as saying, "While the A students are learning the details of photosynthesis, the ADHD kids are staring out the window and wondering if it still works on a cloudy day."

ADHD support groups note that many imaginative people displayed classic ADHD behaviors, such as impulsivity, inattention, and disorganized lives. The group called One ADD Place provides information and support for people with the disorder. They cite American inventor Thomas Edison (1847–1931), German-born American physicist Albert Einstein (1879–1955), British politician Winston Churchill (1874–1965), and British mystery writer Agatha Christie (1890–1976) as being among those who have exhibited ADHD-like symptoms. A 2005 *Wall Street Journal Online* article told the story of the chief executive officer (CEO) of JetBlue Airways—someone who never took drugs for his ADHD. He believes the disorder helped him succeed in the business world and even contributed to his invention of the electronic airline ticket. E-tickets are helpful for people who are forgetful, like those with ADHD.

on an assignment. People with ADHD may be fidgety, forgetful, and do impulsive things. They often interrupt conversations and act without thinking about the consequences. These behaviors can interfere with social interactions and school performance. But not everyone who displays symptoms of ADHD has the disorder. Being very talkative and showing signs of inattention are traits that exist in many children and adults, but at a low level or over a short period of time.

Diagnosing ADHD is a complex process. The symptoms of ADHD must continue for at least six months, and the behaviors must create a real handicap in at least two areas of a person's life. These areas include academic, social, and family aspects of life. An individual who shows some symptoms of ADHD, for example, but whose schoolwork and friendships are not harmed by these behaviors, would not be diagnosed with the disorder.

An eight-year-old boy learns concentration skills as he plays a computer game. In the game, he tries to move images on the screen using only his mind. Such therapies are being developed as alternatives to drugs like Ritalin. *AP/Wide World Photos.*

Prescriptions Increase

By 1975, more than 1 million U.S. children had been diagnosed with ADHD, according to "The Top Pharmaceuticals That Changed the World: Ritalin," a 2005 article in *Chemical & Engineering News.* About 500,000 of those patients were being treated with drugs, the article stated, with more than half of them receiving Ritalin. In the mid-1990s, ADHD diagnoses nearly doubled to 2 million. In a 2000 article in *USA Today,* the American Academy of Pediatrics put the number of students with ADD/ADHD at nearly 4 million. Mayo Clinic researchers announced in 2002 "that 7.5 percent of children up to the age of 19 have ADHD," according to *CBS News.* A 2003 booklet titled "Attention Deficit Hyperactivity Disorder," released by the National Institute of Mental Health, noted that 80 percent of children medicated for ADHD will still need the medication as teenagers.

Half of those teens will continue on medication as adults. "The kids of the ADHD drug boom are growing up, and some are finding that what they thought would be a school-age ailment may in fact last a lifetime," noted *MSNBC.com* in May 2005.

Many studies have found that the number of children using ADHD medication differs depending on where the children live. For example, a 2003 study published in *Pediatrics* found that among commercially insured U.S. children, those living in the Midwest, compared with those in the West, were 1.55 times more likely to use at least one stimulant medication. Those living in the South were 1.71 times more likely that those in the West to do the same. In the study, about 65 percent of all stimulants used were methylphenidates. Many factors could play a part in this regional variation, including different state laws on illegal use of substances, drug advertising, physician style, and expectations of parents and teachers in the community.

In the 2000 article "Just Say Yes to Ritalin!: Parents Are Being Pressured by Schools to Medicate Their Kids—Or Else," Dr. Lawrence H. Diller noted that some "4 million children [are] taking Ritalin in America." He also explained that some doctors think that Ritalin is being overprescribed for some and underprescribed for others. "Data shows, for example, that African-American families use Ritalin at rates one-half to one-quarter of their white socioeconomic peers. Asian-American youth are virtually absent in statistics for Ritalin use."

Overdiagnosis of ADHD?

A dramatic increase in the number of both children and adults being diagnosed with ADHD has prompted controversy. Some parent and health groups say that doctors are overdiagnosing ADHD, especially among children. The result of overdiagnosing, they say, is that children may be taking unnecessary drugs, which can lead them to experience unnecessary side effects.

In some cases, the concern is that methylphenidates (and other ADHD drugs) are being prescribed to control "problem" children so that they will not disrupt class or home life. Other concerns are that naturally energetic and imaginative children are being labeled as having ADHD because these characteristics and the symptoms of the disorder are similar. Psychologist Deborah Ruf told Colette Bouchez of *WebMD Health* that "an alarming number of children who are simply creative, gifted individuals are mistakenly being diagnosed with ADHD." Many health organizations, however, say the growth of ADHD cases suggests that the disorder is better understood, more easily recognized, and more generally accepted within the medical communities. They also defend a parent's right to seek drug therapy for ADHD children.

FDA Announces Plans to Study Concerta

In mid-2005, the FDA announced that it would consider placing new warnings on Concerta and other methylphenidates. Concerta is a long-lasting form of Ritalin. "The FDA has identified two possible safety concerns with the methylphenidate drug products: psychiatric adverse events and cardiovascular adverse events," noted the FDA in a statement.

Specifically, the FDA decided to look into reports that some children on ADHD drugs have experienced hallucinations, suicidal thoughts, episodes of violent behavior, and increased aggression. *NBC4.TV* quoted Dr. Dianne Murphy of the FDA as saying: "Some kids saw bugs—took them off the drug, the bugs went away." She added: "Put them back on the drug, the bugs came back."

USA Today explained that the FDA will also look into reports that the drugs can cause "high blood pressure, arrhythmia and racing heartbeats." *CNN.com* noted that the FDA will study the drugs because "[t]he FDA can't say if the drugs actually cause those side effects—the reports are from a database of reactions reported by medication users." It's not yet clear if the side effects are caused by the ADHD drugs or can be attributed to some other factor.

Parents Pressured to Medicate

Some parents and their children believe that taking medications, such as Ritalin, are unnecessary, and they refuse to participate in what they call the "drugging" of America's children. They are concerned about the side effects of ADHD drugs and the fact that the long-term effects are still unknown. Anti-Ritalin groups contend that such drugs interfere with a child's personality and creativity. However, some teachers find it difficult to manage students who have ADHD and aren't taking any medication. They believe that ADHD drugs will benefit children who are too disruptive in class. Some schools have told parents that their children need to be evaluated to see if they would benefit from taking ADHD drugs.

A number of parents have refused, only to be told by school staff that their children are just too hard to handle. They are advised to "Medicate or Else!," according to Diller. He added that such schools "will not allow students to attend [regular] classes unless they are medicated." Some parents have had to make that choice—put their children on medication or put them in special education classes. Some parents reluctantly agree and have their children put on ADHD drugs. Others fight the schools and even file lawsuits against what they call "legal drug pushing."

Singer Lisa Marie Presley (second from right), national spokesperson for the Citizens Commission on Human Rights (CCHR), addresses a congressional committee about the dangers of drugs like Ritalin and urges parents to consider alternatives to such drugs. Also appearing are (left-right) Patricia Weathers, president of Parents for Label and Drug Free Education; author Mary Ann Block; and Bruce Wiseman, U.S. President of the CCHR. *© Isaac Menashe/ZUMA/Corbis.*

A small percentage of parents have pulled their children out of public schools to homeschool them instead. In "Teaching Children Well, from Home" on *MSNBC.com,* a mother described her frustration with her daughter's educational experience in public schools. Rather than place her child in special education, the mother decided to homeschool her daughter. "Three years later, she's off Ritalin and working above her grade in many subjects," noted the authors of the article. Homeschooling is believed to help some ADHD sufferers because they receive more individual attention in a more structured setting.

Parents who don't want to medicate their children have also been subjected to legal trouble. "In the most extreme cases,"

noted Diller, "parents unwilling to give their kids drugs are being reported by their schools to local offices of Child Protective Services, the implication being that by withholding drugs, the parents are guilty of neglect[ing their children]." According to *USA Today,* "some parents are medicating their children for fear of having them hauled away." Parents have also been pressured to medicate their children by neighbors and relatives. In some situations, divorcing parents disagree on whether their child should be medicated, so the decision falls to a judge.

Taking the Stand Against Ritalin. Various groups of parents and other concerned individuals believe that ADHD medicines are greatly overused in the United States. Testifying before Congress in 2002, Lisa Marie Presley of the Citizens Commission on Human Rights stated: "I find it alarming that in my 13 years of motherhood, the use of Ritalin for ADHD has increased 700 percent. Today it is estimated that between six and eight million American children take psychiatric drugs for ADHD and other so-called learning and behavioral disorders." Urging Congress to look into finding drug-free alternatives, she described the situation as "the totally needless and tragic drugging of innocent children."

Methylphenidate and Narcolepsy

Methylphenidate is also used to treat narcolepsy, a life-long sleep disorder. Although the disorder can affect people of any age, in most cases the symptoms are first noticed in teenagers and young adults. However, it is not uncommon for there to be a delay of ten years between the onset of the symptoms and a final diagnosis.

Narcolepsy was first described in 1880 by a French physician who gave the disorder its name. The name comes from two Greek words: *narke,* meaning "to numb," and *lepsis,* meaning "seizure." People who have narcolepsy are frequently drowsy and can fall asleep suddenly and deeply, often in the middle of an activity. The effects of this disorder can cause serious problems. People may fall asleep at work or school, while having a conversation, playing a game, eating a meal, or even driving a car. Orphan Medical, Inc., the maker of a new non-methylphenidate narcolepsy drug called Xyrem (ZY-rem), reported in 2005 that narcolepsy affects about 100,000 to 140,000 Americans, but only 50,000 of these individuals receive treatment for their symptoms.

What Is It Made Of?

Methylphenidate is a synthetic substance that is chemically related to amphetamines. Synthetic substances are produced in a laboratory from chemicals. Methylphenidate is also related to the substance piperidine, a chemical used in the manufacture of rubber. Methylphenidate is a white, odorless, fine crystalline powder with a chemical structure similar to that of the NEUROTRANSMITTER called DOPAMINE.

How Is It Taken?

Methylphenidate comes in tablet, liquid, and capsule form. When used for medical purposes, it is taken by mouth. The FDA has approved methylphenidate for patients six years of age and older, but it is sometimes prescribed for children younger than six.

Illegal users of the drug usually swallow it, inhale or snort it through the nose, smoke it, or inject it by needle into a vein. Abusers typically crush the tablets into a powder to inhale or smoke the drug. To prevent abuse, some methylphenidate tablets—Concerta, for example—are made in a special way so they cannot be ground into a powder. To inject the drug, abusers usually dissolve immediate-release methylphenidate tablets in water and then inject the mixture into a vein with a needle and syringe.

Methylphenidate Formulas

Methylphenidate is available as an immediate-release tablet and liquid; an intermediate-acting (extended-release) tablet; and a long-acting (extended-release) capsule and tablet. Some of the tablets are chewable. Immediate-acting formulas have an effect that lasts approximately three to four hours; intermediate-acting formulas last about six to eight hours; and long-acting formulas last approximately eight to twelve hours. The immediate-release formulas are typically taken two to three times a day. Dexmethylphenidate (Focalin) is an immediate-release tablet that is usually taken twice a day. Ritalin and Methylin are methylphenidates that are taken two or three times a day. Longer-acting versions of the drug (such as Concerta) are becoming more popular, however. According to the CHADD fact sheet, these formulas "may cause fewer 'ups and downs' over the day and may eliminate the need for taking additional doses at school or during work."

When a person takes an extended-release formula, part of the drug is released into the body shortly after it is swallowed, while the remaining drug in the capsule or pill is released more

neurotransmitter: a substance that helps spread nerve impulses from one nerve cell to another

dopamine: pronounced DOPE-uh-meen; a combination of carbon, hydrogen, nitrogen, and oxygen that acts as a neurotransmitter in the brain

slowly. Different extended-release formulas use different methods to deliver the medicine into the body over many hours. Packing the methylphenidate into granules called beads is one method. Metadate CD capsules use this bead-delivery system. These capsules use two different types of beads. The rapid-release beads allow the medicine to reach the bloodstream quickly. In Metadate CD, about 30 percent of the drug is released immediately. The extended-release beads, which make up the remaining 70 percent of the capsule, dissolve slowly over several hours. Ritalin LA uses the same bead delivery system, but it contains about 50 percent rapid-release beads.

Concerta is an extended-release formula of methylphenidate that uses a different method to release its medicine. The tablet has an outer methylphenidate coating that dissolves immediately when swallowed. Once that drug dissolves, an underlying membrane allows water to flow in and out of the tablet. Beneath the membrane are two more layers of drug. When water enters the tablet, it expands and pushes the drug out of the top. The delivery time can be increased by using a thicker membrane or decreased by using a thinner one.

Methylphenidate Dosages

The dose of Ritalin and other methylphenidate formulas depends on the age and size of the patient and the nature and severity of the medical disorder. The starting dose of the immediate-acting formula of methylphenidate for adults and teenagers with either ADHD or narcolepsy is generally between 5 and 20 milligrams, taken two or three times a day. The medicine can be taken with or after meals. Younger children with ADHD generally start at 5 milligrams and take the drug two times a day. Chewable tablets should be thoroughly chewed and taken with a full glass (eight ounces) of water or other liquid.

For extended-release formulas, the recommended starting dose is 20 milligrams a day for adults, teenagers, and children over six years old. The maximum dose is generally 60 milligrams per day. The medicine is taken in the morning before breakfast. Intermediate-acting and long-acting extended-release tablets and capsules are designed to be swallowed whole.

Are There Any Medical Reasons for Taking This Substance?

Ritalin and other methylphenidates are approved by the FDA to treat ADHD and narcolepsy. In some cases, methylphenidate is used in the treatment of other medical disorders, such as symptoms associated with a traumatic brain injury. Such injuries can be caused by a blow to the head, a fall, or a car crash. People who experience

To help those with ADHD, various programs and activities can be used in combination with Ritalin or in place of Ritalin. Here, students attend camp to learn discipline, structure, and social skills to help manage their ADHD.
Photo by Brendan Smialowski/Getty Images.

traumatic brain injury often experience behavioral problems and ADHD-like symptoms, including decreased attention span. These symptoms can last for years after a moderate or severe brain injury. Methylphenidate has also been used to help patients who have suffered a STROKE and to enhance the effects of antidepressants.

Most methylphenidate prescriptions are written for children with ADHD. Methylphenidate helps children and adults with ADHD to increase their focusing abilities and decrease their level of distraction. Experts agree that drugs alone are not the best treatment for people with ADHD. Psychological and behavioral therapies, as well as BEHAVIOR MODIFICATION—in combination with medicines—offer the most effective means of dealing with the symptoms of ADHD.

stroke: a loss of feeling, consciousness, or movement caused by the breaking or blocking of a blood vessel in the brain

behavior modification: a type of therapy that changes behavior by substituting desired responses for undesired ones

Usage Trends

Both legal and illegal uses of prescription medications have increased significantly since the 1990s, especially in the United States. A 2005 report by the Partnership for a Drug-Free America states that 10 percent of American teenagers (2.3 million young people) admit to using the prescription drug Ritalin or Adderall without a doctor's order. (Adderall is an amphetamine-type drug used to treat ADHD. An entry on Adderall is included in this encyclopedia.)

The illegal use of Ritalin and other methylphenidates among high school and college students began to rise in the late 1990s. Students used the drug at parties, often snorting it to get a quick high. By the early 2000s, reports were surfacing of high school and college students using Ritalin for academic purposes. Users claim the drug helps them stay awake and focus during late-night study sessions or while writing essays. In a 2005 article for *USA Today*, Donna Leinwand wrote that students who take stimulants such as Ritalin are doing so "not necessarily to get high, but also to ease stress or to try to improve academic performance." The article further noted that universities with high academic standards tend to have higher rates of illegal prescription drug use.

Some students abuse prescription drugs like Adderall or Ritalin because they want to perform better on tests, such as college entrance exams. Students feel a lot of pressure to succeed, and some believe using these prescription drugs, even illegally, will help them focus and get better scores. They defend their drug abuse by claiming that a low test score can mean many missed opportunities and lesser job opportunities. Other students believe that using performance-enhancing drugs is unfair and is a form of cheating.

What the Surveys Say

Data collected on methylphenidate use for the "2003 National Survey on Drug Use and Health" show that nonprescription use of the drug has held steady since 2000. The highest percentage of use is in the eighteen- to twenty-five-year-old age group (5.7 percent).

Monitoring the Future (MTF), an annual survey that tracks drug use among eighth, tenth, and twelfth graders, revealed a similar trend. MTF is conducted by the University of Michigan and funded by the National Institute on Drug Abuse (NIDA). The survey began including questions about Ritalin in 2001. The 2004 survey noted that 2.5 percent of eighth graders, 3.4 percent of tenth graders, and 5.1 percent of twelfth graders had taken Ritalin without a prescription.

How Users Get Ritalin

Some drugs of abuse can be manufactured illegally. This is not true for methylphenidate. The four ways users can obtain Ritalin and other methylphenidates are: 1) from a doctor; 2) from a pharmacy; 3) from someone else who has a prescription for it; or 4) from a drug dealer who has obtained it through illegal means. Methods of getting methylphenidate illegally include stealing, drug trafficking, and faking prescriptions.

Effects on the Body

The effect of methylphenidate on the user depends on the amount of drug used and the way it is taken. Researchers are studying possible long-term effects of the misuse and long-term use of methylphenidate on a person's brain and behavior.

The Role of Neurotransmitters

Methylphenidates increase the levels of a natural substance in the brain called dopamine. Dopamine is a neurotransmitter, a substance that helps nerve cells communicate with one another. Dopamine plays a critical role in motivation and feelings of pleasure. It is involved in naturally pleasurable activities such as eating good food and being sexually aroused. Methylphenidate is similar to other addictive drugs, such as cocaine and alcohol, in that they all increase dopamine levels.

Research published in the January 2001 issue of the *Journal of Neuroscience* found that relatively small amounts of methylphenidate increase dopamine levels in the brain. The study, led by Dr. Nora Volkow at the Brookhaven National Laboratory, used the same amounts of methylphenidate that are typically prescribed for children. Through brain-imaging techniques, the study found that men who took a dose of Ritalin an hour before the test had higher dopamine levels than those who did not. Dr. Volkow, a psychiatrist who became head of the National Institute on Drug Abuse (NIDA) in 2004, said in a press release that by increasing free dopamine levels, "you can activate . . . motivational circuits and make the tasks that children are performing seem much more exciting."

Concerns about Addiction

Both cocaine and methylphenidate increase dopamine levels in the brain. Cocaine is a very addictive drug, but methylphenidate is generally not addictive when taken by prescription at the

Schedule II Drugs

Some parents and children are concerned about drugs such as Ritalin because they are listed as Schedule II stimulants. Schedule II drugs are those that have a high potential for addiction, but have accepted medical uses. Parents worry that their children will become addicted to these drugs and might want to try more dangerous drugs later in life.

recommended dosage. Oral doses of methylphenidate take about sixty minutes to reach the brain. This length of time prevents the drug from causing the kind of high produced by many illicit, or illegal, drugs that release dopamine. When snorted or injected, however, methylphenidate has the potential to be addictive. In both of these methods, the drug reaches the brain more rapidly than when swallowed in pill form.

The most frequently observed side effects of Ritalin and other methylphenidates (when used appropriately) are difficulty sleeping, loss of appetite, and nervousness. Less common side effects include skin rash, fever, weight loss, dizziness, headaches, stomach pain, irregular heartbeat, difficulty breathing, and feelings of anxiety. It is possible that long-term use of methylphenidate causes slowed growth in children.

Some parents fear that children who take methylphenidate in childhood may become substance abusers in their teens. They note that ADHD drugs such as Ritalin are listed as Schedule II stimulants, which is the same designation used for cocaine. In her testimony to Congress in 2002, Presley noted: "Suicide is the major complication of withdrawal from Ritalin and similar drugs." On its Web site, the Citizens Commission for Human Rights features various stories of young adults who have turned to harder, illegal drugs allegedly as a result of taking prescribed ADHD drugs in childhood.

However, CHADD's "Evidence-Based Medication Management for Children and Adolescents with ADHD" presents a different perspective. Researchers concluded that the proper use of stimulant medicines did not increase a person's risk for later substance abuse. They suggest that when children with ADHD receive the appropriate drug treatment, their risk of later drug or alcohol problems is about the same as that of any other non-ADHD individual.

Methylphenidate Used to Get High

The health consequences of methylphenidate abuse depend on the method used to deliver the drug into the body. When injected, the drug moves quickly into the body and bypasses many of the body's natural defenses against environmental contaminants. Dust, bacteria, or other substances can get into the solution and cause serious harm to the user. Users who inject methylphenidate risk

health problems like blood clots, infections, and drug overdoses. Those who share needles increase their chances of contracting hepatitis, a liver disease, and HIV (the human immunodeficiency virus), which can lead to AIDS (acquired immunodeficiency syndrome). Snorting methylphenidate can seriously damage a user's nasal passages, causing open sores in the nose, frequent nose bleeds, and a burning sensation in the nose.

The abuse of methylphenidate can lead to a number of more general health problems, as well. Methylphenidate that is abused gives the user a high, which is addictive and leads to the desire for greater amounts of the drug. Higher doses can bring on agitation, uncontrollable shaking, and high blood pressure. Methylphenidate abusers may also see things that are not real, have strange ideas that are not true, and act in a bizarre manner. Severe consequences, including death, have been reported.

Reactions with Other Drugs or Substances

Ritalin and other methylphenidates are stimulants that activate the nervous system. The stimulating effects of methylphenidate increase significantly when the drug is used along with other stimulants such as caffeine or over-the-counter cold remedies. (An entry on over-the-counter drugs is included in this encyclopedia.) Methylphenidate can also cause complications if mixed with medications for high blood pressure, seizures, anxiety, or depression.

Treatment for Habitual Users

DEPENDENCE on Ritalin and other methylphenidates can lead to withdrawal once the drug is stopped. Withdrawal is the process of gradually cutting back on the amount of a drug being taken until it can be discontinued entirely. Withdrawal can cause a variety of side effects, including depression, unusual behavior, and feelings of weakness and sleepiness. Users who stop taking methylphenidates should have their doses tapered down slowly under the direction of a physician.

The most effective treatment for methylphenidate abusers is behavioral therapy, sometimes used in conjunction with antidepressants. One behavioral approach is cognitive-behavioral therapy (or talk therapy), which focuses on modifying the patient's attitudes, thinking processes, and coping skills. Recovery support groups may also be helpful, especially in the months or years following addiction treatment.

dependence: a physical need for a drug in order to ward off withdrawal symptoms

A young boy with ADHD is shown with his parents at their home in Massachusetts. His mother filed a civil rights complaint against his school claiming that his teachers were pressuring her to keep her son on Ritalin. *AP/Wide World Photos.*

Consequences

Patients who have EPILEPSY or other seizure disorders (sudden attacks of involuntary muscle movement) could increase their risk of having seizures if they take methylphenidate. Methylphenidate may worsen symptoms in people who experience TICS. Methylphenidate can also cause serious problems when taken by people with severe anxiety or high blood pressure. When a patient first starts taking the drug or restarts it after going without it for a month or more, the medication has a more pronounced effect.

Individuals who abuse methylphenidate or patients who have developed a dependence on the drug may experience an increased tolerance to the drug. When this happens, higher and higher doses of a drug are needed to produce the original effect (or high) experienced. These individuals may also experience a psychological dependence on the drug. This means that, over time, the frequent user will begin to feel that he or she needs the drug to function effectively.

epilepsy: a disorder involving the misfiring of electrical impulses in the brain, sometimes resulting in seizures and loss of consciousness

tics: repetitive, involuntary jerky movements, eye blinking, or vocal sounds that patients cannot suppress on their own

The Law

Methylphenidate is a strictly regulated drug and is available only with a prescription. Its use is controlled by federal law. The U.S. Controlled Substances Act (CSA) of 1970 places all controlled drugs into one of five categories called schedules. These schedules are based on a substance's medical value, harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use.

Methylphenidates like Ritalin are categorized as Schedule II drugs with genuine medical uses that also have a high potential for abuse and addiction. This is the most restrictive category for medical drugs. The U.S. government requires special licenses for the manufacture and distribution of methylphenidate. Possessing methylphenidate without a medical doctor's prescription is against the law and can result in imprisonment and heavy fines.

Whether parents should be forced to put their children on ADHD medications is still highly debated. Various lawsuits have been filed to determine whether schools can insist that hard-to-handle children be medicated. Also, parents continue to fight for laws to protect their rights not to medicate their children.

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See also: Adderall; Amphetamines; Dextroamphetamine

Rohypnol

Official Drug Name: Flunitrazepam (flu-nih-TRAZ-uh-pam), Rohypnol (roh-HIPP-nahl)
Also Known As: Circles, forget-me pill, la rocha, lunch money, Mexican Valium, mind erasers, R-2, rib, ro, roaches, roachies, roapies, roche, roofies, rope, rophies, rophy, ruffies, ruffles, shays, stupefi, wolfies
Drug Classifications: Schedule III, depressant

What Kind of Drug Is It?

Rohypnol (roh-HIPP-nahl) is the brand name for the drug flunitrazepam (flu-nih-TRAZ-uh-pam). Rohypnol is a depressant, which means it decreases activity in the brain and the rest of the body. There are two main types of medical depressants: barbiturates (bar-BIH-chuh-rits), which are used as sleeping pills and are often referred to as "downers"; and benzodiazepines (ben-zoh-die-AZ-uh-peenz), a group of drugs used to treat anxiety. Rohypnol is a benzodiazepine.

Rohypnol is often referred to as a sedative-hypnotic as well, because it calms people down and brings on sleep. In addition, Rohypnol causes muscles to relax, eases anxiety (feelings of being extremely overwhelmed, restless, and worried), and reduces the severity of seizure conditions. Although it is approved for use in about sixty countries (primarily as a sleeping aid), it is not and never has been a legal substance in the United States.

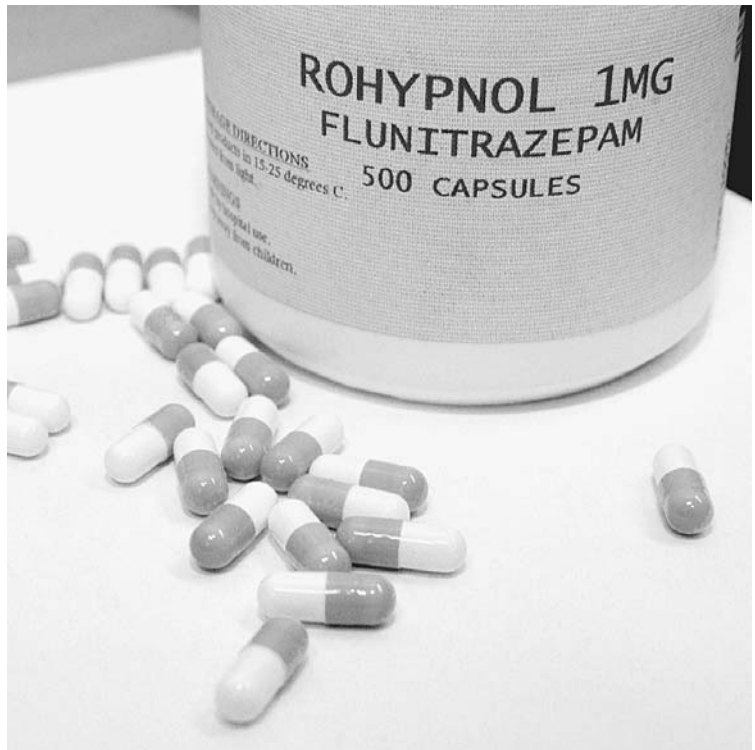
In the early to mid-1990s, a marked increase in the use of Rohypnol was being reported worldwide. In the United States, more young people in college and high school were using it recreationally to get high, not to treat a medical condition. Youth used the drug at nightclubs, music festivals, fraternity parties, and all-night dance parties called raves, which typically involve huge crowds of people, loud techno music, and illegal drug use.

Because of its popularity among club-goers, Rohypnol joined the group of drugs commonly referred to as club drugs. These drugs, according to the U.S. Drug Enforcement Administration (DEA), include cocaine, ecstasy (MDMA), GBL, GHB, ketamine, LSD (lysergic acid diethylamide), methamphetamine, PCP (phencyclidine), and psilocybin. (Separate entries on each of these drugs are available in this encyclopedia.) All of these substances are used to enhance the club experience.

Date Rape Drug

As Rohypnol was gaining popularity as a club drug, sexual predators realized its power to incapacitate, or paralyze, a person temporarily. The drug also causes a special type of AMNESIA that stops the brain from remembering new events. Consequently, users find

amnesia: loss of memory



Finnish police confiscated this bottle of Rohypnol along with another 400,000 pills in a drug raid in 2003. In the United States, the drug is not sold legally or approved for medical use. *Photo by Merja Ojala/AFP/Getty Images.*

that they cannot remember what goes on during the time they are under the influence of Rohypnol.

The combination of being able to incapacitate a victim and wipe out hours of memories is very attractive to criminals. The drug allows them to take advantage of their prey without much resistance—and have a greater chance of getting away with it. Because of this, Rohypnol is considered a "date rape drug." In the mid- to late-1990s, it was linked to a large number of date and acquaintance rapes. In these cases, the rapist is usually someone the victim knows.

Overview

The Swiss drug company Hoffmann-La Roche originally developed Rohypnol in the 1970s. It was one of a number of benzodiazepines the company was working on at the time. Rohypnol

turned out to be the most powerful drug of its kind on the market—ten times stronger than Valium, a benzodiazepine. Valium is a legal drug available by prescription in the United States. But Rohypnol has never been approved for sale—even for medical use—in the United States. However, it is one of the most popular benzodiazepines sold in Europe, Mexico, South America, and Asia.

Rohypnol acts rapidly on the body. Its effects kick in about fifteen to twenty minutes after it is taken. Because of its strength and its ability to stop memories from forming, Rohypnol is given to patients as an anesthetic to deaden pain before surgeries. In addition, it is taken as a SEDATIVE and sleep aid.

The Problem of Smuggling

Although Rohypnol is not approved for use in the United States, it became popular as a low-cost recreational drug among some drug-using Americans in the 1990s. Recreational drugs are those taken purely to get high. It is believed that Rohypnol made its first U.S. appearance in 1989, when it was brought in from South America to Florida. From that point on, according to the 2003 fact sheet on Rohypnol published by the White House Office of National Drug Control Policy (ONDCP), the drug has been shipped into the United States through international mail or courier services from other countries, especially Colombia. People have been known to cross the U.S. border into Mexico, buy the drug at Mexican pharmacies, then bring it back to the United States.

In the early 1990s, abuse of Rohypnol became a serious problem in the United States. In response, the U.S. Customs Service began cracking down on the smuggling—or illegal import—of Rohypnol into the country. Smuggling was highest in Texas and Florida. This action by U.S. Customs decreased the amount of Rohypnol being brought in to the country.

Rohypnol: The Club Drug

Club drugs are the drugs of choice for use at music festivals, dance parties, and raves. Users take them to enhance the sensations of sight and sound and to heighten their feelings as they interact with others. Because these drugs help break down social INHIBITIONS, users typically take them in crowded settings. The most popular club drugs are ecstasy, GHB, ketamine, and Rohypnol.

The popularity of these drugs is linked to their cost and availability. They are relatively inexpensive (a few dollars each) and easy to distribute and take without being noticed. They all come in pill,

sedative: a drug used to treat anxiety and calm people down

inhibitions: inner thoughts that keep people from engaging in certain activities

Rohypnol is widely available in Mexico, but it is illegal to bring the drug across the border. At this border crossing between Tijuana, Mexico, and San Isidro, California, customs agents have a huge job checking cars and trucks entering the country. *© Lynsey Addario/Corbis.*

powder, or liquid form. Many people take them with alcohol, which increases the risk of side effects. These effects may include dizziness, confusion, and violent behavior and can lead to overdose.

Drug-Facilitated Rape

Drugs can cause people to lose control of their minds and bodies for a certain period of time. This leaves people vulnerable to others. In the case of drug-facilitated rape, rapists use drugs to overpower their unsuspecting victims. Most drug-facilitated rapes involve Rohypnol or another fast-acting depressant called GHB. Found in small quantities in the human body, GHB was once marketed as a sleep aid and a body-building supplement. Both Rohypnol and GHB are usually taken in combination with alcohol. These depressants work quickly to incapacitate a victim, making it easier for a rapist to attack.

Rohypnol is a very powerful substance that causes heavy sedation. It leaves users motionless, silent, and unable to remember events that occur during its use. A few years after Rohypnol was introduced in the United States, a high number of sexual assaults were being reported in which the drug played a role in subduing the victim. Rape victims were reporting attacks that they didn't remember but showed physical signs of enduring.

This alarming trend caused the U.S. Congress to pass the Drug-Induced Rape Prevention and Punishment Act of 1996. The act increased the penalties against criminals who use drugs in their attacks or distribute or possess Rohypnol. The DEA banned the drug in the United States in 1997. "No one really knows how common drug-facilitated rape is because today's research tools do not offer a means of measuring the number of incidents," noted Nora Fitzgerald and K. Jack Riley in a 2000 article titled "Drug-Facilitated Rape: Looking for the Missing Pieces."

The Unsuspecting Victim. Rohypnol is tasteless, odorless, and colorless (except for the newer tablets of Rohypnol that contain a dye that is released when mixed with liquids). After a rapist picks a potential victim, he decides how to get the nearly undetectable drug into the victim's drink. He either buys a beverage for the victim and slips the drug into the drink before it is served, or tries to get close enough to the victim to spike the drink when no one is looking. That's why it is so important not to accept drinks from strangers, share drinks, or leave a drink unattended. Drinks in punch bowls should also be avoided.

Once Rohypnol is in a drink and the victim consumes it, the effects of the drug become evident quite quickly, usually within fifteen minutes or so. The victim will begin to feel sick or disoriented and most likely think it's from drinking too much alcohol. People around the victim may not notice anything strange. The victim might even accept help from the would-be

Banned in the United States

In 1997, Rohypnol was banned in the United States. This means it cannot be sold or used in the United States in any form or for any purpose, including medical uses. Other drugs with similar properties, such as Valium, would have to be used in its place. As of 2005, Rohypnol was still being used in Europe and Latin America. Some South American countries even sell it over the counter.

Despite the U.S. ban, Rohypnol that is manufactured and sold legally in other countries manages to make its way into the United States. However, the supply of the smuggled drug does not always match the high demand on American streets. To meet that demand, dealers may provide poor substitutes that are not made under the strict quality-control measures followed by the actual manufacturer of Rohypnol. Therefore, a user cannot be sure of the drug's effectiveness, purity, or safety. A so-called "knock-off" Rohypnol pill could contain more or less of the active ingredients than the original, and it may contain other substances that could be harmful to the user.

Because Rohypnol is colorless and odorless, it can be used to "spike" just about any beverage. Thus, it has gained a reputation as a date rape drug. To help consumers know if their drinks are free of such drugs, Drink Detective testing kits hit the market in 2004. *© Stephen Hird/Reuters/Corbis.*

rapist in getting to a bathroom or getting home. At this point, the rapist has gained control of the victim and might take advantage of the victim.

Rape victims who are drugged with Rohypnol often don't know how the attack occurred. They remember being at a bar or a party, but the next thing they know they wake up in a strange place and show signs of having been abused. In some cases, victims may even wake up in the middle of an attack but be too physically weakened by the drug to do anything to stop it. Gail Abarbanel, in Fitzgerald and Riley's article, pointed out that "in drug-facilitated rapes, [victims are subjected] to an extreme form of powerlessness."

What Is It Made Of?

Rohypnol is a benzodiazepine. It contains ingredients that slow down the brain and body. Rohypnol is stronger than other benzodiazepines, such as Valium, Xanax, and Halcion, which are available by prescription in the United States. In low doses, Rohypnol sedates and relaxes the user. In higher doses it causes sleep and can incapacitate a person who has consumed it.

An overdose of Rohypnol, which may occur after ingesting about seven or more tablets, can lead to COMA and death. Death has occurred most often when Rohypnol has been mixed with heroin or other depressants such as alcohol. (Entries on heroin and alcohol are available in this encyclopedia.)

Rohypnol was originally a small, round white pill with the name Roche etched into it along with the number indicating the dose of the pill (either a "1" for 1 milligram or a "2" for 2 milligrams). This pill is still available, along with the reformulated, larger, oblong green tablet with the number 542 on one side. The number 542 tablet contains a bright blue dye that is released when it is put in a drink. This dye alerts the drinker to the presence of the drug and is intended to stop an impending assault from occurring.

A Life-Saving Dye

In response to the trend of criminals slipping Rohypnol into the drinks of unsuspecting victims, Rohypnol manufacturer Hoffmann-La Roche added a dye to the Rohypnol tablet. When this reformulated tablet is dropped into a drink, a bright blue color is released. The dye alerts the victim that his or her drink has been tampered with. However, many predators are aware of the dye and may order a blue cocktail for their victims or seek out victims with bluish-colored mixed drinks. Tropical drinks such as the Blue Hawaii are made with curaçao (KYOOR-uh-soh or KYOOR-uh-sow), a bright blue liqueur with an orangey taste.

How Is It Taken?

Rohypnol comes in pill or tablet form or as a solution to be injected. The pill or tablet is swallowed, chewed, or put under the tongue to dissolve slowly. Less commonly, it is crushed and snorted or dissolved and injected. It is also added to marijuana and smoked. Rohypnol comes in doses of 1 or 2 milligrams. It affects the user rather quickly, within fifteen to twenty minutes, and the effects last anywhere from eight to eighteen hours.

Rohypnol is approved for use and sale in dozens of countries. It is typically smuggled into the United States, where it is sold on the street or in clubs in its original packaging. Many users think it is safe because it comes individually wrapped in the manufacturer's packaging and looks like other drugs sold by prescription or at the drugstore. However, any substance taken for recreational use involves risks, such as overdose or even death, especially if mixed with other

coma: a state of unconsciousness from which a person cannot be aroused by noise or other stimuli

A pharmaceutical worker is shown operating a drug-packaging machine. Rohypnol is made and prescribed legally in Europe and Latin America, but is illegal in the United States. Smugglers sell the drug on U.S streets and in clubs, often in its original packaging. *AP/Wide World Photos.*

drugs like alcohol. Poor substitutes for Rohypnol can be found in the United States and are passed off to the buyer as the real thing. Taking these substitutes can be even more dangerous than taking the original, as the contents of the drug are unknown.

Sexual offenders and other criminals have found that they can slip crushed Rohypnol pills into a victim's drink without the victim knowing. The drug dissolves somewhat in liquid and cannot be tasted, smelled, or even seen. As the victim consumes the drink, the drug

incapacitates him or her, which allows the criminal to take action. This series of events has been known to occur at group gatherings, where people may not be keeping a constant eye on their drinks.

Are There Any Medical Reasons for Taking This Substance?

Rohypnol is not approved for medical use in the United States. It is widely used in other countries as a sleep aid. Due to its rapid onset, sedating features, and effect on memory, Rohypnol is also used prior to surgery as an anesthetic.

Usage Trends

After Rohypnol arrived on the U.S. drug scene in 1989, its abuse became popular among young people. Despite measures to keep the drug out of the United States, that abuse continued. Use especially occurred within southern border states such as Texas and Florida, where it is imported from Mexico and Colombia. Many believe that the drug's popularity stems from the fact that it is relatively inexpensive, about fifty cents to five dollars a tablet, and appears safe since it comes in the original manufacturer's packaging. Some abusers also mistakenly think it will escape detection by drug tests. However, it is detectable for up to seventy-two hours after it is taken.

Recreational Use

Rohypnol is usually taken recreationally to enhance the effects of other drugs, such as alcohol, marijuana, or ecstasy. The 2003 ONDCP fact sheet on Rohypnol states that "the predominant user age group is 13- to 30-years-old and users tend to be male." Paul M. Gahlinger, writing in *Illegal Drugs: A Complete Guide to Their History, Chemistry, Use and Abuse,* commented, "To young people, getting 'roached out' is a novel, seemingly benign way of getting high, different from the marijuana, cocaine, and heroin of the older generation. The fact that this drug's main effect is heavy sedation—and not EUPHORIA, stimulation, or HALLUCINATIONS—is an interesting commentary on the life of the modern high school student."

The results of the 2004 Monitoring the Future (MTF) study, conducted by the University of Michigan (U of M) and sponsored by research grants from the National Institute on Drug Abuse (NIDA), were released to the public on December 21, 2004. Three years earlier, in 2001, 1.1 percent of eighth graders, 1.5 percent of tenth graders, and 1.7 percent of twelfth graders reported using Rohypnol at least once in

euphoria: pronounced yu-FOR-ee-yuh; a state of extreme happiness and enhanced well-being; the opposite of dysphoria

hallucinations: visions or other perceptions of things that are not really present

their lives. Those percentages were down considerably from 1998, when 1.4 percent of eighth graders, 2.0 percent of tenth graders, and 3.0 percent of twelfth graders admitted to using Rohypnol at least once. In 2004, the percentages dropped slightly from 2001—to 1.0 percent for eighth graders and 1.2 percent for tenth graders. MTF statistics on the use of Rohypnol among seniors were not available for 2004. However, the authors of the survey noted that Rohypnol use "showed little systematic change in 2004 . . . at any grade level."

The 2004 "Pulse Check" report released by the ONDCP stated that law enforcement officials found a variety of synthetic drugs, including Rohypnol, "easier to purchase" in 2003 than in 2002. Synthetic drugs are those made in laboratories, not those that occur naturally.

Other Uses

Rohypnol has been used to help ease withdrawal symptoms from other drugs such as heroin. Withdrawal symptoms occur when the user gradually cuts back on the amount of a drug being taken until it can be discontinued entirely. Such symptoms include a variety of physical and psychological effects, depending on the drug.

Cocaine users have taken Rohypnol to help come down after a drug-using binge. Specifically, Rohypnol has been known to help with the DEPRESSION that may occur after using STIMULANTS like cocaine. Some use it as a cure for a hangover, the uncomfortable feelings—such as the pounding headache, upset stomach, and trembling feelings—that often occur after a bout of heavy drinking.

Criminals worldwide have used the power of Rohypnol in a variety of crimes. Both females and males have been victims of Rohypnol-assisted crimes. Rapists have used this sedative-hypnotic to incapacitate their victims so they can overpower them with ease. Thieves have also used Rohypnol to knock out people so they could steal money and credit cards from their wallets.

Effects on the Body

Rohypnol is a very strong benzodiazepine. It is ten times more powerful than the other popular benzodiazepine Valium, and its effects are felt quickly by the user. The drug typically works on the body for up to eighteen hours (sometimes longer). During that time, a user will feel drowsy, disoriented, and even lose consciousness. Most people will suffer from a form of amnesia that prohibits memory formation for as long as the drug is in their system. Too much Rohypnol can lead to overdose. The chances of overdosing increase substantially when Rohypnol is mixed with alcohol or other depressants.

depression: a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts

stimulants: substances that increase the activity of a living organism or one of its parts

Users can build up a tolerance to Rohypnol. This results in the person needing more and more of the drug to get the same effect as the first time he or she used it. Rohypnol abuse can also lead to physical and PSYCHOLOGICAL DEPENDENCE, which causes cravings that can make it very difficult to stop taking the drug.

The longer a user is on Rohypnol, the greater the degree of tolerance that occurs, and the worse the withdrawal symptoms will be when he or she stops taking it.

Side Effects

The common side effects of Rohypnol are:

- Amnesia
- Coma
- Disorientation
- Headache
- Lowered heart rate
- Mood swings
- Nausea
- Sedation
- Seizure
- Slowed breathing
- Slurred speech
- Staggered walk
- Violent behavior
- Vomiting

Reactions with Other Drugs or Substances

Rohypnol is most commonly mixed with alcohol, since it is found primarily at parties, raves, and clubs. It is used in the party atmosphere either to enhance a high or to aid a criminal in sedating a victim. Alcohol is a depressant. When Rohypnol, which causes sedation or sleep, is mixed with alcohol, a user may lose consciousness and even die.

Depressants and other benzodiazepines should never be taken with Rohypnol. Also, users should not combine it with amphetamines (am-FETT-uh-meens), which are stimulant drugs that increase mental alertness, reduce appetite, and help keep users awake. The combination of both drugs increases the risk of seizures.

Treatment for Habitual Users

Rohypnol is highly addictive, or habit-forming. Experts advise users who want to quit the habit for good to consult with a physician. Sudden withdrawal, often called going "cold turkey," is not recommended and can be dangerous. The body of a Rohypnol addict is accustomed to receiving a regular supply of the drug. Without it, the user can experience painful withdrawal symptoms such as headache, muscular pain, hallucinations, DELIRIUM, and seizures (which can occur more than a week after a person stops taking Rohypnol). Other symptoms include intense irritability, anxiety, tension, and restlessness. Numbness and tingling in the arms and legs may also occur.

psychological dependence: the belief that a person needs to take a certain substance in order to function

delirium: a mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating

Many young people think they can take Rohypnol, drive home from a club or rave, and avoid being arrested for driving under the influence. As this teen is learning, drugs and alcohol impair one's vision substantially, making it difficult to walk a straight line or drive a car. The teen is wearing goggles to impair her eyesight to simulate the experience of being intoxicated. *AP/Wide World Photos.*

Treatment programs exist that help users give up addictive substances. There are inpatient and outpatient programs, depending on the severity of the addiction. According to the "Pulse Check" report, "treatment numbers [for Rohypnol] remain low when compared with other drugs." However, the number is rising steadily. About 98 percent of these treatment clients are male.

Drug addiction is curable. However, even after successfully recovering from a period of abuse, addicts usually need support from others in order to stay off drugs for good. Many support groups offer safe havens for addicts to share stories of their struggles and meet others who are going through the same experience. Knowing that others are feeling the same way can help users gain the strength needed to fight their drug cravings.

Consequences

Rohypnol is an illegal substance in the United States. Taking it for any reason is breaking the law and is putting the user at risk of addiction and even death. Even a low dose can lead to an adverse reaction or negative side effect, especially if it is taken in combination with other drugs. A small habit can lead to full-blown abuse and ultimately addiction. If a user overdoses, an ANTIDOTE called flumazenil (flu-MAH-zin-ihl) may be administered to the patient. A patient usually recovers from an overdose within about seven hours if treated by emergency medical personnel.

The Law

Rohypnol is legal in more than sixty countries but not in the United States. It was originally classified along with the other benzodiazepines as a Schedule IV drug. The Controlled Substances Act of 1970 classifies drugs in five categories called schedules. These schedules are based on a substance's medicinal value, possible harmfulness, and potential for abuse and addiction. Schedule I is reserved for the most dangerous drugs that have no recognized medical use.

In February 1995, the DEA made two enormous seizures of Rohypnol—one in Louisiana and one in Texas. That same year, Rohypnol was moved to Schedule III status. All other benzodiazepines remained at Schedule IV. In 1997, the DEA banned Rohypnol from being imported into the United States. Some states have classified it as a Schedule I drug, and the DEA is considering doing the same.

Drug-Induced Rape Prevention and Punishment Act of 1996

The high number of rapes that involved Rohypnol and other date rape drugs in the mid-1990s led the U.S. government to create the Drug-Induced Rape Prevention and Punishment Act of 1996. This act states that a person who uses a drug in a sexual assault will receive

antidote: a remedy to reverse the effects of a poison

More Than Just a Date Rape Drug

Criminals worldwide have found that they can sedate people with Rohypnol and steal from them. In Asia, it was reported that prostitutes in the Wan Chai bar district in China were drugging men with Rohypnol and then stealing their money and credit cards. They would even target men at ATM machines, watch as the victim keyed in his pin number, distract and drug him, and then steal his ATM card and money from his account.

harsher penalties, such as higher fines and longer prison terms—up to twenty years. Just possessing Rohypnol is punishable by three years in prison and a fine. In 1997, penalties for possessing and selling Rohypnol were stiffened even more to reflect the penalties of Schedule I drugs.

Difficulty Prosecuting Rapists Who Use Rohypnol

Since Rohypnol causes amnesia, a rape victim may awaken after the drug has worn off and see and feel physical signs of being assaulted but not remember much or anything at all about the attack. The victim may not even know the identity of the attacker. Rohypnol provides a rapist with the possibility of remaining completely anonymous. Having limited memory of an attack or not remembering it at all makes it extremely difficult to find and prosecute a perpetrator.

In addition, some victims wait too long before reporting an attack to the police. They may feel ashamed, embarrassed, afraid, or blame themselves for the rape. No matter the circumstances—even if the victim doesn't know the identity of the rapist—it is important for a victim to go to the authorities and report a rape right away. The victim can be examined and evidence can be built for a case against the attacker. The evidence is better the sooner it is collected.

If Rohypnol use is suspected in a rape case, the victim will need to be tested for the drug. However, Rohypnol tests are time-sensitive. The drug is only detectable in the body for up to seventy-two hours after it is consumed. Waiting beyond seventy-two hours could result in a negative test for Rohypnol, which would weaken the chances of convicting the perpetrator. In suspected rape cases, Roche Laboratories offers a free screening for Rohypnol.

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See also: Benzodiazepine; Cocaine; Ecstasy (MDMA); GBL; GHB; Ketamine; LSD (Lysergic Acid Diethylamide); Methamphetamine; PCP (Phencyclidine); Psilocybin

Salvia Divinorum

Official Drug Name: *Salvia divinorum* (Epling and Jativa-M.), salvinorin A, divinorin A
Also Known As: Hierba (YER-buh) Maria (the Virgin Mary's herb), semilla de la Virgen (the Virgin's seed), ska Maria Pastora (the leaves of Mary, the shepherdess); also diviner's sage, herbal ecstasy; Mexican mint, Pastora, salvia
Drug Classifications: Not scheduled, hallucinogen

What Kind of Drug Is It?

Salvia divinorum is a member of the mint (Lamiaceae) family of plants. When the leaves from this plant are chewed or brewed as a tea, they release a substance called salvinorin A. The substances cause humans to experience hallucinations, which are images, sounds, or other perceptions of things that are not actually present.

The *Salvia divinorum* plant grows naturally in the mountainous regions of central Mexico. In the Oaxaca region, the native peoples have traditionally used the plant in rituals that, they believe, cure physical ailments and allow them to see into another world. There are several other plants that have been used for similar purposes in Mexican indigenous (native) cultures, including the peyote (pay-OH-tee) cactus, psilocybin (sill-o-SIGH-bin) mushrooms, and the morning glory flower. (An entry on psilocybin is available in this encyclopedia. Peyote is discussed in the mescaline entry.)

These types of vegetation are known as PSYCHOTROPIC plants. They are all considered to be in the hallucinogen family of drugs. Hallucinogens are substances that bring on hallucinations and alter the user's perception of reality.

Overview

Salvia divinorum has been used for centuries by the people who live in the highland areas of the Sierra Mazateca region of Oaxaca, Mexico. Within the Mazatec Indian culture, the plant is an important part of rituals that promote physical healing and spiritual growth. It is not clear exactly when the *Salvia divinorum* plant was first used by humans, but it is known that native peoples have used other such plants for several thousand years.

After the Spanish took control of the region in the 1500s, they did not allow the native peoples to perform rituals using hallucinogenic plants. The Spanish were devout Catholics and viewed the use of such substances as being contrary to Christian practices. They severely punished those who used the drug. The indigenous peoples did not change their traditions, however. They merely began conducting them in secret. Knowledge of the plants, and the practices

psychotropic: having an effect on the mind

Salvia divinorum is grown in the Sierra Mazateca Mountains in Oaxaca, Mexico. *The Gale Group.*

associated with them, continued to be passed on through the generations, in various regions.

Researchers Examine the Herb

During the 1930s, Richard Schultes was one of a group of researchers who led expeditions to Oaxaca to study the rituals and plant use of the Mazatec Indians living in the northeastern region of the state. Their surveys included investigation into the use of *Salvia divinorum.* Samples of the plant were brought to the United States some thirty years later by another team of researchers, headed by amateur MYCOLOGIST R. Gordon Wasson (1898–1986) and Swiss chemist Albert Hofmann (1906–). Hofmann was the man who created the well-known synthetic hallucinogen, LSD (lysergic acid diethylamide), in a laboratory. The plant was subsequently identified by researchers as a type of *Salvia,* or sage, which is a genus or subgroup within the larger mint family of plants.

mycologist: a person who studies mushrooms

For many years the plant was grown in the United States mainly by a few researchers. Interest in its effects has gradually increased, however, in part because, as of 2005, *Salvia divinorum* is one of the few hallucinogens that is not illegal to use or possess in the United States. Although use of it was still uncommon in the early years of the twenty-first century, it has increased in popularity since the mid-twentieth century, when it was almost completely unknown in the United States.

Despite the drug's availability and legal status, authorities predict that use of *Salvia divinorum* will not become a problem because it has several characteristics that make it unappealing as a street drug. These include a bitter taste and effects on the user that may be more frightening than enjoyable.

What Is It Made Of?

Salvia divinorum is an herb, a member of the family of sages and mints. When fully grown, it stands approximately 24- to 36-inches (61- to 91-centimeters) tall. Its leaves—which are the part of the plant that causes hallucinations and other changes in the user's mind—are about 6-inches (15-centimeters) long. *Salvia divinorum* grows naturally in Mexico, in the highland areas of the Sierra Mazatecas in the state of Oaxaca. Originally, the plant grew only in remote pockets of the mountainous regions of that area. But the Mazatec Indians transplanted it at lower elevations, closer to their villages. In modern times it continues to thrive at these lower elevations, both in the wild and in CULTIVATED areas. The first plants brought to the United States were imported by researchers, who kept them mostly in university greenhouses. By 2005, however, *Salvia divinorum* had been identified as growing in the wild in California. It has also been cultivated in Mexico, Hawaii, and California.

In chemical terms, the pure ACTIVE INGREDIENT in the plant is known as salvinorin A. When salvinorin A is extracted from the plant and purified, it takes on a crystalline form.

Salvinorin A is a member of a group of nitrogen-containing compounds known as neoclerodane diterpenes (nee-oh-CLER-uh-dane dy-ter-peenz). These substances have psychotropic properties, or the ability to cause changes in the human mind. Other substances classified as neoclerodane diterpenes are the active ingredients in the wormwood, or artemisia plant, and in tetrahydrocannabinol (TETT-ruh-HY-droh-kah-NABB-ih-nol; THC), the active ingredient in marijuana. (An entry on marijuana is available in this encyclopedia.) Oil of wormwood is used in making absinthe, an alcoholic drink whose properties are so strong and potentially damaging that it has

cultivated: planted and tended with the intention of harvesting

active ingredient: the chemical or substance in a compound known or believed to have a therapeutic, or healing, effect

A twenty-four-year-old student is shown surrounded by some of the *Salvia divinorum* plants that he grows in Mexico. *AP/Wide World Photos.*

been outlawed in many places. THC, salvinorin A, and the active ingredient in wormwood are all chemically very similar.

In the traditional means of using the *Salvia divinorum* plant, the leaves are taken in their natural state. As people outside the traditional Indian cultures have begun to experiment with it, other methods of preparing the substance have been developed. A purified form of

salvinorin A can be extracted from the leaves of the plant, and then concentrated through repeated crystallization (the process of causing a substance to form a crystalline structure).

How Is It Taken?

The shamans, or medicine men, of the Mazatec Indians collect *Salvia divinorum* to use in their work. Shamans are spiritual leaders who seek to cure the sick and uncover hidden truths. Shamans use the plant for their rituals of healing and DIVINATION. Once the leaves of the plant are removed from the stalk, they are prepared in a variety of ways. Sometimes they are ground up, or they are crushed or squeezed. At times they are brewed as a tea, while in other instances the leaves are simply chewed.

The dosage varies, according to the desired effect. Four or five pairs of fresh or dried leaves are the usual treatment for minor ailments. This treatment would be given to cure headaches; to treat constipation (the inability to have a bowel movement); or to serve as a general tonic for someone feeling weak or achy. A similar amount is considered to be an excellent cure for a mysterious illness that the Mexican Indians call *panzon de barrego.* This illness causes a swollen belly, and legend says it is caused by the curse of a sorcerer—a being with magical powers given to him by evil spirits.

Ritual Uses of Fresh Leaves

There are other reasons why a shaman, also called a *curandero* (KOO-ren-DAH-roh), would use the plant. Low doses cause mild effects, but when the leaves are taken in much larger amounts, the results are much more noticeable and unusual. Doses of perhaps twenty to sixty leaves of *Salvia divinorum* cause hallucinations and a trance-like state. A trance is a sleep-like state in which important body functions slow down. In a trance, users will usually talk, and the words spoken are thought to reveal some sort of hidden truth.

If a person is suffering from an unidentified illness, *Salvia divinorum* may be used to try to determine the nature of the problem. In this case, the *curandero* climbs a mountaintop to obtain some leaves; kneels and prays before harvesting the plant; then returns to the patient. A dose of perhaps fifty leaves is prepared for the ill person to consume. However, if the person is known to be an alcoholic, twice as much of the plant is used.

Continuing the ritual, the *curandero,* the patient, and a third person, who acts as an assistant to the shaman, all proceed to some quiet spot. Once there, the person being treated drinks a preparation of water, into which the leaves have been squeezed. Soon, the person

divination: the mystical experience of seeing into the future, witnessing a hidden truth, or gaining a deep insight

A shaman works to heal a young woman in her home using *Salvia divinorum*, also known as Pastora. According to the shaman, "It opens doors in your head that let you see God and that can be frightening." *AP/Wide World Photos.*

becomes intoxicated, like he or she has been drinking a lot of alcohol. The person then enters a trance state and begins speaking. It is believed that whatever is said will reveal the true problem causing the illness. When the experience is over, the patient tosses aside all clothing in a symbolic gesture to free himself or herself. Then, the person goes to sleep. The final phase of treatment takes place the following morning, when the *curandero* gives the patient a bath, which completes the ritual cleansing.

Chewing

The chemical makeup of salvinorin A is such that it is quickly broken down by the human digestive system. Therefore, simply eating it immediately makes it almost completely inactive. This is why the substance is usually administered in some other fashion—one that

allows the body a chance to absorb the compound. In the traditional medicine of the Mazatec Indians, *Salvia divinorum* is usually taken by means of chewing the leaves. The leaves are not, however, quickly chewed and swallowed as if they were food.

Taking four or five fresh leaves, the user instead holds them in the mouth for quite a while. The user chews the leaves thoroughly without swallowing them, in a manner similar to that used on a plug of chewing tobacco. This method causes the active ingredients to be absorbed through the tissues of the mouth. After many minutes of thorough chewing, the user finally swallows the mass of leaf material. The taste of the leaves is extremely bitter, so chewing them may be quite an unpleasant experience. *Curanderos,* however, consider this the best method for taking in the salvinorin A and the most effective way to bring on long-lasting visions.

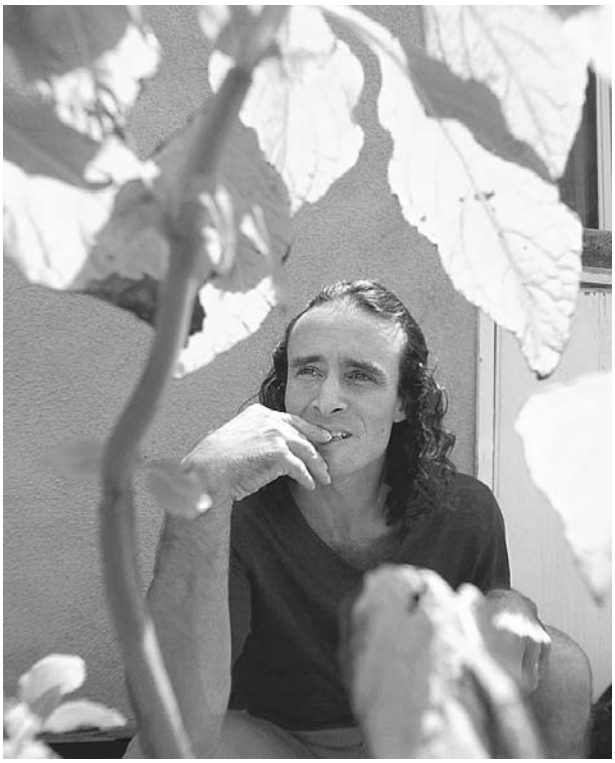
Drinking

Other methods of ingesting the leaves are sometimes used as well. The fresh leaves are squeezed, and the juices are consumed as a beverage. Because of the action of the digestive tract on the salvinorin A, if this method is chosen, the liquid must be held in the mouth for some time before swallowing. This is done in order for the substance to have a noticeable effect. As with the chewing method, the longer the liquid is held in the mouth, the stronger the effect will be, because the salvinorin A is absorbed through the lining of the mouth. Still, the effect from this method is typically quite mild, as it is difficult to hold the liquid in the mouth for very long.

In yet another method, fresh leaves are crushed and soaked in water to create an extract. A solution made with four or five leaves is said to act as a mild tonic (a substance that energizes or refreshes) to increase general well-being. A solution made with twenty to sixty leaves is required to bring on hallucinations.

Smoking

In addition to eating or drinking *Salvia divinorum*, users occasionally smoke it. The leaves are dried and rolled up into cigarette form. In this method, five or six deep puffs will produce a mild euphoria (yu-FOR-ee-yuh), a state of extreme happiness and enhanced well-being. This feeling is somewhat like the high produced by marijuana. The feeling will rapidly reach a peak but then linger for an hour or two. The most powerful effect comes from vaporizing the crystalline form of salvinorin A and inhaling it. When taken by means of this method, a dose of 200–500 micrograms will produce very intense hallucinations.



Daniel Siebert, a researcher and botanist who has studied the effects of *Salvia divinorum,* sits near his plants. *AP/Wide World Photos.*

Experimentation with Various Forms

In the early 1990s, Daniel Siebert, a researcher who has studied the effects of *Salvia divinorum,* coordinated an experiment using twenty human volunteers who took the substance in a variety of ways. Those participating in the experiment reported that no effects at all were noticeable when they took 10 milligrams in a capsule, which was swallowed.

However, as little as 2 milligrams produced effects when prepared as an alcohol extract and sprayed on the tissue of the mouth. Yet, the results from this method were unreliable. When participants in Siebert's trial took 200–500 micrograms of crystallized salvinorin A, vaporized over heat and inhaled, hallucinations were experienced reliably, with an intensity that was very much like that brought on by the use of fresh leaves.

Are There Any Medical Reasons for Taking This Substance?

As of 2005, *Salvia divinorum* was not being used in the modern medical field. Tribal healers in Mexico have used the plant, probably for centuries, to treat constipation, headaches, and generalized symptoms of pain, weakness, and lack of well-being. Daniel Siebert, along with some other researchers, has claimed that *Salvia divinorum* is an effective treatment for depression. A mood disorder, depression causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts.

More information is being gathered about the way this plant works. In the early twenty-first century, the active ingredients in the herb were being investigated for possible use in treating certain psychiatric disorders.

Usage Trends

Interest in *Salvia divinorum* has increased among people outside the native cultures that have traditionally used it for centuries. It was first brought to the United States by researchers and botanists during the mid-twentieth century. It was scarcely known outside these

small, academic circles for several decades. Yet during the last several years of the twentieth century, information about *Salvia divinorum* began to be more widely spread.

Subsequently, interest in its use rose, in part because, as of 2005, it was not classified as an illegal substance. People from various walks of life have experimented with the plant for its possible herbal healing qualities, as a way to enhance MEDITATION, and as a recreational hallucinogen used to get high.

Growers in Hawaii, California, and Mexico raise and sell *Salvia divinorum.* The leaves of the plant, both fresh and dried, are widely available for sale on the Internet. Other preparations made from the plant are also sold, including: 1) an extract of the leaves combined with alcohol and water; 2) an extra-strength leaf product fortified with an extract; and 3) a pure, crystallized form of salvinorin A, the active ingredient normally created for use in scientific experiments. A milligram of purified salvinorin A crystals might cost approximately $20, while an ounce of the leaves in their natural state sells for around $100.

Internet Sales

As of 2005, the use of *Salvia divinorum* was still relatively rare, yet it appeared to be increasing. A major reason for the rising interest in the use of this substance is the Internet, which has provided a means for people to learn about *Salvia divinorum* and also to obtain it. But despite the growing interest in this psychotropic plant, law enforcement agencies do not appear alarmed about its use.

There have been no reports of emergency room visits or other health problems associated with the plant. It is not considered a substance that is likely to be much abused. There are several reasons for this, including the unpleasant taste of the leaves and the length of time necessary to chew them in order to obtain a noticeable effect. Furthermore, *Salvia divinorum* does not produce the kind of sensations or behavioral changes that are likely to make it a so-called party drug. It does not make people less inhibited, or more sociable. Instead, it tends to cause users to become withdrawn and inwardly focused.

Effects are sometimes described as extremely strange, perhaps even profound, but not particularly enjoyable. For many who try it, the first time is also the last time they will ever want to use *Salvia divinorum.* Although the pure form of the active ingredient, salvinorin A, can be taken without experiencing the unpleasant taste, the effects have the same strange quality as when the natural leaves of the plant are used.

meditation: spending time in quiet thought and reflection

Hallucinogen History

Hallucinogens had their first wave of popularity in the United States during the 1960s, particularly on college campuses. At that time, LSD and other psychotropic drugs were hailed by some as a means to find happiness, creativity, and increased spiritual awareness. Users claimed to experience these feelings while under the influence of the drugs. However, many realized that simply taking a drug cannot produce lasting happiness or enlightenment.

Abusing hallucinogens caused many people to experience negative effects, including paranoia (abnormal feelings of suspicion and fear), accidental injury, depression, and loss of touch with reality. Almost all hallucinogens were made illegal and declared controlled substances during the late 1960s and early 1970s. Use of these drugs decreased sharply and reached the lowest levels of use during the mid-1980s.

Throughout the 1990s, however, hallucinogen use began to rise. In 2004, the Drug Enforcement Administration (DEA) reported on its Web site that young adults and adolescents were regaining an interest in plants that could provide hallucinations or "mystical" experiences. In 2000, there were about 1 million users of hallucinogens in the United States. The number of new hallucinogen users among people age 12 to 25 doubled between 1990 and 1997, from 12 per 1,000 in 1990 to approximately 24 per 1,000 in 1997. These numbers dipped again, however, after the turn of the twenty-first century.

The "2003 National Survey on Drug Use and Health (NSDUH)," conducted by the U.S. Department of Health and Human Services, reported that overall hallucinogen use dropped from 4.7 million users in 2002 to 3.9 million users in 2003. The study showed that 1 percent of youths between the ages of 12 and 17 abused hallucinogens, with 0.8 percent of adults above the age of 26 abusing them.

Much of the interest in *Salvia divinorum* stems from the fact that, as of 2005, there are no legal consequences for growing or using it. Many people experiment with it in the hope of finding a legal alternative to smoking illegal marijuana. However, they may find its effects to be very different and unpredictable. If not for its legal stature, *Salvia divinorum* would probably draw little attention. This is, in part, because the taste of the leaves is extremely bitter, and many leaves must be chewed for a long time to achieve the desired effect. The hallucinations brought on by the herb are often very unpleasant, and many first-time users report that they would never want to repeat the experience.

Effects on the Body

The psychotropic effects of *Salvia divinorum* are of interest to scientific researchers. The active ingredient in the plant has been identified as salvinorin A. Testing on animals and human volunteers in research projects has shown that the effects of salvinorin A in its pure, crystallized form are similar to those of mescaline, the active ingredient in one of the most widely recognized of the psychotropic plants, the peyote cactus. (An entry on mescaline is available in this encyclopedia.)

A dose as small as 200–500 micrograms of pure salvinorin A will produce hallucinations when the crystalline form is vaporized and inhaled. *Salvia divinorum* has a reputation as a very mild psychotropic. However, when pure forms of the active ingredients of the various psychotropics are compared, salvinorin A turns out to be the most powerful natural hallucinogen of all, based on the size of the effective dose. The leaves, in their natural form, contain between 1 and 4 milligrams of salvinorin A per gram of dry leaf.

Not Like Other Hallucinogens

Most hallucinogenic drugs seem to bring about their strange effects on the mind by affecting the places on the brain's nerve cells that respond to SEROTONIN. Serotonin is a chemical messenger that has a powerful effect on many other chemicals within the brain. Tests were conducted to measure the effect of salvinorin A on nearly fifty different chemical RECEPTORS in the various tissues of the body, including the brain. None of these receptor sites, including the serotonin receptors, seemed to exhibit any unusual activity due to the presence of salvinorin A.

However, in the early twenty-first century, the drug was re-examined using new technology. In 2002 B. L. Roth and other researchers revealed that salvinorin A binds to kappa opioid receptors (KOR), which influence human intellect and perception. Since this finding, *Salvia divinorum* has been the subject of considerable research. According to researchers, the plant may prove useful in the development of antipsychotic drugs.

In tests conducted on mice, it was noted that salvinorin A seemed to bring about responses similar to mescaline. Mice in the tests became quiet and inactive. They appeared to be under sedation, but this was not really the case. If touched or startled by a noise, they were easily stimulated to move, and they continued to display the righting reflex, or the natural urge to get back on their feet if turned over. If truly sedated, the mice would not have been able to respond to these stimuli.

Wide-Ranging Effects

The effects of *Salvia divinorum* on humans range from mild feelings of well-being to full-blown, intense hallucinations, extreme ANXIETY, and feelings of leaving the body altogether. The size of the dose, the method of taking it in, and the surroundings and emotional state of the person taking the substance will all affect the outcome.

Users in the United States have reported that chewing the leaves in a cud or smoking them brings on an experience that is

serotonin: a combination of carbon, hydrogen, nitrogen, and oxygen; it is found in the brain, blood, and stomach lining and acts as a neurotransmitter and blood vessel regulator

receptors: groups of cells that receive stimuli

anxiety: a feeling of being extremely overwhelmed, restless, fearful, and worried

Seeking the Truth

In Mexico, the Mazatec Indians have used *Salvia divinorum* and other hallucinogenic plants in their religious practices for thousands of years. Within the native culture, physical illness is seen as a symptom of a spiritual problem. Therefore, religious practice and medical treatment are combined. The *curandero*, or medicine man, is both a doctor and a religious leader. *Curandero* is Spanish for shaman.

In addition to using *Salvia divinorum* to treat physical symptoms, the *curanderos* have also traditionally used the herb in rituals that are meant to uncover hidden truths, or even to find lost objects. If a crime has been committed but remains unsolved, the *curandero* may attempt to clear up the matter by giving *Salvia divinorum* leaves to someone involved in the incident. The shaman will then sit and listen when the person becomes intoxicated and begins to talk. It is believed that the person's speech will reveal the truth about whatever happened.

In the case of a lost object or animal, the person who cannot find his or her property may be given a dose of *Salvia divinorum* and encouraged to go to sleep. Another person stays close by, listening carefully when the person who has taken the dose begins to talk in his or her sleep. As in the case of undiagnosed illness or unsolved mysteries, it is believed that the words of the speaker will reveal the true location of the lost animal or object. When the next day comes, the two people will go together to locate the lost item.

Salvia divinorum is also considered an important tool for training new *curanderos*. It is believed that the trance brought on by consuming the leaves allows one to travel to heaven and learn from God, as well as from saints that are already in heaven. Also, because *Salvia divinorum* is relatively weak, it is thought to be an ideal starting point for training the *curanderos* to work with more powerful hallucinogenic plants, such as peyote, psilocybin mushrooms, or morning glory seeds.

even more intense than one resulting from LSD, although it will last for a much shorter time span. An LSD experience may last for many hours, while the effects of *Salvia divinorum* usually peak within twenty minutes and begin to fade away after an hour. A dose of 200–500 micrograms of salvinorin A will bring on a strong hallucinatory experience, lasting anywhere from between half an hour to two hours.

While many hallucinogens simply distort true perceptions, making everyday objects appear strange or alive, a high dose of *Salvia divinorum* may bring on true hallucinations, or vivid, intense images of things that simply are not there at all. This can be very frightening and disorienting to the user. Visions of people, places, and objects may take over the user's mind. The sense of personal identity may

be lost. The user may feel completely disconnected from his or her body. There can be a sense of being in many places at once, or in many time periods at once. The user may feel that he or she is taking on the identity of some object.

Other Bizarre Feelings

Another commonly reported feeling is that of turning into a two-dimensional surface, then being twisted and pulled. At times, users laugh uncontrollably for no apparent reason. When heavy doses are taken, the user sometimes babbles uncontrollably and staggers about in an uncoordinated way, creating the risk of accidental injury. The native peoples typically take the *Salvia divinorum* user to a dark, quiet place, but users in more stimulating environments may find themselves overreacting, or reacting inappropriately, to normal stimuli.

Other hallucinogenic drugs can have adverse effects or negative side effects on the brain from long-term use. As such, some researchers suspect that *Salvia divinorum* may have similar effects. However, as of 2005, there is no scientific proof of this.

Reactions with Other Drugs or Substances

There is no scientific data about the effect *Salvia divinorum* may have on the actions of other medicines or illicit (illegal) substances. Information indicates that when it is consumed, it is usually taken without any other drugs or substances. The drug alone is known to cause disorientation and the loss of contact with reality. Therefore, some researchers believe that such feelings would only intensify if the substance was consumed along with other drugs that cause these sorts of sensations.

Treatment for Habitual Users

A person going through an intense hallucinatory experience after taking *Salvia divinorum* may feel a sense of panic, DELIRIUM, or confusion. In this situation, it is helpful to have another person calmly offer reassurance that the drug will wear off, and that any frightening visions cannot really harm the user.

A guardian who helps the user through the *Salvia divinorum* experience is typically part of the Indian rituals involving the drug. Part of the guardian's role is to offer reassurance. Guardians also help keep users from accidentally harming themselves or others. In very rare cases, people under the influence of an

delirium: a mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating

The Sierra Mazateca Mountains in Oaxaca, Mexico, are home to the *Salvia divinorum* plant. People come from various parts of the world, including the United States, to gather the plant. As of 2005, the plant is not illegal in the United States. *AP/Wide World Photos.*

hallucinogenic substance may become so anxious and confused that their state of mind may become violent and psychotic. When people become psychotic, they suffer a dangerous loss of contact with reality, sometimes leading to violence against themselves or others. Such a reaction might require treatment with sedatives or tranquilizers, which calm people down, or with antipsychotic drugs.

There is very little hard scientific data about the effects, long- or short-term, of *Salvia divinorum* use. However, it is considered a hallucinogen, and hallucinogens have been linked with long-term, undesirable side effects. These primarily include hallucinogen persisting perception disorder (HPPD, commonly known as "flashbacks"), mood disorders, ANXIETY DISORDERS, and psychotic disorders. In a flashback, the user experiences the effects of the drug even though he or she has not recently taken a dose of the drug. The unexpected hallucinations of a flashback can be particularly terrifying.

anxiety disorders: a group of mental disorders or conditions characterized in part by extreme restlessness, uncontrollable feelings of fear, excessive worrying, and panic attacks

Consequences

As of 2005, *Salvia divinorum* is a legal substance in the United States, so there are no penalties for possessing or using it. Various forms of it can be purchased, and the plants may be grown for personal use. If more people begin using *Salvia divinorum,* and negative side effects begin to be identified, the legal status of the plant could change.

There have been no known reports of emergency medical treatment needed for the use of *Salvia divinorum.* Because its use is not widespread, little is known about the long-term physical, mental, and emotional effects of the plant and its extracts. In a sense, the status of *Salvia divinorum* in the early part of the twenty-first century can be compared to that of LSD and other hallucinogens during the 1960s. They, too, were legal throughout much of that decade. Yet, when this led to widespread use, their negative effects became more evident, and their alleged benefits were deemed less practical. Eventually, this led to such drugs being declared illegal.

The Law

As of 2005, there are no federal laws in the United States that regulate or outlaw the possession or use of *Salvia divinorum.* In Mexico, California, and Hawaii, it is grown and sold. Its legal status is probably one of the main reasons that it has gained some popularity as a recreational PSYCHEDELIC DRUG. Information about the plant has spread widely by way of the Internet, and is the subject of various Web sites. Many different types of people have sampled it to find out firsthand about its herbal healing properties, its supposed benefits as a meditation aid, or its psychotropic qualities.

In 2004, the Drug Enforcement Administration (DEA) stated that, in general, there is growing interest among young people about plants that bring on hallucinations and apparently mystical experiences. According to the DEA, *Salvia divinorum* is most commonly smoked in order to bring on hallucinations similar to those caused by THC, the active ingredient in the hemp or marijuana plant (*cannabis sativa*).

On June 1, 2002, Australia became the first country to issue a ban on *Salvia divinorum* and salvinorin A. Bills have been introduced in the U.S. Congress suggesting that these substances be banned, but none have yet been passed. The DEA is aware of *Salvia divinorum* and monitors its growing availability and increasing use.

psychedelic drug: a drug that can produce hallucinations and distort reality

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See also: LSD (Lysergic Acid Diethylamide); Marijuana; Mescaline; Psilocybin

Steroids

Official Drug Name: Anabolic-androgenic steroids (ann-uh-BAH-lik ann-drah-JENN-ik STEH-roydz), androstenedione (ann-druh-steen-DIE-own or ann-druh-STEEN-dee-own), Deca-Durabolin, dehydroepiandrosterone (dee-HIGH-droh-EPP-ee-ANN-droh-stehr-own or dee-HIGH-droh-EPP-ee-ann-DROSS-tuhr-own; DHEA), Depo-Testosterone (DEH-poe tess-TOS-tuhr-own), Dianabol, ergogenic (UHR-go-JENN-ik) drugs, tetrahydrogestrinone (TETT-ruh-HIGH-droh-JESS-trinn-own; THG)
Also Known As: Andro, D-ball, D-bol, Deca, Deca-D, Depo-T, gear, juice, junk, ragers, roids, stuff
Drug Classifications: Schedule III, hallucinogens

What Kind of Drug Is It?

Steroids are drugs that mimic the actions of testosterone (tess-TOS-tuhr-own), a HORMONE found in greater quantities in males than in females. Testosterone is responsible for male traits and the male sex drive. Steroids are SYNTHETIC versions of the testosterone that is produced by the body. Steroids help build muscle mass and strength.

Steroids are referred to medically as anabolic-androgenic steroids. The term *anabolic* describes the characteristics of the drugs that build muscle. The term *androgenic* refers to the way the substances heighten masculine traits. Most doctors use the acronym "AAS" to describe these steroids. This abbreviation helps avoid confusion with a different class of steroids, the corticosteroids. These other steroids are used widely to treat a variety of medical conditions, including internal swelling and inflammation; asthma (AZ-muh), a lung and breathing disorder; bronchitis, an illness that affects the bronchial tubes in the lungs; and allergic reactions. Unless otherwise noted, use of the term "steroids" in this entry refers to anabolic-androgenic steroids.

Anabolic-Androgenic Steroids (AAS)

Such steroids have some limited medical use. More commonly, though, they are abused in high doses to increase lean muscle mass and strength. Chemists have created more than 100 varieties of anabolic-androgenic steroids that are available legally by prescription only. New designer steroids, which are just slightly altered versions of existing prescription steroids, hit the BLACK MARKET regularly. Designer steroids are made in a laboratory and designed to pass through urine tests undetected.

In 1991, health concerns brewed over the abuse of steroids. As a result, steroids were placed on the list of Schedule III drugs under the U.S. Controlled Substances Act. Since then it has been illegal to possess or sell prescription steroids in the United States. While some illegal drug makers work hard to create synthetic male hormone drugs that will not be detected in drug tests, medical researchers are busy devising more accurate tests to spot these "designer" substances.

hormone: a chemical messenger that is formed in the body and transported by the blood to a certain target area, where it affects the activity of cells

synthetic: made in a laboratory

black market: the illegal sale or trade of goods; drug dealers are said to carry out their business on the "black market"

Anabolic steroids are used nonmedically to improve athletic performance, physical appearance, and fighting ability. Many sporting competitions will not allow athletes who use steroids to participate. *Yavuz Arsian/Peter Arnold, Inc.*

Overview

It is true that high doses of anabolic-androgenic steroids increase muscle size and endurance in both men and women. But this does not come without dangerous costs to the health of the user. "Research has shown that the inappropriate use of anabolic steroids can have catastrophic medical, psychiatric and behavioral consequences," wrote Dr. Nora D. Volkow, director of the National Institute on Drug Abuse (NIDA), in "Consequences of the Abuse of Anabolic Steroids." Volkow added: "We are now facing a very damaging message that is becoming [widespread] in our society—that bigger is better, and being the best is more important than how you get there."

In fact, use of high doses of anabolic-androgenic steroids by men and women has been linked to heart problems, negative sexual side effects, aggressive behavior, depression, and suicide. The way

steroids are misused to build muscle leads to chemical imbalances in the body that can affect the mind and the body's METABOLISM. "Steroids are toxic [harmful and poisonous] substances that have to be cleaned from your body by your liver and kidneys," noted Terry Goodland in *Flex* magazine. Goodland added, "without regular testing by a doctor, you will have no idea how your body is dealing with the drugs until it's too late."

Research on Testosterone

The history of experimentation with testosterone, the main hormone associated with male characteristics, began in 1889. That year, French-born scientist Charles Edouard Brown-Sequard (1817–1894) reported that he had injected himself with a compound taken from the testicles of dogs. He said the compound made him feel stronger and more energetic. In fact, he recommended it highly as a "fountain of youth."

In the early twentieth century, scientists experimented with natural testosterone. They thought it might decrease symptoms of age-related illnesses and syndromes such as senility (suh-NILL-ih-tee), a condition associated with old age that decreases a person's ability to think clearly and make decisions.

Testosterone was first isolated in a European laboratory in 1935, and synthetic versions of the hormone quickly followed. These were the first anabolic-androgenic steroids. Doctors began using the synthetic steroids to treat men who suffered from hypogonadism (high-poh-GO-nad-izm), which is the inability of the body to produce enough natural testosterone. Steroids have been prescribed by doctors for this purpose ever since.

Olympic-Sized Abuse

At the end of World War II (1939–1945), when Allied troops liberated prisoners from the Nazi concentration camps, many of the survivors were at the brink of death from starvation. Doctors gave some of these former prisoners anabolic-androgenic steroids to help restore their muscle mass and gain their weight back quickly. Soon after, bodybuilders and athletes began taking steroids to further develop their already-fit bodies. Historians believe that the abuse of synthetic steroids began in the weight lifting and bodybuilding communities in the late 1940s and spread to some Olympic sports by the 1950s.

metabolism: the process by which food is converted to energy that the body uses to function

Effective drug tests for anabolic-androgenic steroids did not exist before the early 1970s. Steroid use was widespread during that time in Olympic sports, particularly among Eastern European

Irina Korzhanenko of Russia won the women's shot put competition at the Olympic Games in Greece in 2004. However, she was stripped of her gold medal after testing positive for steroids. *© George Tiedemann/New Sport/Corbis.*

competitors. Both female and male athletes from various countries in Europe broke records—and roused suspicions—with their heavily muscled frames. When questioned later about their training methods, many of these young athletes said they just took the "vitamins" their trainers offered and never asked what might be in them. (Barry Bonds [1964–], the 2004 National League Most Valuable Player and record-holder for single-season home runs as of 2005, would later make the same claim when accused of abusing steroids in 2005.)

In 1975 the International Olympic Committee banned use of all anabolic-androgenic steroids and began a testing policy to keep

steroid users out of the Olympics. The tests were only effective when they were done randomly. If athletes knew the test date ahead of time, they could cease steroid use beforehand. This would give them enough time to clean their systems of the drug and avoid detection. Scandal erupted at the 1988 Summer Olympic Games in Seoul, South Korea, when Canadian sprinter Ben Johnson (1961–) tested positive for banned substances after winning a gold medal in the 100–meter dash. Johnson had to forfeit his medal to the runner-up, American Carl Lewis (1961–).

Abuse Floods Other Sports

When Johnson lost his medal, the situation helped call attention to the rampant use of steroids in almost every high-level competitive sport. According to retired professional football player Steve Courson (1955–), author of *False Glory: Steelers and Steroids—The Steve Courson Story,* many football players of the 1980s bulked up with steroids. In fact, Courson barely survived a damaged heart after taking steroids during his playing career with the Pittsburgh Steelers.

Since then the National Football League (NFL) has set down a strict set of guidelines regarding the use of steroids and other banned substances. The league's official "Steroid Policy," posted on the *NFL Players Association* Web site, notes that the league specifically "prohibits the use by NFL players of anabolic/androgenic steroids." The policy further states that such "substances have no legitimate place in professional football" and that "steroids and related substances threaten to distort the results of games and League standings." Furthermore, "the League is concerned with the adverse health effects of steroid use," along with "the wrong message [that a player's use of prohibited substances sends] to young people who may be tempted to use them."

Professional wrestling was popular in the 1980s as well. Many of the stars of that sport were involved in steroid abuse, too. Anabolic-androgenic steroids were also the drugs of choice for weight lifters and bodybuilders.

Women and Steroids

Young women began using steroids not only to improve their athletic ability but also to slim down and reduce body fat quickly. According to an article titled "Girls Are Abusing Steroids Too, Experts Say," published on *MSNBC.com* in 2005, the rate of steroid use among teenage girls has been rising since 1991. The article notes that "overall, up to about 5 percent of high school girls and 7 percent of middle school girls admit trying anabolic steroids at least once."

Steroids are also sometimes used by women in the aftermath of traumatic, dangerous, or life-threatening attacks, such as rape or assault. The psychology behind this type of use involves the woman's desire to appear stronger, less vulnerable, and consequently less likely to be the target of a future attack.

Rob Garibaldi: A Deadly Outcome

On October 1, 2002, Rob Garibaldi, a former University of Southern California baseball player, shot himself with a stolen gun after failing to be chosen in the Major League draft. Garibaldi had been using illegal steroids purchased in Mexico for about four years in order to increase his size and strength.

Mark Fainaru-Wada, writing in the *San Francisco Chronicle,* quoted one of Garibaldi's high school friends as saying: "Every hope and dream he had was surrounded by baseball. And you do whatever it takes."

Steroids Join List of Controlled Substances

Concerns about the long-term health issues surrounding steroids led the U.S. government in 1991 to place all prescription steroids on the Schedule III list of controlled substances. However, this did not end steroid abuse. A $500-million-year black market developed, with dealers offering "juice" or "gear" of unknown strength and purity to people of all ages. American dealers typically smuggle steroids across the border to the United States from Mexico.

Illegal underground laboratories began creating compounds such as tetrahydrogestrinone (THG) that could not be detected in urine. Interest in herbal DIETARY SUPPLEMENTS, such as ephedra, creatine, and androstenedione ("andro"), skyrocketed as young athletes sought legal ways to bulk up. (Entries on creatine and ephedra are available in this encyclopedia.) Coaches and trainers contributed to the problem by urging young athletes to bulk up. However, they failed to monitor the safety of the methods used to attain that goal.

Baseball, Hot Dogs, Apple Pie, and Steroids

The twenty-first century has seen the level of anabolic-androgenic steroid abuse decrease. In September of 2003, investigators from the U.S. Drug Enforcement Administration (DEA) raided the Bay Area Laboratory Cooperative (BALCO) in San Francisco, California, and discovered that the lab had been creating steroids that could go undetected in drug tests. The agents also uncovered the names of professional athletes in several sports who had received products from BALCO through personal trainers or other suppliers.

This raid followed two highly publicized suicide deaths of aspiring baseball players: Rob Garibaldi in California, who shot himself in the fall of 2002, and Taylor Hooten in Texas, who hanged himself in the summer of 2003. Both men had abused steroids

dietary supplements: products including vitamins, herbal extractions, and synthetic amino acids sold for specific uses such as weight loss, muscle building, or prevention of disease

Jose Canseco (top left) and Sammy Sosa (bottom center) listen to testimony at the congressional hearing on steroid use in professional baseball. Canseco caused a storm of controversy when he wrote about his steroid use in his 2005 book *Juiced: Wild Times, Rampant 'Roids, Smash Hits, and How Baseball Got Big.* AP/Wide World Photos.

thinking that the drugs would help them make it to the major leagues. The U.S. Food and Drug Administration (FDA) declared THG illegal in 2003 and also, in early 2005, placed "andro" on the Schedule III list of controlled substances.

Steroid use made the headlines again in March of 2005, when several Major League Baseball players, executives, and the commissioner testified before Congress. One of those who testified, Jose Canseco (1964–), wrote a book earlier that year called *Juiced: Wild Times, Rampant 'Roids, Smash Hits, and How Baseball Got Big.* In it, he states that he used steroids while he was with the Oakland Athletics. Canseco named other players whom he alleged used steroids too, including Mark "Big Mac" McGwire (1963–). McGwire broke the single-season home run record in 1998 while with the St. Louis Cardinals. Making his own appearance before the Congressional Committee, McGwire refused to answer questions about his alleged past use of performance-enhancing products.

In the wake of the hearings, Major League Baseball's steroid policy was criticized by many as not being strict enough. Many fans, lawmakers, and sports commentators didn't believe that the fines were set high enough or the suspensions set long enough. Some even suggested that players be banned from the sport if they violated the policy more than once. The notion that "three strikes and you're out" was expressed by many who want steroids out of baseball.

Bad News for Palmeiro. In August of 2005, steroids in baseball again made the headlines when Baltimore Orioles star Rafael Palmeiro (1964–) was suspended for 10 days for "violating baseball's anti-drug policy," according to Jorge Arangure Jr. of the *Washington Post.* Palmeiro was one of the players who had testified before Congress just a few months earlier and had strongly denied ever having used steroids. When news of his positive drug test broke, Palmeiro again denied taking steroids. As reported on *ESPN.com,*

Palmeiro explained: "Today I am telling the truth again that I did not do this intentionally or knowingly." He added: "Why would I do this in a year when I went in front of Congress and I testified. . . . Why would I do this during a season where I was going to get to 3,000 hits? It just makes no sense."

Turning Tides?

Opinion has begun to turn against steroid users, an attitude that is reflected in the 2004 Monitoring the Future (MTF) survey. The MTF report is an annual survey of drug use among young people in the United States. The MTF survey is conducted by the University of Michigan with funding from NIDA. The 2004 MTF study noted a general decrease in steroid use among eighth and tenth graders. According to the survey, these younger teens expressed more concern about the health issues surrounding steroids than their peers of the 1980s and 1990s.

Steroid use among seniors in high school, however, "remained stable at peak levels," according to the MTF. Researchers suggest that steroid use may be even higher among high school students than the survey shows, since some young athletes would never report their steroid use—even on an anonymous survey.

All Steroids Are Not the Same

Anabolic-androgenic steroids should not be confused with *corticosteroids*. Anabolic-androgenic steroids are prescribed only for a few, very uncommon disorders, such as muscle wasting in patients with acquired immunodeficiency syndrome (AIDS) and men with abnormally low testosterone levels.

Corticosteroids are widely prescribed for conditions that cause inflammation, including asthma, bronchitis, pneumonia, certain serious allergies, and even severe poison ivy blisters. Jacqueline Adams reported in *Science World* that people who take prescription corticosteroids according to a doctor's directions will not experience any of the side effects that plague abusers of anabolic-androgenic steroids.

What Is It Made Of?

Testosterone is a naturally occurring hormone in both men and women, but men produce more of it than women. At puberty—the stage of growth in which a person becomes capable of sexual reproduction—the hormone is responsible for changing a boy into a man. It causes deepening of the voice, growth of facial hair, and the maturity of the reproductive organs. It also plays an important role in the growth and development of muscles. When men are finished growing, they typically produce between 35 and 50 milligrams of natural testosterone each week throughout life. The hormone is created in the testes, the male reproductive glands.

Women also produce natural testosterone but at far lower levels than men. Female maturity is influenced chiefly by estrogen, a hormone that regulates the female reproductive system.

Steroid Chronology

Steroids have an interesting history. How much do you know about the history of the drug?

1889 Charles Edouard Brown-Sequard (1817–1894) reports that he feels more energetic after injecting himself with a compound taken from animal testicles.

1935 The hormone testosterone is isolated in a European laboratory. Chemists quickly learn how to make synthetic versions.

1945 Survivors of Nazi concentration camps are given anabolic-androgenic steroids to help restore weight and muscle lost during periods of starvation.

1975 After years of steroid abuse by Olympic athletes, the International Olympic Committee adds anabolic-androgenic steroids to its list of banned substances and announces plans to test athletes randomly for steroid use.

1988 Olympic sprinter Ben Johnson forfeits his gold medal in the 100–meter dash after testing positive for a banned substance.

1991 Anabolic-androgenic steroids are named Schedule III drugs under the Controlled Substances Act of 1970. Former Pittsburgh Steeler Steve Courson (1955–) writes *False Glory: Steelers and Steroids*.

2003 Federal narcotics agents raid the Bay Area Laboratory Cooperative (BALCO), an alleged source of "designer" steroids.

2005 Former baseball star Jose Canseco writes the book *Juiced: Wild Times, Rampant 'Roids, Smash Hits, and How Baseball Got Big.* Major League Baseball players and management are called to testify before the U.S. Congress about steroid use in professional baseball. "Andro" is added to the Schedule III list of controlled substances. The Olympics Committee announces its decision to drop baseball and softball from the 2012 games in London, in the United Kingdom, due in part to the controversy surrounding steroid use in the sport.

Synthetic anabolic-androgenic steroids are very similar to natural testosterone, except for a slightly altered carbon structure. Pill forms of steroids contain an extra chain of carbon and hydrogen atoms called an alkyl group. These can be dangerous to the liver and to CHOLESTEROL levels when taken at high doses. Injectable steroids contain an acidic chain of carbon and hydrogen called an ester that is slightly less toxic to the liver.

Creatine and DHEA are considered dietary supplements. As of 2005, they have not been regulated as drugs by the FDA. Creatine provides fuel to muscles during periods of high exertion. DHEA is sold as an anti-aging supplement. But because DHEA turns into androstenedione in the body, it is used as a steroid. Users of either of these supplements run health risks when they exceed the doses recommended on the labels.

cholesterol: pronounced kuh-LESS-tuhr-ol; an essential substance made of carbon, hydrogen, and oxygen that is found in animal cells and body fluids; in high amounts, it may be deposited in blood vessels, resulting in dangerous blockages of blood flow

How Is It Taken?

With steroids, the issue is not only *how* they are taken, but *how much* of the substance is needed to produce results. A healthy man will produce 35 to 50 milligrams of natural testosterone each week. Most steroid programs involve 300 to more than 1,000 milligrams per week in pills, creams, or injectable forms.

Steroid users have several strategies for taking the substances. Medical professionals consider all of them extremely dangerous to immediate and long-term health.

- *Cycling* involves taking high doses of steroids for several weeks to several months, then discontinuing use of the steroids for as many weeks or months.
- *Stacking* involves using two or more different steroids or combining oral and injectable steroids in the belief that the drugs will interact to produce better results.
- *Pyramiding* involves beginning a cycle with a lower dose of steroids, gradually increasing the dose over time to a peak level, then gradually decreasing the dose down to zero again.

Those who use injectable steroids usually administer shots into their large muscles in the buttocks. Sometimes people who inject steroids share needles or inject one another without sterilizing the needles or the injection sites. This can cause infectious diseases such as HIV (the human immunodeficiency virus), which leads to AIDS (acquired immunodeficiency syndrome), and hepatitis, which is a liver disease.

Are There Any Medical Reasons for Taking This Substance?

Anabolic-androgenic steroids are legally prescribed for men who have lower than normal levels of testosterone. They may also be used to treat patients who have developed muscle-wasting syndromes associated with cancer and AIDS. Very rarely they are used to help restore tissue in burn victims. Female patients sometimes receive these kinds of steroids for problems associated with MENOPAUSE and other issues related to the female reproductive system. In all of these cases, the dosage prescribed by physicians is far lower than the levels of steroids typically seen among illegal users.

menopause: a hormonal process associated with aging in females that results in an inability to become pregnant; also known as the "change of life"

Usage Trends

From 2002 to 2004, the number of teenagers reporting steroid use in the MTF survey declined overall, but the statistics can be

misleading. Eighth- and tenth-grade respondents reported being more concerned about the health risks surrounding steroid use than older students. Use among twelfth-graders remained steady. A breakdown of the survey results showed a dramatic decrease in use among male seniors, from about 6 percent in 2002 to 4.4 percent in 2004. At the same time, however, the reported use of steroids by female seniors was nearly six times higher in 2004 than it was in 1991. This spike in usage among twelfth-grade girls made up for the drop in usage among twelfth-grade boys.

However, evidence shows that female users are not necessarily athletes. According to the 2005 *MSNBC.com* article "Girls Are Abusing Steroids Too, Experts Say," the Oregon Health and Science University found that about two out of every three high school girls in the state who said they had used steroids weren't looking for an athletic advantage. Instead, they just wanted to get thin. Members of the medical and health community are continuing their efforts to identify steroid abuse and to educate those who are at high risk for potential abuse.

It's Not about Getting High

MUSCLE DYSMORPHIA is the scientific name for a disease that affects some teenagers and adults. The condition resembles anorexia nervosa (ah-nuh-REK-see-uh ner-VOE-sah), a severe eating disorder characterized by an intense fear of gaining weight. People who have muscle dysmorphia are never satisfied with how muscular they appear. No matter how hard they train, they never feel "big enough." These individuals run a higher risk for steroid abuse because steroids build muscle rapidly.

Steroid abusers are very different from those who abuse other illegal drugs. For instance, heroin, cocaine, and marijuana users take the substances for an immediate "high," or rush of pleasurable feelings. (Entries for these three drugs are included in this encyclopedia.) Steroid users do not experience a high after taking pills or injecting the drug. They have different goals and may not notice the behavioral changes and compulsive behavior brought on by the drugs until their health is affected. In the meantime, they may spend many hundreds or thousands of dollars on illegal substances that have not been tested for strength or purity or safety.

Effects on the Body

muscle dysmorphia: pronounced muh-SUL diss-MORE-fee-uh; a mental disorder leading to a desire for bigger and bigger muscles

Anabolic-androgenic steroids increase strength and lean muscle mass. However, flooding the body with any hormone at ten to twenty times greater strength than normal is dangerous. Anabolic-androgenic

A teenage ballplayer in the Dominican Republic is shown holding two bottles of injectable drugs: a horse vitamin supplement and an animal steroid. Some aspiring ballplayers purchase the drugs, intended for animals, to bulk up and improve their athletic performance. They think it will help them get into the Majors.

steroids produce a long list of potential side effects. Some of these effects can be deadly. Others are just plain unpleasant.

Steroids Do More Than Just Build Muscles

Side effects for men abusing anabolic steroids include:

- acne and oily hair
- gynecomastia (GY-nuh-koh-MASS-tee-uh), the formation of female-type breasts on a male body, which is a permanent condition that can only be reversed with surgery
- testicular atrophy (tess-TIK-yoo-lar AH-truh-fee), the shrinking of the male testicles, which sometimes results from overdoses of testosterone or anabolic-androgenic steroids; this condition may not be reversible

- low sperm count
- disruption of the natural "growth spurt" in young users, which leads to abnormal shortness throughout life
- male-pattern baldness
- insomnia, which is difficulty falling asleep or an inability to sleep
- ruptured tendons
- increased chance of heart attack
- increased chance of liver cancer or bleeding in the liver, especially with pill forms of steroids
- bursts of aggressive behavior (called "roid rage")
- mania (a mental disorder characterized by intense anxiety, aggression, and delusions), loss of touch with reality, and delusions or false beliefs. (Note: anabolic-androgenic steroids are classified as hallucinogens, which are substances that bring on hallucinations that alter the user's perception of reality.)
- boils or infections at injection sites, as well as infections elsewhere from dirty needles
- human immunodeficiency virus (HIV) or hepatitis infections from sharing needles
- depression, sometimes leading to suicide, when steroid use is stopped
- loss of enthusiasm and sex drive when steroid use is stopped.

Side effects for women abusing steroids include:

- growth of coarse hair on the face and body
- enlargement of the clitoris (a part of the female genitals)
- deepening of voice
- male-pattern baldness
- mood swings and aggression
- insomnia
- loss of menstrual period (also referred to as a "menstrual cycle")
- infertility or the inability to have children.

Bulk v. Height

One of the most devastating side effects of steroid abuse occurs in the youngest users. If teens begin using steroids before they have stopped growing, the flood of hormones will alter the normal growth process. Under normal circumstances, height increases as the soft ends of the bones grow longer. However, high levels of testosterone shut down the production of new bone. The body is fooled into thinking that the user has already reached maturity. As a result, growth stops prematurely.

Robert Hazelton testifies before the House Committee on the Judiciary about the Anabolic Steroid Control Act of 2004. A former boxer and steroid user, Hazelton explains how he lost his legs because of steroid use. *AP/Wide World Photos.*

Reactions with Other Drugs or Substances

Any combination of anabolic-androgenic steroids and other mind-altering substances increases the risk of mental side effects and dangerously aggressive behavior. When users end a cycle of steroid use, they often find themselves sinking into depression. They may seek help from a doctor for depression without admitting to steroid use. Antidepressant medications should not be mixed with steroids. Doctors can only provide effective treatment when they have a complete medical history, including knowledge of any illegal substances—or even any dietary supplements—that the patient is taking or may have taken.

Users sometimes take other drugs to counteract some of the side effects associated with steroid use. DIURETICS may be used to rid the body of excess water. Human growth hormone may be taken to compensate for the effects steroids have on height. Estrogen blockers may be used to reduce breast enlargement in men. The practice of adding more and more drugs to the system can increase the risk of adverse reactions, or negative side effects, in the user.

diuretics: pronounced die-er-EH-tiks; substances that reduce bodily fluids by increasing the production of urine

In many sporting competitions, the athletes' urine is tested for steroids and other drugs. If drugs are found, the athlete is disqualified. *AP/Wide World Photos.*

Covering Up Steroid Use

Diuretics also have another impact on steroid use—one that some athletes use to their advantage. Some sports figures use diuretics to "mask" the use of steroids. They use diuretics to speed the elimination of banned performance-enhancing substances from their bodies in an effort to increase their chances of passing mandatory drug tests. Various sporting organizations have added diuretics and other masking agents to their list of banned substances. Athletes testing positive for banned diuretics will also be suspended or disqualified from competition just like those using steroids.

Treatment for Habitual Users

Even though steroids are not classified as addictive substances, steroid users do exhibit patterns of habitual behavior. Help for steroid abusers—and education for those considering trying steroids—is available through several national programs in the United States. The National Center for Drug Free Sport offers online and telephone support, newsletters, and other resources. (The *Drug Free Sport* Web site is located at http://www.drugfreesport.com.)

In addition, the U.S. Substance Abuse and Mental Health Services Administration (SAMHSA) has pioneered two model programs: ATLAS (Athletes Training and Learning to Avoid Steroids) for boys and ATHENA (Athletes Targeting Healthy Exercise and Nutritional Alternatives) for girls. (*SAMHSA*'s Web site is located at http://www.oas.samhsa.gov.) These programs are designed for school coaches and health teachers to use with sports teams. Even some bodybuilding magazines, including *Flex,* take pride in spotlighting drug-free athletes and their successful training regimens.

Some people who use steroids for a short period of time stop on their own without help. Many more will need counseling, prescription medications, and serious lifestyle alterations to stay clear of steroid use.

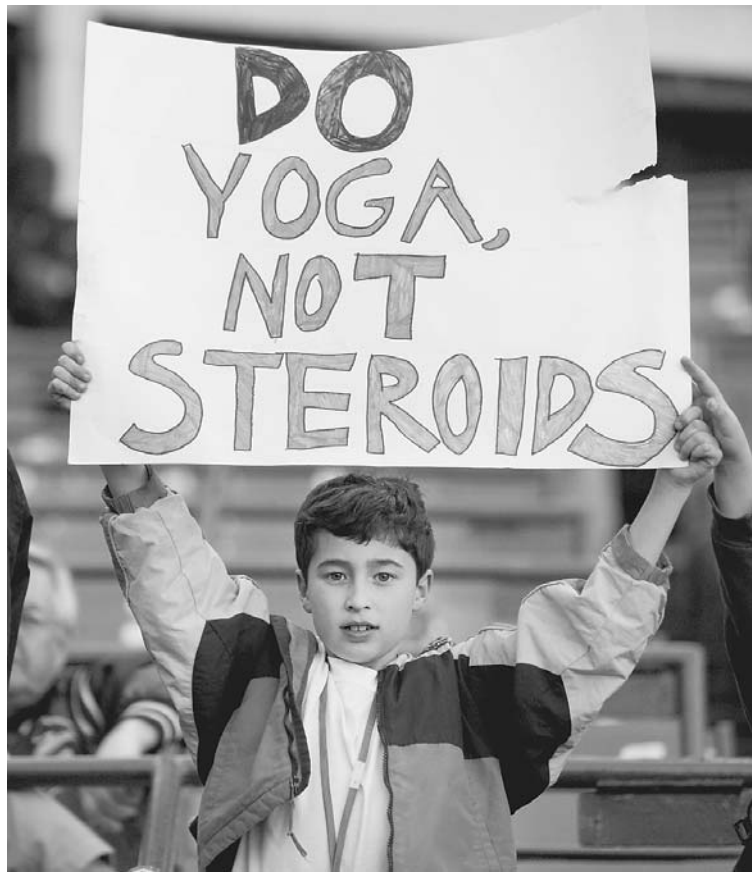
Consequences

Severe depression and an increased chance of suicide have been linked to steroid abuse. Other consequences may take years to develop. Steve Courson, the former Pittsburgh Steeler player who admitted to steroid use, almost lost his life to heart disease brought on by his drug abuse. He has since recovered, and he dedicates a great deal of his time to lecturing about the dangers of steroid use. Even short-term use of steroids can damage the heart, liver, kidneys, and sexual function in otherwise healthy people.

Ruined Reputations

Athletes who use performance-enhancing drugs are often seen as cheaters because they have used chemicals to achieve their goals. "Real men work for what they earn," wrote Terry Goodland in *Flex.* "They don't look for quick fixes or magic bullets. Lasting results don't come overnight. You need patience to grow, despite what some people would like you to think. Your progress will be unpredictable and temporary as long as you lean on the crutch of drug abuse."

On March 17, 2005, former Oakland Athletics and St. Louis Cardinals star Mark McGwire testified before Congress about the



A young baseball fan urges players to "Do Yoga, Not Steroids" in 2004 as the controversy surrounding professional baseball and steroid use begins heating up. *© Paul J. Sutton/Duomo/Corbis.*

use of performance-enhancing drugs in Major League Baseball. McGwire's seventy home runs in 1998 set a new single-season record in the sport (since broken by Barry Bonds). Although he had always previously denied steroid use, he refused to "talk about the past" when asked under oath if he had used steroids. McGwire told Congress, as reported in the *Philadelphia Daily News,* "I cannot answer these questions without jeopardizing my family, my friends, and myself."

The press reacted sharply, challenging McGwire's records and suggesting that he should not be eligible for the Baseball Hall of Fame. On the day of the testimony, according to Howard Bryant in the *Boston Herald,* "the entire nation witnessed the end of Mark McGwire as an American icon."

The Law

It is against the law to possess a Schedule III controlled substance without a valid prescription. It is also against the law to sell Schedule III controlled substances or their ANALOGS. Penalties vary from state to state but can include high fines, probation, mandatory rehabilitation, a criminal record, and—especially with second and third offenses—jail time.

Chemists try to get around the law by creating steroids that cannot be detected in drug tests, or substances that can be called "dietary supplements." One anonymous "doctor" boasted to *Sports Illustrated* in 2005: "A guy on my stuff could walk into the test with a needle in his [buttocks] and not worry." The same source said he knew of ten substances that could not be detected by urine tests.

The illegal creation of synthetic drugs that are not covered by law creates another challenge—that of detecting and revealing the substances and prosecuting their creators. The bust at the Bay Area Laboratory Cooperative in 2003 led to the scheduling of THG, a substance once thought to be undetectable by tests.

As of 2005, creatine and DHEA were still legal over-the-counter dietary supplements. However, the FDA was studying the effects of DHEA overdose and considering adding it to the list of controlled substances.

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analogs: drugs created in a laboratory, having a slightly different chemical composition than a pharmaceutical, yet having the same effects on the brain as the pharmaceutical

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See also: Creatine; Ephedra

Tranquilizers

Official Drug Name: Major tranquilizers: aripiprazole (ah-rih-PIP-rah-zole; Abilify); chlorpromazine (klorr-PROH-mah-zeen; Thorazine); clozapine (CLAW-zuh-peen; Clozaril); fluphenazine (flu-FENN-uh-zeen; Permitil, Prolixin); haloperidol (hal-oh-PEH-rih-dawl; Haldol); loxapine (LOK-suh-peen; Daxolin, Loxitane); mesoridazine (meh-zoh-RY-duh-zeen; Serentil); olanzapine (oh-LANN-zuh-peen; Zyprexa); perphenazine (per-FENN-uh-zeen; Trilafon); pimozide (PIMM-oh-zide; Orap); quetiapine (kweh-TY-uh-peen; Seroquel); risperidone (rih-SPER-ih-doan; Risperdal); thioridazine (thy-oh-RY-duh-zeen; Mellaril); thiothixene (thy-oh-THIK-seen; Navane); trifluoperazine (try-FLU-oh-PERR-uh-zeen; Stelazine); triflupromazine (try-flu-PROH-muh-zeen; Vesprin); ziprasidone (zih-PRAY-zih-don; Geodon)
Also Known As: Antipsychotics, neuroleptics
Drug Classifications: Major tranquilizers; not scheduled

Official Drug Name: Minor tranquilizers (benzodiazepines): alprazolam (al-PRAZZ-oh-lam; Xanax); chlordiazepoxide (klor-dye-az-uh-POKS-ide; Librium); clonazepam (kloh-NAZZ-uh-pam; Klonopin); clorazepate (klor-AZZ-uh-pate; Tranxene); diazepam (dye-AZZ-uh-pam; Valium); estazolam (ess-TAH-zoh-lam; ProSom); flunitrazepam (flu-nih-TRAZ-uh-pam; Rohypnol); flurazepam (flor-AZZ-uh-pam; Dalmane); halazepam (huh-LAZZ-uh-pam; Paxipam); lorazepam (lorr-AZZ-uh-pam; Ativan); midazolam (my-DAY-zoh-lam; Versed); oxazepam (oks-AZZ-uh-pam; Serax); prazepam (PRAZZ-uh-pam; Centrax); quazepam (KWAY-zuh-pam; Doral); temazepam (tuh-MAZZ-uh-pam; Restoril); triazolam (try-AY-zoe-lam; Halcion)
Also Known As: Anxiolytics (ANG-zee-oh-LIH-tiks), benzos, BZDs, downers, goofballs, happy pills, sedative-hypnotics, tranks, tranx
(continued on next page)

What Kind of Drug Is It?

Tranquilizing drugs slow normal brain function. For that reason, they are often referred to as depressants. These kinds of drugs work by affecting the neurotransmitter gamma-aminobutyric acid (GABA). Neurotransmitters are brain chemicals that help brain cells communicate with one another by spreading nerve impulses from one nerve cell to another. The higher the level of GABA activity in the brain, the greater the calming effect produced. Tranquilizers are prescribed by doctors only and are usually dispensed as pills or capsules. Some types come in liquid or solution form.

Because tranquilizers slow down normal brain activity and produce a calming or drowsy effect, they are among the most common drugs prescribed to patients suffering from insomnia. Insomniacs are patients who either have trouble falling asleep or cannot fall asleep at all. Tranquilizers are also prescribed to patients diagnosed with anxiety, a type of mental disorder that causes extreme restlessness, uncontrollable feelings of fear, excessive worrying, and panic attacks. According to Jim Parker in *Tranx: Minor Tranquilizers, Major Problems,* about 70 million prescriptions for tranquilizers are written each year in the United States. Tranquilizers are also among the most commonly abused medications. In 2005, the National Center on Addiction and Substance Abuse (CASA) at Columbia University released a 214-page report titled "Under the Counter: The Diversion and Abuse of Controlled Prescription Drugs in the U.S." That report indicates that in 2003 nearly 6 million Americans abused prescription tranquilizers and sedatives.

Overview

In general, tranquilizers fall into two categories: major tranquilizers and minor tranquilizers. Major tranquilizers are drugs used to treat severe mental illnesses, such as schizophrenia and psychosis (sy-KOH-sis). A mental disease, schizophrenia causes patients to withdraw from reality and suffer other intellectual and emotional disturbances. Psychosis is a severe mental disorder that often causes hallucinations, or visions, and makes it difficult for people to distinguish what is real from what is imagined. Major

Various herbs are used as tranquilizers. © *DK Limited/Corbis.*

tranquilizers are more commonly called neuroleptics or antipsychotics. These drugs help decrease the symptoms of serious psychiatric disorders by targeting areas of the brain that deal with emotion. They are not typically abused by patients.

Minor tranquilizers, also known as sedative-hypnotic or anxiolytic drugs, are a group of medications that are prescribed to treat sleep and anxiety disorders. Although different sedative-hypnotic and anxiolytic drugs work in the brain in slightly different ways, they all produce a calming effect that is beneficial to patients who cannot sleep or who suffer from severe anxiety attacks. These drugs are among the most abused in the United States.

Minor tranquilizers can also be broken down into two main categories: barbiturates, which are used to treat anxiety, tension, and sleep disorders; and benzodiazepines (BZDs), which can be prescribed to treat anxiety, severe stress reactions, and panic attacks. Panic attacks are unexpected episodes of severe anxiety that can cause shortness of breath, dizziness, sweating, and shaking. (Entries on barbiturates and benzodiazepines are included in this encyclopedia.) The main difference between the two groups is that BZDs target specific receptors (groups

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Drug Classifications: Benzodiazepines: Schedule IV (except for flunitrazepam, which as of 2005 was a Schedule III drug; change in status to Schedule I possible, according to the Drug Enforcement Administration); depressants

Official Drug Name: Minor tranquilizers (nonbenzodiazepines): buspirone (byoo-SPY-rone; BuSpar); zaleplon (ZAH-leh-plon; Sonata); zolpidem (zole-PIE-dem; Ambien)
Also Known As: Anxiolytics, sedative-hypnotics, tranks, tranx
Drug Classifications: Nonbenzodiazepine hypnotics: buspirone, not scheduled; zaleplon and zolpidem, both Schedule IV, depressants

Official Drug Name: Minor tranquilizers (barbiturates): amobarbital (AMM-oh-BAR-bit-al; Amytal); butabarbital (BYOOT-uh-BAR-bit-al; Butisol); butalbital (byoo-TAHL-bit-al; Fioricet and Fiorinal); mephobarbital (MEFF-oh-BAR-bit-al; Mebaral); methohexital (meh-thoh-HEK-sih-tal; Brevital); pentobarbital (PENT-oh-BAR-bit-al; Nembutal); phenobarbital (FEEN-oh-BAR-bit-al; Luminal); secobarbital (SEK-oh-BAR-bit-al; Seconal)
Also Known As: Amys, anxiolytics, barbs, blues, downers, rainbows, red devils, sedative-hypnotics, tranks, tranx, yellow jackets
Drug Classifications: Barbiturates: amobarbital, pentobarbital, and secobarbital, all Schedule II, depressants; butabarbital and butalbital, both Schedule III, depressants; mephobarbital, methohexital, and phenobarbital, all Schedule IV, depressants

Official Drug Name: Minor tranquilizers (nonbarbiturate sedative-hypnotics): chloral hydrate (KLORR-uhl HIGH-drate; Aquachloral Supprettes, Noctec); ethchlorvynol (eth-KLORR-vih-nol; Placidyl); glutethimide (glue-TEH-thuh-mide; Doriden); meprobamate (meh-proe-BAMM-ate; Miltown, Equanil); methaqualone

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(meth-a-KWAY-lone; Quaalude); methyprylon (meth-ih-PRY-lon; Noludar)
Also Known As: Anxiolytics, ludes, sedative-hypnotics, sopors, tranks, tranx
Drug Classifications: Nonbarbiturate sedative-hypnotics: methaqualone, Schedule I, depressant; glutethimide, Schedule II, depressant; methyprylon, Schedule III, depressant; chloral hydrate, ethchlorvynol, and meprobamate, all Schedule IV, depressants

Official Drug Name: Herbals: *Rauwolfia serpentina* (row-WOLF-ee-uh SER-penn-TEEN-uh; active ingredient in reserpine [Serpasil]); *Valeriana officinalis*
Also Known As: Indian snakeroot (for *Rauwolfia*); valerian
Drug Classifications: Not scheduled; dietary supplements

of cells that receive stimuli) in the brain instead of affecting the entire brain. Therefore, BZDs do not produce many of the negative side effects associated with major tranquilizers or barbiturates, such as impaired judgment or breathing problems. Most tranquilizers and sleeping pills prescribed as of 2005 belonged to the BZD chemical group because of their higher safety ratings. The best-known examples of BZDs are Ativan, Halcion, Librium, Valium (VAL-eum), and Xanax (ZAN-ex).

History

In some form or another, tranquilizers have been around since ancient times. Virtually every culture discovered the sedative effects of certain herbs and plants growing in nature. (A separate entry on herbal drugs is available in this encyclopedia.) Through years of trial and error, these cultures were able to identify specific plants that—when prepared a particular way—could have a tranquilizing effect. By drying these plants or their roots and grinding them into food or mixing them with liquids, herbalists found that the substances could relieve stress, insomnia, and the symptoms of severe mental disorders in people who consumed them.

Major Tranquilizers. The first major tranquilizer was developed from *Rauwolfia serpentina*, also known as the Indian snakeroot. *Rauwolfia* is known for its ability to lower blood pressure. Used for many years in India for the treatment of serious mental illness, it was frequently referred to there as the "insanity herb." Most often, its roots were crushed and consumed in a tea. In 1943 an Indian physician named Rustom Jal Vakil (1911–1974) wrote about the plant's success in treating mental illness. It wasn't long before Western doctors began studying *Rauwolfia,* hoping that it could help patients with severe psychiatric disorders.

American doctor Robert Wallace Wilkins (1906–2003) of Boston University Medical School conducted extensive research on *Rauwolfia serpentina* after hearing about its use in India. In 1954, he showed that reserpine, an ALKALOID and the ACTIVE INGREDIENT in *Rauwolfia,* was successful in treating both high blood pressure and severe psychiatric disorders such as schizophrenia and other psychoses. Almost immediately the new drug (sold under the brand name Serpasil) became the most popular way to treat such disorders.

alkaloid: nitrogen-containing substances found in plants

active ingredient: the chemical or substance in a compound known or believed to have a therapeutic, or healing, effect

Wilkins' work inspired further research, which resulted in the development of other drugs used as major tranquilizers. With neuroleptic and antipsychotic drugs came the possibility that mentally ill patients would not have to spend their lives committed

Patients at a mental hospital lie down as they experience the effects of reserpine in 1957. Without the drug, however, they might have to be put in restraints. Reserpine was the first major tranquilizer.

to institutions and under a doctor's strict supervision. Instead, they could return to their homes and families as long as they followed prescribed drug therapy and other treatment.

Minor Tranquilizers. Herbs such as valerian, kava, and lavender produce tranquilizing effects and have been used by various cultures for centuries. There were no alternatives to natural tranquilizers until the 1860s, when the first synthetic minor tranquilizer, bromide, was created. (Synthetic drugs are those created in a laboratory.) But the dangerous side effects it produced made it rather unpopular. The drug caused stomach problems and, if taken for a long time, proved toxic (harmful or poisonous). Bromides were replaced by barbiturates in 1903. Barbiturates are effective in reducing anxiety and causing drowsiness, but can very quickly become addictive or habit-forming. Amytal, Nembutal, and Seconal are all examples of barbiturates.

The danger with barbiturates is the high rate of death connected with overdose. An overdose of barbiturates affects the heart and the respiratory system, causing shortness of breath, extreme drowsiness,

Drug Therapy Replaces Radical Treatments for Mental Illness

Reserpine was the first drug developed to treat patients with severe psychiatric problems, such as: schizophrenia; paranoia—having abnormal feelings of suspicion and fear; and hallucinations—having visions or seeing things that are not really present. Before reserpine, psychiatric patients suffering from severe mental illnesses had to endure radical treatments. These included: 1) insulin shock therapy, in which a doctor injects the patient with insulin, making blood sugar levels fall so low that the patient becomes comatose, or unconscious; 2) electroconvulsive (ECT) therapy, in which a patient is shocked with electricity; and 3) lobotomy, a surgical procedure that actually removes part of the brain. It is easy to see why the development of reserpine was viewed as a revolutionary treatment for psychiatric patients.

Because of its positive effects in treating not only psychiatric disorders but also high blood pressure, reserpine quickly became a very popular drug. Reserpine lowers high blood pressure in two ways. First, it decreases the heart rate. Second, it opens up blood vessels to improve the flow of blood throughout the body. According to the *MedlinePlus* Web site, the drug was still being used for this purpose in the early 2000s. However, as of 2005, it was no longer considered the drug of choice for treating patients with mental disorders.

Doctors and researchers soon realized that although the drug was useful in calming upset psychotic patients—those experiencing a dangerous loss of contact with reality that could lead to violence—it caused severe depression in others. There were also other negative side effects, including nightmares, stomach problems, and parkinsonism (PAR-kin-son-izm), which is a disorder of the nervous system that resembles Parkinson's disease. Symptoms of parkinsonism include overall weakness, partial paralysis of the face, trembling hands, and a slowed, shuffling walk. As a result, reserpine has been largely replaced in psychiatric use by other major tranquilizers.

and an unusually slow heart rate. The user then slips into a COMA and dies. Because of this, chemists knew they had to find an alternative to barbiturates—a drug that could ease anxiety without slowing breathing rates to dangerously low levels. The answer came with the discovery of benzodiazepines.

In 1954, Austrian scientist Dr. Leo Sternbach (1908–2005) discovered the first benzodiazepine while conducting research on chemical compounds for the New Jersey-based Hoffmann-La Roche drug company. He did not recognize the importance of his discovery until 1957, when he realized that one of his compounds would make a great tranquilizer. Known as RO 5-0690, the drug eventually became Librium. Sternbach also developed Valium in 1963. Over time, BZDs became popular drugs for the treatment of anxiety and sleep disorders.

coma: a state of unconsciousness from which a person cannot be aroused by noise or other stimuli

Leo Sternbach, the chemist who created Valium, poses with his wife, Herta, in 2003. Sternbach was working with Hoffmann-La Roche when he created the popular tranquilizer. *AP/Wide World Photos.*

What Is It Made Of?

Although all tranquilizers have the same general effects, they vary widely in chemical makeup. Most are synthetic, which means they are made in a lab from chemicals. Other tranquilizing drugs are found naturally in plants and have been used for centuries to cure such troubles as tremors, insomnia, and heart problems. An example of a natural tranquilizer is valerian, which is a plant that grows in mild climates. Other herbal supplements that are thought to decrease stress responses and improve sleep include kava, skullcap, chamomile, passion flower, lemon balm, and lavender.

A History of Valerian

Valerian (*Valeriana officinalis*) is a natural herbal remedy that has been popular throughout history for its sedative and hypnotic (sleep-producing) properties. In more contemporary times, it has been used as an anxiolytic drug with mixed success. The rhizomes (RYE-zohmz), or underground stems, of the plant are used to make teas and other herbal remedies for nervous tension and insomnia. Dosages of 300 to 600 milligrams of valerian are said to help people fall asleep faster.

Valerian grows in Europe, North America, and the northern part of Asia. It has been used since the time of the ancient Greeks. The Greek physician Hippocrates (430–370 BCE) wrote about valerian, and the renowned Greek physician Galen (131–203 CE) prescribed it for insomnia. It was very popular in the Middle Ages (c. 500–c. 1500), when it was used to treat tremors, nervous conditions, and heart palpitations. In World War II (1939–1945), it was used by the British to relieve the massive stress brought on during nightly air raids by the Germans.

There are more than 150 species of valerian root. All of them contain rare oils that are known to produce nerve-calming, sedative effects on the body. Valerian is also well known for its extremely unpleasant odor, which is described as being similar to sweaty feet and dirty socks.

How Is It Taken?

Most tranquilizers are taken by mouth in pill, capsule, or liquid form. If a pill or capsule is taken, doctors recommend drinking a full glass of water along with each dose. Since most pills or capsules are formulated to release the medication in the body slowly, it is important not to chew or break them. Concentrated liquid forms should be diluted, or mixed with another liquid, such as coffee, milk, tea, water, or fruit juice. Tranquilizers also can be injected into a vein or administered rectally in a SUPPOSITORY. Illegal tranquilizers, like Rohypnol (roh-HIPP-nahl) or ketamine (KETT-uh-meen), are sometimes dissolved in drinks, snorted, or sprinkled on tobacco or marijuana and then smoked. (Entries on Rohypnol and ketamine are included in this encyclopedia.)

Are There Any Medical Reasons for Taking This Substance?

Major tranquilizers such as Clozapine, Haldol, or Thorazine are powerful drugs that are prescribed to relieve the symptoms of major psychiatric disorders such as schizophrenia. Some have been developed to treat the following: 1) dementia, a brain disorder that causes a reduction in a person's intellectual functioning, most often affecting

suppository: medicine that is delivered through the anus

memory, concentration, and decision-making skills; 2) autism, a psychological disorder, usually diagnosed in children, that affects emotional development, social interactions, and the ability to communicate effectively; 3) bipolar disorder, a psychological disorder that causes alternating periods of depression and extreme happiness; 4) Tourette's syndrome, a severe tic disorder that causes distress and significant disability to those affected by it; and 5) attention-deficit/hyperactivity disorder (ADHD), a condition characterized by impulsive behavior, difficulty concentrating, and hyperactivity that interferes with social and academic functioning. These drugs may also be used in individuals exhibiting signs of severe agitation, violence, hostility, or paranoid behavior. In rare cases, they have been used to ease severe pain.

There are a number of medical reasons why doctors prescribe tranquilizers. Because minor tranquilizers produce a calming or drowsy effect, the most common reasons are insomnia and anxiety disorders. Minor tranquilizers are also considered effective in treating anxiety in patients suffering from Alzheimer's disease, which is a brain disease that usually strikes older individuals and results in memory loss, impaired thinking, and personality changes. Minor tranquilizers are sometimes prescribed to help with alcohol and drug WITHDRAWAL. Others help to prevent epileptic seizures, which are sudden violent spasms or convulsions resulting from epilepsy, a disorder involving the misfiring of electrical impulses in the brain. In some instances, certain types of barbiturates and BZDs have been used as an anesthetic to deaden pain in outpatient procedures. In some states, a form of barbiturate is used to execute criminals by lethal injection.

"Someone Must Have Slipped Him a Mickey"

There are a few stories behind the term "slipping someone a Mickey," which means putting a knockout drug in someone's drink. Some say the original Mickey was a laxative (a drug that helps produce bowel movements) used for horses. Others believe that the phrase began with Mickey Finn, a man who owned a bar named the Lone Star Saloon and Palm Garden in Chicago, Illinois, in 1896. A colorful criminal, Mickey found that when he mixed a little sedative-hypnotic chloral hydrate into an unsuspecting patron's drink, the guy would quickly pass out. Then Mickey and his associates would drag the victim into a back room, rob him, and dump him in an alley. The next morning, the unsuspecting victim would wake up with no memory of what had happened.

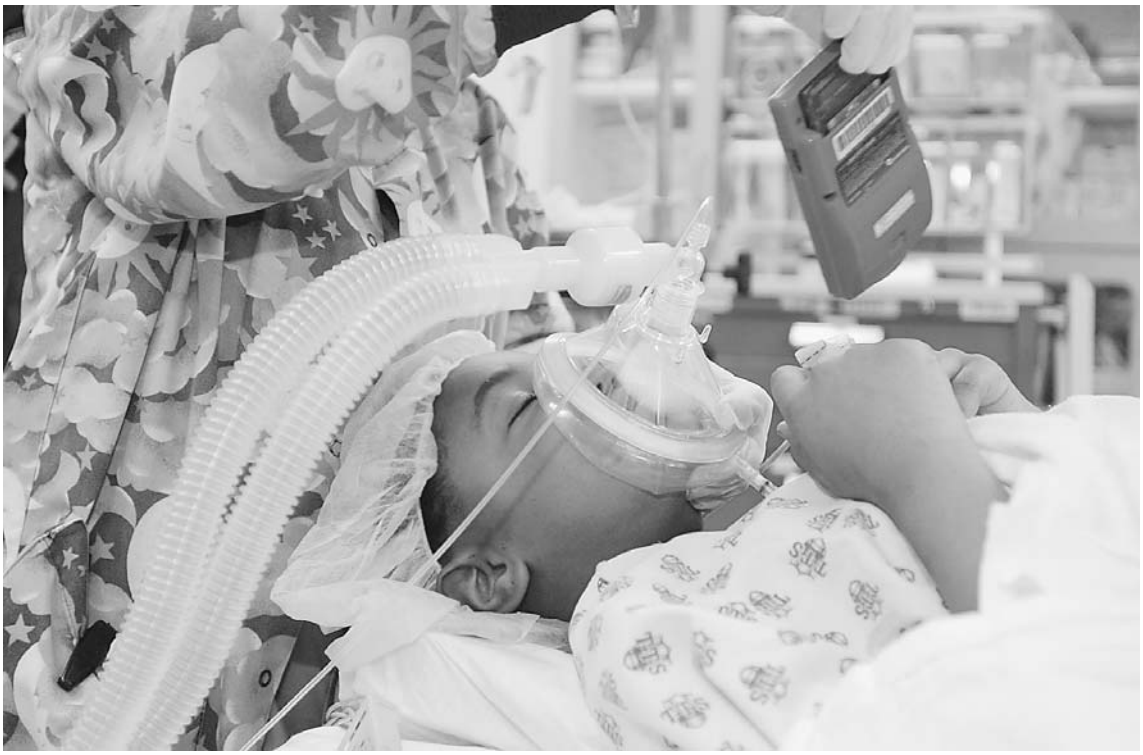
The Lone Star Saloon and Palm Garden was shut down in 1903, but Finn was never arrested for his crimes. He even sold his secret drink recipe to other bar owners. The "Mickey Finn" became a popular term for any kind of knockout punch, especially one that comes in a glass.

Usage Trends

By the end of the twentieth century, usage trends for tranquilizers had shifted. In the 1980s, tranquilizers were used mainly to treat DEPRESSION. In the 1990s, they were prescribed more often for anxiety and stress disorders. As diagnoses of anxiety and stress disorders

withdrawal: the process of gradually cutting back on the amount of a drug being taken until it is discontinued entirely; also the accompanying physiological effects of terminating use of an addictive drug

depression: a mood disorder that causes people to have feelings of hopelessness, loss of pleasure, self-blame, and sometimes suicidal thoughts



Tranquilizers are used to help calm patients prior to surgery. Some doctors are looking into alternatives, however. Here, a doctor is shown taking a handheld game from a young boy who is about to go into surgery. Researchers have found that letting children play such games until anesthesia takes effect is often more effective than tranquilizers in preventing anxiety. *AP/Wide World Photos.*

increased in the 1990s and early 2000s, so did the demand for tranquilizers. The 2005 CASA report states that prescriptions filled for benzodiazepines alone increased nearly 50 percent between 1992 and 2002. In addition, BZDs account for 20 percent of all prescriptions written for controlled substances in the United States. As the use of BZDs has increased, the demand for barbiturates has decreased dramatically.

Trends in the Use of Major Tranquilizers

According to Parker in *Tranx: Minor Tranquilizers, Major Problems,* "The major tranquilizers do not produce effects generally experienced as pleasurable, and are thus rarely abused." However,

doctors are increasingly prescribing neuroleptics for children with severe cases of autism, ADHD, Tourette's syndrome, and childhood bipolar disorder. Moreover, neuroleptics are also commonly prescribed for elderly patients in nursing homes and other institutions, particularly those who have been diagnosed with Alzheimer's disease.

Trends in the Use of Minor Tranquilizers

The National Survey on Drug Use and Health (NSDUH) is conducted by the U.S. Substance Abuse and Mental Health Services Administration (SAMHSA). This well-known survey obtains information on nine different categories of illicit drug use. One of these categories includes the nonmedical use of prescription-type pain relievers, tranquilizers, STIMULANTS, and sedatives. The NSDUH report refers to these drugs collectively as "any psychotherapeutics" (SY-koh-ther-uh-PYOO-tiks).

The latest NSDUH results available as of mid-2005 covered drug usage trends for the year 2003. NSDUH statistics showed that teenagers and young adults were increasingly turning to prescription drugs to get high. A large number of Americans became "new users" of psychotherapeutic drugs in 2003. Roughly 1.2 million people began using tranquilizers that year, and 225,000 began using sedatives. Among fifteen benzodiazepines, the nonmedical use of two specific drugs—alprazolam (Xanax) and lorazepam (Ativan)—rose the most, from 3.5 percent to 4 percent of those surveyed in 2003. Usage among eighteen to twenty-five year olds was particularly high, increasing from 6.7 to 7.5 percent in 2003.

The results of the 2004 Monitoring the Future (MTF) study, conducted by the University of Michigan (U of M) and sponsored by research grants from the National Institute on Drug Abuse (NIDA), reveal similar findings. MTF data indicate that about 2.5 percent of eighth graders, 5.1 percent of tenth graders, and 7.3 percent of high school seniors reported using drugs such as Xanax between 2003 and 2004. Barbiturate use among twelfth-grade students held steady between 2003 and 2004.

According to the Drug Abuse Warning Network (DAWN), psychotherapeutic agents were "the drugs most frequently involved in overmedication" emergency room visits in the last six months of 2003. More females than males were hospitalized for overmedication cases, and young people age eighteen to twenty were involved in overdose visits more often than any other age group. These statistics were the latest available from DAWN as of mid-2005.

stimulants: substances that increase the activity of a living organism or one of its parts

Mom's an Addict

In the 1960s, an unusual trend in tranquilizer use emerged: middle-class, suburban homemakers were becoming addicted. Known as "Mother's Little Helpers," these minor tranquilizers were prescribed by doctors to help discontented wives and mothers deal with the pressures of domestic life. Soon, advertisers caught on to the trend and marketed these drugs as a perfectly safe way to relax. Ads for tranquilizers such as Librium and Valium portrayed these drugs as the answer to anxieties about housework and demands from work, school, or family.

Such drugs were also said to help calm anxiety over political and social issues like the sexual revolution and American involvement in the Vietnam war (1954–1975). The trend became so widespread that the rock group the Rolling Stones wrote a song about it in 1966. Titled "Mother's Little Helper," the song talked about the little yellow pill that helped mothers get through the stress of their busy days.

But as use increased, so did the rate of addiction. It wasn't long before the negative effects of that addiction were also being reported. People began to realize that there was a serious downside to "Mother's Little Helper."

A 2001 NIDA Research Report titled "Prescription Drugs: Abuse and Addiction" indicates that, historically, females are twice as likely as males to become addicted to sedative-hypnotic-type drugs. Furthermore, women who have been abused or have witnessed abuse in their family are more likely to use and be addicted to tranquilizers, alcohol, and illegal drugs. In general, women of all ages, older individuals of both sexes, people with low levels of education, and people with unsatisfying family lives or jobs are most likely to abuse tranquilizing drugs.

Effects on the Body

Tranquilizers act on the brain by affecting the neurotransmitter known as GABA. Although different types of tranquilizers work in different ways, ultimately they all decrease brain activity by increasing GABA activity. This action produces a drowsy, calming effect that helps those suffering from anxiety or sleep disorders. Some tranquilizers are absorbed into the bloodstream very quickly, and others are timed to be released in slower amounts. For example, barbiturate classification is determined by how quickly the drugs start to work and how long the effects last. An ultrashort-acting barbiturate starts working in less than one minute. Long-acting barbiturates take effect in about one hour, and their effects can last for about twelve hours.

Effects on the body also differ depending on what kind of tranquilizer is ingested. Most tranquilizers produce a general calming feeling, a reduction in stress and anxiety, and sometimes a feeling of happiness. Other effects include slowed heart rate, reduced muscle spasms, pain relief, a decrease in convulsions, and even sedation.

Dangerous Side Effects

Depending on the dose, frequency, and duration of use, tolerance and dependence can occur rapidly among users of tranquilizers. Tolerance is a condition in which higher and higher doses of a drug are needed to produce the original effect or high experienced. Dependence occurs when a user has a physical or psychological need to take a certain substance in order to function. As tolerance develops, users may increase their doses to dangerous levels that can result in COMA or death.

Other harmful side effects may develop if an individual uses tranquilizers for a long time period. At high doses, both major and minor tranquilizers may cause convulsions, slowed breathing, loss of speech, and kidney problems. Major tranquilizers can also cause confusion, agitation, heart and breathing problems, weight gain, lowered blood pressure, tremors, and muscle stiffening. In the long term, one of the most serious side effects of neuroleptics is tardive dyskinesia (TAR-div diss-kih-NEE-zhuh; TD). TD is a nerve disorder that causes involuntary tics and uncontrollable movements of the face, mouth, tongue, and limbs. It can also interfere with breathing if it affects the chest. The onset of TD usually begins between six months to two years after the use of neuroleptics starts. It occurs in about 20 percent of patients treated with these types of tranquilizers.

Another possible side effect of major tranquilizers is the development of a life-threatening disorder called neuroleptic malignant syndrome. Symptoms of neuroleptic malignant syndrome include a very high fever, sweating, rapid heart rate, high blood pressure, INCONTINENCE, stupor (profound drowsiness or lethargy), DELIRIUM, extreme muscle rigidity, and coma. Once the syndrome is diagnosed in a patient, steps are taken to minimize the risk of brain damage. The neuroleptic drug is discontinued immediately, and efforts are made to reduce the fever as quickly as possible.

Minor tranquilizers can also have serious side effects, such as dizziness, irritability, confusion, and loss of memory. Some long-term users have also reported blurred and double vision, increased anxiety, insomnia, hallucinations, depression, agitation, and aggression. The ability to drive or operate machinery can be extremely impaired in people taking minor tranquilizers.

coma: a state of unconsciousness from which a person cannot be aroused by noise or other stimuli

incontinence: the loss of bladder and/or bowel control

delirium: a mental disturbance marked by confusion, hallucinations, and difficulty focusing attention and communicating

The Thalidomide Tragedy and the Woman Who Said "No"

The thalidomide (thuh-LIH-doh-myd) tragedy is a prime example of what can happen when doctors prescribe drugs that have not been thoroughly studied and tested. Created in a West German lab in 1954, the hypnotic drug was sold as a sleep aid in Australia, Europe, Asia, Africa, and North America. It was considered so safe that it was also given to thousands of pregnant women to relieve morning sickness—the nausea and vomiting that often accompany the early stages of pregnancy.

By the end of the 1950s, doctors became alarmed when there was a shocking increase in the number of babies born with disabilities. Some had brain damage. Many were born with very short, flipper-like arms or legs, a condition known as *phocomelia* (foh-koh-MEE-lee-uh). When doctors began tracing these disabilities back to the mother's use of thalidomide, these children became known as "thalidomide babies." As of 2005, there were approximately 12,000 people dealing with some form of disability caused by their mother's use of thalidomide.

A dangerous drug like thalidomide was so widely prescribed because drug testing procedures in the 1950s were much different than they are in the 2000s. At that time, drug companies did not have to submit testing results to the appropriate government agencies. Also, drug manufacturers were not required to reveal some of the results of the tests, which were conducted on rodents—animals that are very different from humans.

FDA's Kelsey Says "No"

In the United States, the right to distribute thalidomide was bought by the William S. Merrell Company, a division of Richardson-Merrell. The company had to get approval to sell the drug from the U.S. Food and Drug Administration (FDA). The thalidomide approval case was assigned to Canadian-born FDA researcher Dr. Frances Kathleen Oldham Kelsey (1914–). It was her first case review and was expected to be a simple process, since the drug was already widely available around the world. But Kelsey was not convinced that the drug was safe. Despite intense pressure, she held up approval of thalidomide until further testing was complete. It wasn't long before there were reports from Europe of the serious health problems. The drug was quickly pulled from the market. Thanks to Kelsey's conviction about thalidomide, only seventeen thalidomide babies were born in the United States.

Brain Damage?

Other long-term effects have been harder to determine. Some researchers believe that prolonged use of minor tranquilizers affect overall brain function and may cause brain shrinkage. Because very few studies have measured these effects, there is little evidence to support such theories. It is generally agreed that taking a low dose over a long period of time has little impact on a user's brain and nervous system. However, if individuals begin to take these drugs at a higher dosage than prescribed or more frequently than recommended, they run the risk of developing serious health problems.

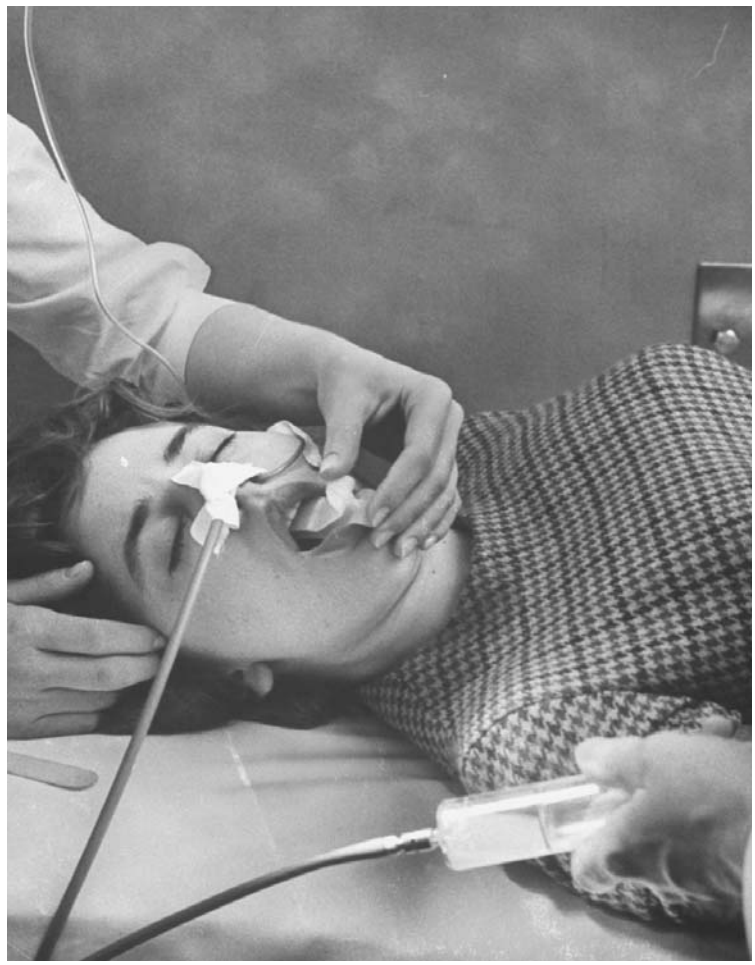
A young girl born with birth defects is shown eating her meal using her foot to hold her spoon in 1967. Many children were born with birth defects after their mothers took thalidomide while pregnant.
Photo by Leonard Mccombe/Time Life Pictures/Getty Images.

Thalidomide babies are still being born in other parts of the world, however. In 1965 doctors discovered that the drug was a very effective treatment for leprosy (LEPP-ruh-see), a tropical disease that is caused by bacteria and affects both the skin and the nerves. Leprosy may produce sores, scarring, and a loss of feeling, especially in the fingers and toes. Later, doctors began using thalidomide to combat Crohn's disease, a serious intestinal disease that causes inflammation along with severe pain, diarrhea, nausea, and sometimes extreme weight loss. The drug has also been prescribed to fight certain cancers and the ravaging effects of acquired immunodeficiency syndrome (AIDS), an infectious disease that destroys the body's immune system and leads to illness and death.

In underdeveloped and poverty-stricken nations across the world, thalidomide is often given to AIDS and leprosy patients—some of whom are pregnant. Despite the medical community's knowledge of the drug's severely harmful effects on babies, thalidomide is still being given to pregnant women who have few resources and are unaware of the dangers. Just one dose of thalidomide can cause major birth defects in a developing fetus. In 1998 the FDA gave approval for thalidomide to be marketed as a leprosy treatment in the United States, but with special safeguards to protect pregnant women.

Reactions with Other Drugs or Substances

Tranquilizers can be used with other medications, but only under a doctor's supervision. A person should not use tranquilizers along with similar drugs that affect the brain and nervous system. These include drugs such as other tranquilizers, prescription pain medications, some over-the-counter cold and allergy medications, and alcohol. Even herbal remedies such as valerian may intensify the sedative effects of barbiturates, so these substances should not be taken together. Combining them can result in an overdose or a serious accident.



Use of tranquilizers among women gained popularity in the 1960s. Some took too many pills and overdosed. Here, doctors pump a woman's stomach to save her life. *Photo by Ralph Morse/Time Life Pictures/Getty Images.*

Treatment for Habitual Users

Tranquilizers are often abused. Even users who take them at a prescribed dose run the risk of developing an addiction after just six weeks of use. In general, the best way to treat an addiction to tranquilizers is to gradually reduce the dose of the drug under the supervision of a qualified physician. If an individual decides to just stop taking the drug, there can be serious physical consequences, such as seizures, psychosis, paranoia, heart palpitations, and depression.

Inpatient or outpatient counseling is also recommended during the DETOXIFICATION and withdrawal processes.

Doctors match the withdrawal process to the type of tranquilizer the patient is abusing. Patients who are taking high-dose BZDs follow a program that takes one of three approaches: 1) the dosage and amount of the abused drug is gradually decreased over time; 2) another BZD is substituted for the original tranquilizer abused, then the substitute BZD is gradually decreased over time; or 3) the barbiturate phenobarbital (Luminal) is substituted for the original tranquilizer abused and then the withdrawal process begins. The chosen method depends on the substance of abuse. Detoxification and the withdrawal process typically occur in a medical setting and require the patient to follow the doctor's orders exactly.

Drug addiction occurs in many families regardless of wealth, race, gender, politics, or religious beliefs. After allegedly trying to fill a fake prescription for Xanax, Noelle Bush was arrested and later ordered into a drug treatment program by the court. The daughter of Florida governor Jeb Bush, she is the niece of President George W. Bush. *AP/Wide World Photos.*

Consequences

Minor tranquilizers can be effective for short periods of time. However, long-term use can result in the buildup of a tolerance to the drug. This means that the body adjusts to the prescribed dosage and the individual has to take more of the drug to achieve the same effect. Individuals who increase the dose they take are in danger of overdosing on the drug, which can result in coma and possibly death.

Tranquilizer addiction can have a damaging impact on an individual's life. Marriages may break up; families may go bankrupt; jobs may be lost; and some addicted individuals may turn to criminal behavior to obtain the drugs they crave. Addicts may turn to other drugs to try to achieve the same effects they get from tranquilizers or to ease withdrawal symptoms from tranquilizer use.

Since the 1990s and early 2000s, there has been a great deal of research conducted on the consequences of overprescribing certain major tranquilizers, especially for elderly people living in nursing homes. This research suggests that an older person living in a nursing home receives four times as many prescription drugs as an older person living in his or her own home. Critics argue that drugging these patients may make life easier for caregivers, but it leaves the

detoxification: often abbreviated as detox; a difficult process by which substance abusers stop taking those substances and rid their bodies of the toxins that accumulated during the time they consumed such substances

patients unresponsive and alienated from their surroundings. Rather than just using drugs, they suggest trying other therapies that may result in a better quality of life for the patient. Similar concerns have surfaced for children who suffer extreme cases of autism and ADHD and are heavily medicated with major tranquilizers.

The Law

Tranquilizers are legal drugs that are only available with a prescription from a licensed doctor. In the United States, they are classified as Schedule II, III, or IV controlled substances under the Controlled Substances Act (CSA) of 1970. However, it is not legal to manufacture, distribute, or sell these drugs without a proper license. A person who illegally distributes tranquilizers can face up to fifteen years in prison and fines of up to $25,000.

A few types of minor tranquilizers are so addictive that they have been outlawed. Doriden and Quaaludes are examples of drugs that were once legally prescribed but are now banned from the United States because they were so frequently abused. Rohypnol, known as a "date rape drug," is illegal in the United States as well, but legal in countries in Europe, Central America, and South America.

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See also: Alcohol; Barbiturates; Benzodiazepine; Herbal Drugs; Rohypnol

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Organizations

Al-Anon/Alateen (Canada)
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Ottawa, ON K2E 7V5
Canada
(613) 723-8484
(613) 723-0151 (fax)
wso@al-anon.org
http://www.al-anon.alateen.org/

Al-Anon/Alateen (United States)
1600 Corporate Landing Pkwy.
Virginia Beach, VA 23454-5617
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(757) 563-1600
(757) 563-1655 (fax)
wso@al-anon.org
http://www.al-anon.alateen.org/

Alcoholics Anonymous (AA)
475 Riverside Dr., 11th Floor
New York, NY 10115
USA
In the U.S./Canada: Look for "Alcoholics Anonymous" in any telephone directory.
http://www.aa.org/

American Botanical Council
6200 Manor Rd.
Austin, TX 78723
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(512) 926-4900
(800) 373-7105
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abc@herbalgram.org
http://www.herbalgram.org

American Council for Drug Education (ACDE; a Phoenix House agency)
164 West 74th St.
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American Society of Addiction Medicine (ASAM)
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Attention Deficit Disorder Association (ADDA)
P.O. Box 543
Pottstown, PA 19464
USA
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(610) 970-7520 (fax)
http://www.add.org/

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Center for Substance Abuse Research (CESAR)
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www.cesar.umd.edu

Center for Substance Abuse Treatment (CSAT; a division of the Substance Abuse and Mental Health Services Administration)
1 Choke Cherry Rd., Room 8-1036
Rockville, MD 20857
USA
(800) 662-HELP(4357) or (877) 767-8432 (Spanish)
http://csat.samhsa.gov or http://findtreatment.samhsa.gov

Centers for Disease Control and Prevention (CDC; a division of the U.S. Department of Health and Human Services)
1600 Clifton Rd.
Atlanta, GA 30333
USA
(404) 639-3311
(800) 311-3435
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Cocaine Anonymous World Services (CAWS)
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Van Nuys, CA 91404
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office@marijuana-anonymous.org
http://www.marijuana-anonymous.org

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11050 Santa Monica Blvd., Suite 100
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USA
(310) 312-0500
(310) 312-0538 (fax)
http://www.methamphetamine.org/mtcc.htm or www.uclaisap.org

Narconon International
7060 Hollywood Blvd., Suite 220
Hollywood, CA 90028
USA
(323) 962-2404
(323) 962-6872 (fax)
info@narconon.org or rehab@narconon.org
http://www.narconon.org

Narcotics Anonymous (NA)
P.O. Box 9999
Van Nuys, CA 91409

USA
(818) 773-9999
(818) 700-0700 (fax)
www.na.org

Narcotics Anonymous World Services Office (WSO)—Europe
48 Rue de l'Été/Zomerstraat
B-1050 Brussels
Belgium
32-2-646-6012
32-2-649-9239 (fax)
http://www.na.org

National Association for Children of Alcoholics (NACoA)
11426 Rockville Pike, Suite 100
Rockville, MD 20852
USA
(301) 468-0985
(888) 55-4COAS
(301) 468-0987 (fax)
nacoa@nacoa.org
http://www.nacoa.org/

National Cancer Institute, Tobacco Control Research Branch (TCRB)
Executive Plaza North, Room 4039B
6130 Executive Blvd. MSC 7337
Rockville, MD 20852
USA
(301) 594-6776
(301) 594-6787 (fax)
blakek@mail.nih.gov
www.tobaccocontrol.cancer.gov or http://dccps.nci.nih.gov/tcrb

National Capital Poison Center—Poison Help
3201 New Mexico Ave., NW Suite 310
Washington, DC 20016
USA
(202) 362-3867
(800) 222-1222
(202) 362-8377 (fax)
pc@poison.org
www.poison.org or www.1-800-222-1222.info

National Center for Complementary and Alternative Medicine Clearinghouse (NCCAM; a division of the National Institutes of Health)
P.O. Box 7923
Gaithersburg, MD 20898
USA
(888) 644-6226

info@nccam.nih.gov
http://nccam.nih.gov/

National Center for Drug Free Sport, Inc.
810 Baltimore
Kansas City, MO 64105
USA
(816) 474-8655
(816) 474-7329 (fax)
info@drugfreesport.com
http://www.drugfreesport.com

National Center on Addiction and Substance Abuse at Columbia University (CASA)
633 Third Ave., 19th Floor
New York, NY 10017-6706
USA
(212) 841-5200
(212) 956-8020 (fax)
www.casacolumbia.org

National Council on Alcohol and Drug Dependence, Inc. (NCADD)
22 Cortlandt St., Suite 801
New York, NY 10007-3128
USA
(212) 269-7797
(800) 622-2255
(212) 269-7510 (fax)
national@ncadd.org
http://www.ncadd.org

National Eating Disorders Association
603 Stewart St., Suite 803
Seattle, WA 98101
USA
(206) 382-3587
(800) 931-2237
info@NationalEatingDisorders.org
http://www.nationaleatingdisorders.org

National Families in Action
2957 Clairmont Road NE, Suite 150
Atlanta, GA 30329
USA
(404) 248-9676
(404) 248-1312 (fax)
nfia@nationalfamilies.org
http://www.nationalfamilies.org/

National Inhalant Prevention Coalition (NIPC)
332 - A Thompson St.
Chattanooga, TN 37405
USA
(423) 265-4662
(800) 269-4237
nipc@io.com
http://www.inhalants.org

National Institute of Mental Health (NIMH; a division of the National Institutes of Health)
6001 Executive Boulevard, Room 8184, MSC 9663
Bethesda, MD 20892-9663
USA
(301) 443-4513
(866) 615-6464
(301) 443-4279 (fax)
nimhinfo@nih.gov
http://www.nimh.nih.gov/

National Institute on Drug Abuse (NIDA; a division of the National Institutes of Health)
6001 Executive Blvd., Room 5213
Bethesda, MD 20892-9561
USA
(301) 443-1124
(888) 644-6432
information@nida.nih.gov
http://www.drugabuse.gov or http://www.nida.nih.gov

National Institutes of Health (NIH)
9000 Rockville Pike
Bethesda, MD 20892
USA
(301) 496-4000
NIHinfo@od.nih.gov
http://www.nih.gov/

Nicotine Anonymous
419 Main St., PMB #370
Huntington Beach, CA 92648
USA
(415) 750-0328
info@nicotine-anonymous.org
http://www.nicotine-anonymous.org

Office of Dietary Supplements (ODS; a division of the National Institutes of Health)
6100 Executive Blvd., Room 3B01, MSC 7517
Bethesda, MD 20892-7517

USA
(301) 435-2920
(301) 480-1845 (fax)
ods@nih.gov
http://ods.od.nih.gov/

Office of National Drug Control Policy (ONDCP; a division of the Executive Office of the President of the United States)
c/o Drug Policy Information Clearinghouse
P.O. Box 6000
Rockville, MD 20849-6000
USA
(800) 666-3332
(301) 519-5212 (fax)
ondcp@ncjrs.gov
http://www.whitehousedrugpolicy.gov/

Oregon Health & Science University, Department of Medicine, Division of Health Promotion and Sports Medicine
3181 S.W. Sam Jackson Park Rd., CR110
Portland, OR 97239-3098
USA
(503) 494-8051
(503) 494-1310 (fax)
hpsm@ohsu.edu
http://www.ohsu.edu/hpsm

SAMHSA's National Clearinghouse for Alcohol and Drug Information (NCADI)
P.O. Box 2345
Rockville, MD 20847-2345
USA
(301) 468-2600
(800) 729-6686
http://www.health.org

Students Against Destructive Decisions (SADD) National
Box 800
Marlborough, MA 01752
USA
(877) SADD-INC
(508) 481-5759 (fax)
info@sadd.org
http://www.sadd.org/

Substance Abuse and Mental Health Services Administration (SAMHSA; a division of the U.S. Department of Health and Human Services)
1 Choke Cherry Rd., Room 8-1036
Rockville, MD 20857

USA
(301) 443-8956
info@samsha.hhs.gov
http://www.samhsa.gov

U.S. Anti-Doping Agency
1330 Quail Lake Loop., Suite 260
Colorado Springs, CO 80906-4651
USA
(719) 785-2000
(866) 601-2632; (800) 233-0393 (drug reference line);
or (877) PLAY-CLEAN (877-752-9253)
(719) 785-2001 (fax)
drugreference@usantidoping.org
http://www.usantidoping.org/

U.S. Drug Enforcement Administration (DEA)
Mailstop: AXS, 2401 Jefferson Davis Hwy.
Alexandria, VA 22301
USA
(202) 307-1000
http://www.dea.gov

U.S. Food and Drug Administration (FDA)
5600 Fishers Ln.
Rockville, MD 20857
USA
(888) INFO-FDA (888-463-6332)
http://www.fda.gov

World Anti-Doping Agency (WADA)
Stock Exchange Tower, 800 Place Victoria, Suite 1700
P.O. Box 120
Montreal, PQ H4Z 1B7
Canada
(514) 904-9232
(514) 904-8650 (fax)
info@wada-ama.org
www.wada-ama.org/

U•X•L Encyclopedia of Drugs & Addictive Substances

Natural Sources of Drugs

Left: Wild ephedra is shown growing in a canyon in Utah. *See* Ephedra, Vol. 3. *(© Scott T. Smith/Corbis)*

Above right: The sap of the opium poppy is used to make a variety of prescription and illegal painkillers. See Codeine, Vol. 2; Heroin, Vol. 3; Morphine, Vol. 4; and Opium, Vol. 5. *(© Vo Trung Dung/Corbis)*

Natural Sources of Drugs

Right: Some Native Americans use the hallucinogenic peyote cactus in religious rituals. *See* Mescaline, Vol. 4. *(AP/Wide World Photos)*

Below left: Tobacco is one of the most widely abused, mind-altering drugs in the world. See Nicotine, Vol. 4. *(© Kevin Fleming/Corbis)*

Natural Sources of Drugs

Top: Marijuana is the most widely used illegal controlled substance in the world. *See* Marijuana, Vol. 4. *(AP/Wide World Photos)*

Middle: Coffee is a major source of caffeine. *See* Caffeine, Vol. 2. *(© Renée Comet/PictureArts/Corbis)*

Bottom: DMT is found in the poisonous venom of the cane toad. *See* Dimethyltryptamine (DMT), Vol. 2. *(© Wayne Lawler; Ecoscene/Corbis)*

Herbal Drugs and Dietary Supplements

Top: Wild echinacea is shown growing near Mount Adams in Washington. *See* Herbal Drugs, Vol. 3. *(© Steve Terrill/Corbis)*

Middle: St. John's Wort is used to treat depression and anxiety. *See* Antidepressants, Vol. 1, and Herbal Drugs, Vol. 3. *(© Clay Perry/Corbis)*

Bottom: The bulking supplement creatine is used by weight lifters, bodybuilders, and other athletes. *See* Creatine, Vol. 2. *(© Najlah Feanny/Corbis)*

Older Illicit Drugs

Top: When snorted, cocaine reaches the brain in less than one minute. *See* Cocaine, Vol. 2. *(Photo by Lezlie Light)*

Middle: Putting tiny amounts of LSD on blotter papers is a common way to take a dose. *See* LSD (Lysergic Acid Diethylamide), Vol. 3. *(Sinclair Stammers/Photo Researchers, Inc.)*

Bottom: Heroin is a Schedule 1 drug, meaning that it has no medical value but a high potential for abuse. *See* Heroin, Vol. 3. *(Garry Watson/Science Photo Library)*

Prescription Drugs

Top row, left: Adderall®, 5 mg. *See* Adderall, Vol. 1.

Top row, middle: Darvocet-N®, 100 mg. *See* Opium, Vol. 5.

Top row, right: Demerol®, 100 mg. *See* Meperidine, Vol. 4.

2nd row, left: Dexedrine®, 5 mg. *See* Dextroamphetamine, Vol. 2.

2nd row, middle: Dilaudid®, 4 mg. *See* Hydromorphone, Vol. 3.

2nd row, right: Halcion®, 0.25 mg. *See* Benzodiazepine, Vol. 1.

3rd row, left: Lasix®, 40 mg. *See* Diuretics, Vol. 2.

3rd row, middle: MS Contin®, 15 mg. *See* Morphine, Vol. 4.

3rd row, right: Nitroglycerin, 6.5 mg. *See* Amyl Nitrite, Vol. 1.

4th row, left: OxyContin®, 40 mg. *See* Oxycodone, Vol. 5.

4th row, middle: Paxil®, 40 mg. *See* Antidepressants, Vol. 1.

4th row, right: Restoril®, 7.5 mg. *See* Benzodiazepine, Vol. 1.

5th row, left: Ritalin®, 20 mg. *See* Ritalin and Other Methylphenidates, Vol. 5.

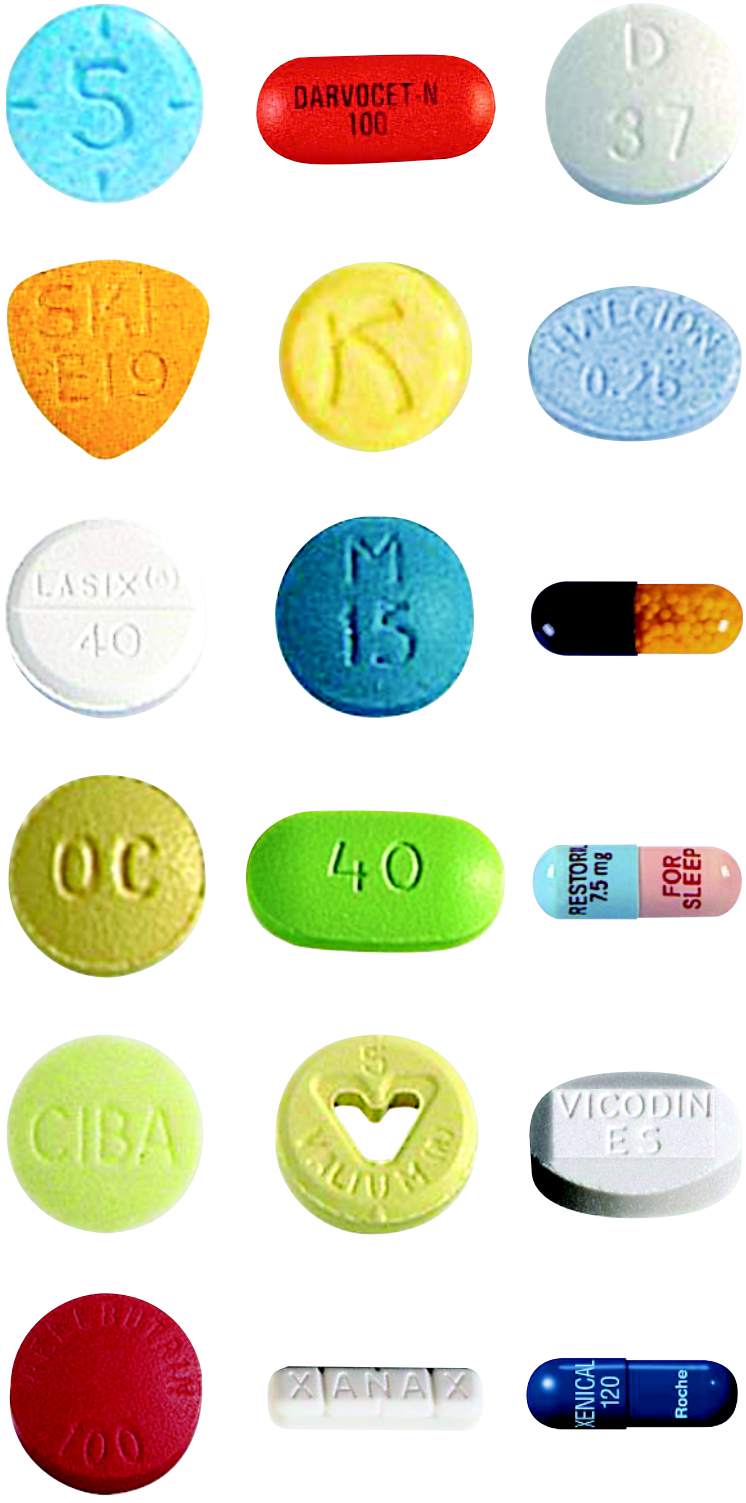
5th row, middle: Valium®, 5 mg. *See* Tranquilizers, Vol. 5.

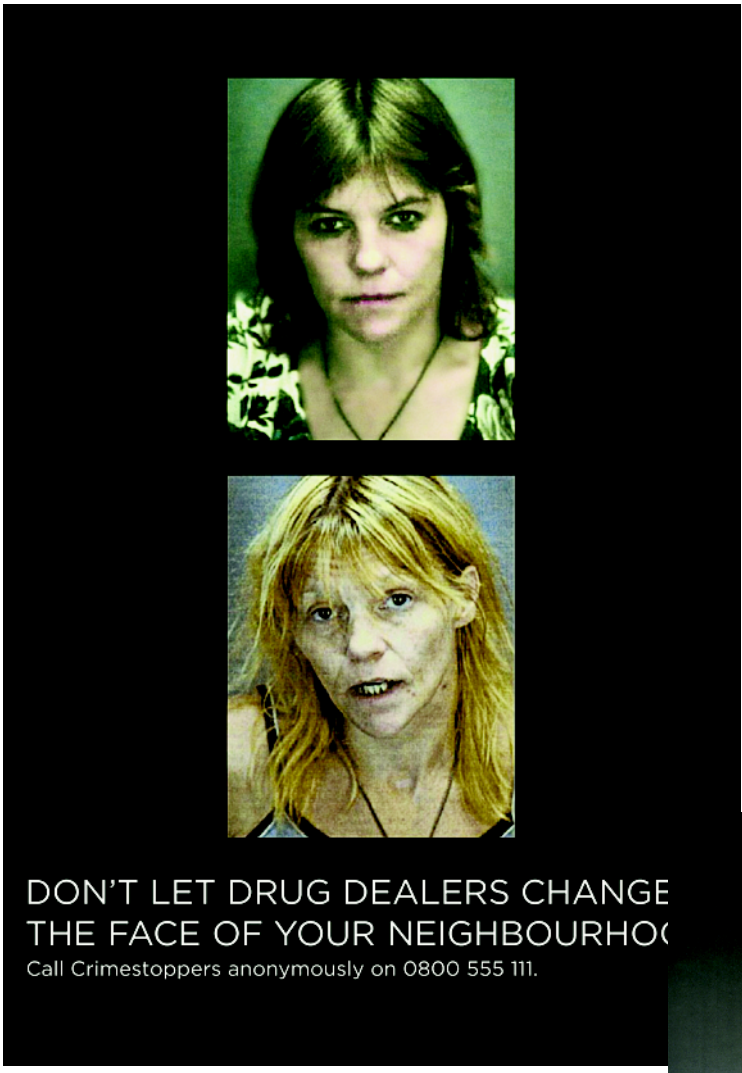
5th row, right: Vicodin ES®, 7.5 mg. *See* Meperidine, Vol. 4.

Bottom row, left: Wellbutrin®, 100 mg. *See* Antidepressants, Vol. 1.

Bottom row, middle: Xanax®, 2 mg. *See* Benzodiazepine, Vol. 1.

Bottom row, right: Xenical®, 120 mg. *See* Diet Pills, Vol. 2.

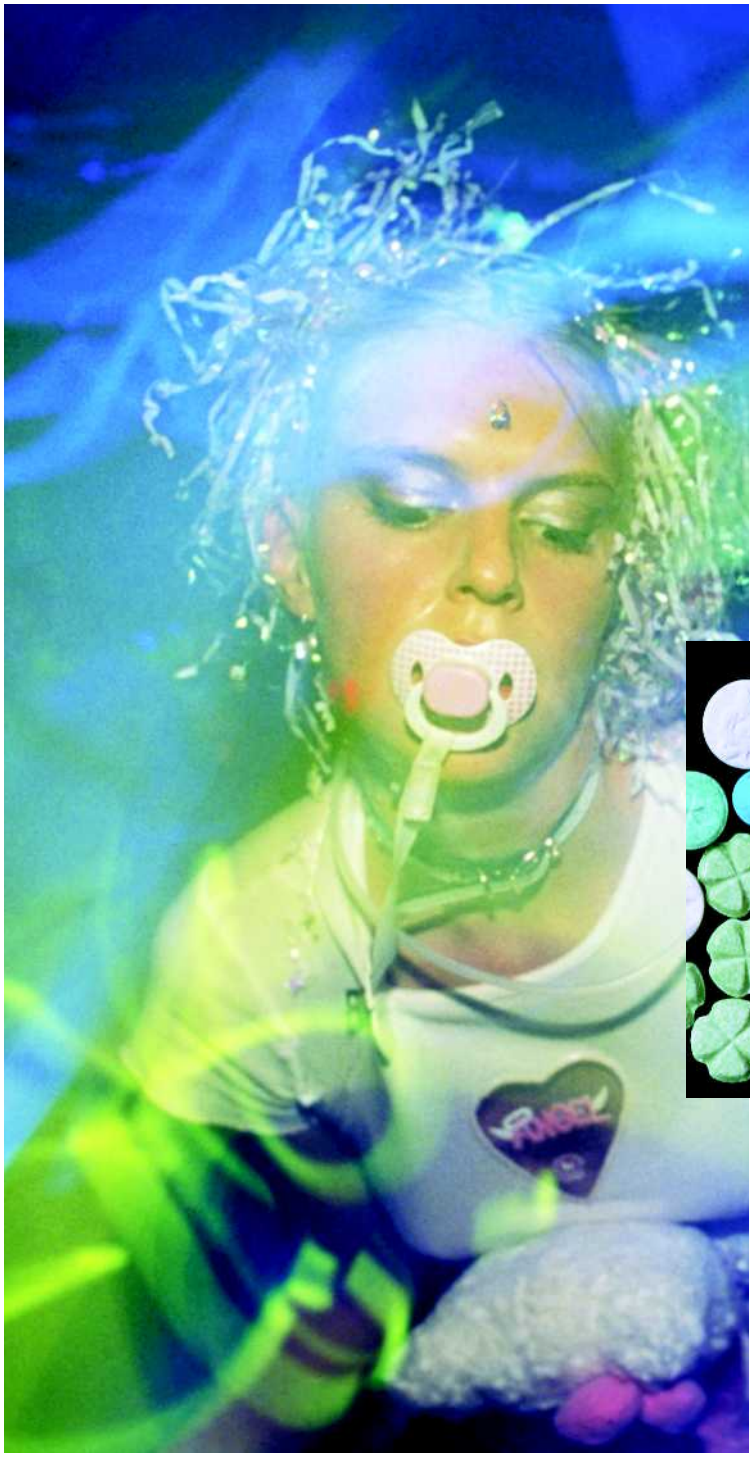




Public Service Announcements (PSAs) Warning Against Drug Use

Left: Anti-methamphetamine public service announcement. See Methamphetamine, Vol. 4. *(© Handout/Reuters/Corbis)*

Below right: Anti-inhalant public service announcement. *See* Inhalants, Vol. 3. *(National Institute on Drug Abuse)*



The Rave Culture

Left: A young rave dancer swirls light sticks and sucks on a pacifier. *See* 2C-B (Nexus) and Amyl Nitrite, Vol. 1; Designer Drugs, Vol. 2; Ecstasy (MDMA), GBL, GHB, and Ketamine, Vol. 3; Methamphetamine, Vol. 4; and PCP (Phencyclidine) and PMA and PMMA, Vol. 5. *(© Scott Houston/Corbis)*

Below right: Ecstasy pills come in various shapes and sizes with symbols, words, and characters stamped on them. See Ecstasy (MDMA), Vol. 3, and PMA and PMMA, Vol. 5. *(© Scott Houston/Corbis)*

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Boldface indicates main entries and their page numbers.

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