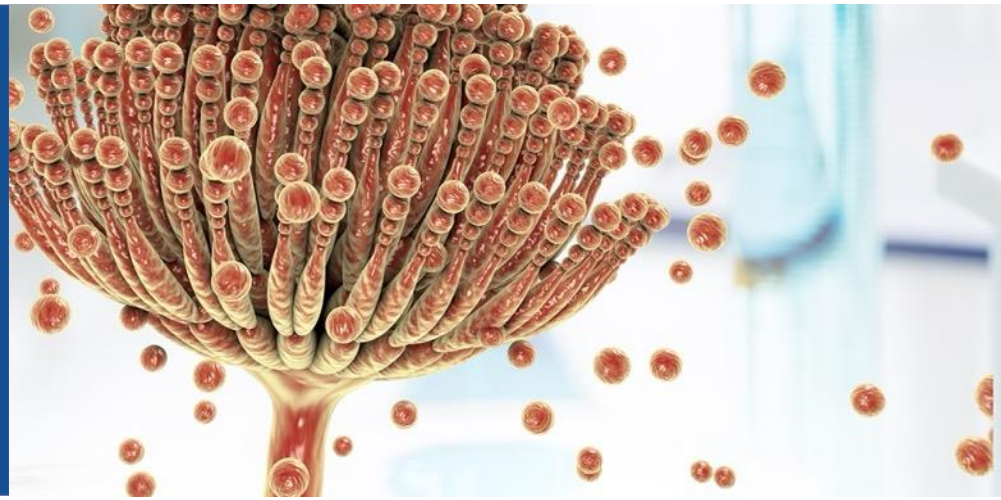
TRILOGY



Virtual Workshop on

Rapid Methodologies for Mycotoxin Analysis & Control

Presented By:

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Trilogy Analytical Laboratory

INTRODUCTION TO TRILOGY

- **HISTORY:**
  Trilogy United States formed in 1999 and has since grown to locations throughout the world. Trilogy Latino America SRL began in 2013 as a way to bring mycotoxin analysis to Latin America countries. In 2019, Trilogy Europe B.V. was formed to provide proficiency testing and broaden the range of Trilogy activities globally.
- **NICHE:**
  Trilogy US began with a focus on mycotoxin analysis utilizing validated analytical methodology and in addition offering rapid turn-around times for analysis.
- **ACCREDITATIONS**:
  Trilogy US is proud to provide services and products that are ISO/IEC 17025:2017, ISO 17034:2016 accredited and ISO 9001:2015 certified.
- **WORKING LABORATORY**:
  The Trilogy Group analyzes between 200,000 and 250,000 mycotoxins on an annual basis.

Mycotoxins:

The Big Picture

Mycotoxin testing, whether by rapid or analytical analysis, is a critical point in global trade.

While many countries have mycotoxin regulations, they are not uniform in toxin concentration levels or commodities. Scheduled or regular testing aids countries from importing shipments that do not meet their regulatory standards as well as exporting contaminated commodities that do not meet other countries regulatory standards as well.

The following presentation will be a general overview of mycotoxins as well as practical and readily implemented tools and plans to consider when introducing a mycotoxin testing program.

Mycotoxins:

The Basics

- Mycotoxins are toxic chemical compounds produced by various strains of molds.
- There are hundreds of Mycotoxins.
  (Penicillin is a commonly known Mycotoxin)
- Mycotoxins are compounds that can not be “killed” once they are produced. The mold is able to be treated by the toxin cannot.
- Mycotoxin have been around since molds began growing – one of the plagues was thought to have been a mold problem.

Penicillin is a commonly known Mycotoxin

Mycotoxins:

Where Do They Come From?

- Different weather conditions produce different molds-hence different mycotoxins.
- Plants are more susceptible at during varying stages of growth and to different weather conditions at those stages.
- Insect damage and broken kernels are entryways for molds
- Mycotoxins and related problems are worldwide issues.
- Storage and transportation conditions have the potential to increase toxin concentrations.
- Mycotoxins enter the food chain both pre-harvest and post harvest. Managing both points of the process is essential for risk management.

Mycotoxins:

Common Mycotoxins & Commodities of Concern

- **Aflatoxins (B1, B2, G1, G2)**
  typically hot and dry conditions at risk,
  but irrigated corn is susceptible
- **Deoxynivalenol (DON, Vomitoxin)**
  typically cool and wet conditions at risk
- **Fumonisin (B1, B2, B3)**
  typically warmer and wet conditions at risk
- **Ochratoxin A**
  Varies a bit with region,
  generally cooler and wetter conditions at risk
- **Zearalenone**
  typically cool and wet conditions at risk
- **T-2 Toxin and HT-2 Toxin**
  typically cool and wet conditions at risk

Critical Factor for Grain Millers
When you process your products the toxins will vary from fraction to fraction –
you **<u>may be</u>** concentrating the toxins

Wheat, Barley, Oats & Soybeans

Commonly have issues with:

- DON
- Ochratoxin
- Zearalenone
- T-2 Toxin
- HT-2 Toxin

Corn and Corn Products

Commonly have issues with:

- Aflatoxin
- DON
- Fumonisin
- Ochratoxin
- Zearalenone
- H-2 Toxin
- HT-2 Toxin

Mycotoxins:

Physical Damage of Grains

DON 7.0 ppm
ZONE 0.0 ppm

DON 0.6 ppm
ZONE 0.6 ppm

Normal Kernels **Slightly Damaged Kernels** **Highly Damaged Kernels**

Photos www.uky.edu

Mycotoxins:

Physical Characteristics & General Guidelines for Wheat

Typical Physical Characteristics of Damaged Wheat Kernels

- Scabby Wheat- not to exceed 2-3 %
- Tombstone Wheat
- Pink Tips or Salmon Colored Kernels
- Wet / Cool Growing Season
- Low Test Weights
- Midds Generally Have the Highest Levels of DON

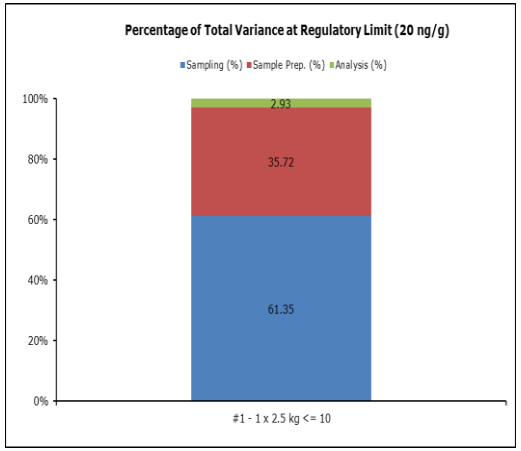
Discolored and shriveled kernels from a scab affected wheat head

Mycotoxins:

Testing Challenges

Sampling Variability Challenges

Probed Sample Size	Results Variability Range
0.5kg	<1 – 46.9ppb
1kg	3.2 – 38.8ppb
2.5kg	8.1 – 31.9ppb
5kg	28.4 – 11.6ppb



The "PPB" Challenge

- 1 Part in 1,000,000,000
- 1 Second in 32 Years
- A Grain of Sand in 500 Pounds
- 1 Kernel of Corn in 3.5 Railcars

Toxin Distribution Challenges

- **Corn:** Only 1 out of every 200 kernels may be contaminated
- **Cottonseed:** (8000ppb) Only 18 seeds out of 150 (12%) were contaminated
- **Peanuts:** Only 5% of kernels are contaminated

Obtaining an accurate representative sample is HARD work.
Even using the most up-to-date equipment and trained analysts utilizing scientifically validated methods can not get accurate results in a sample that was not properly sampled and sub-sampled.

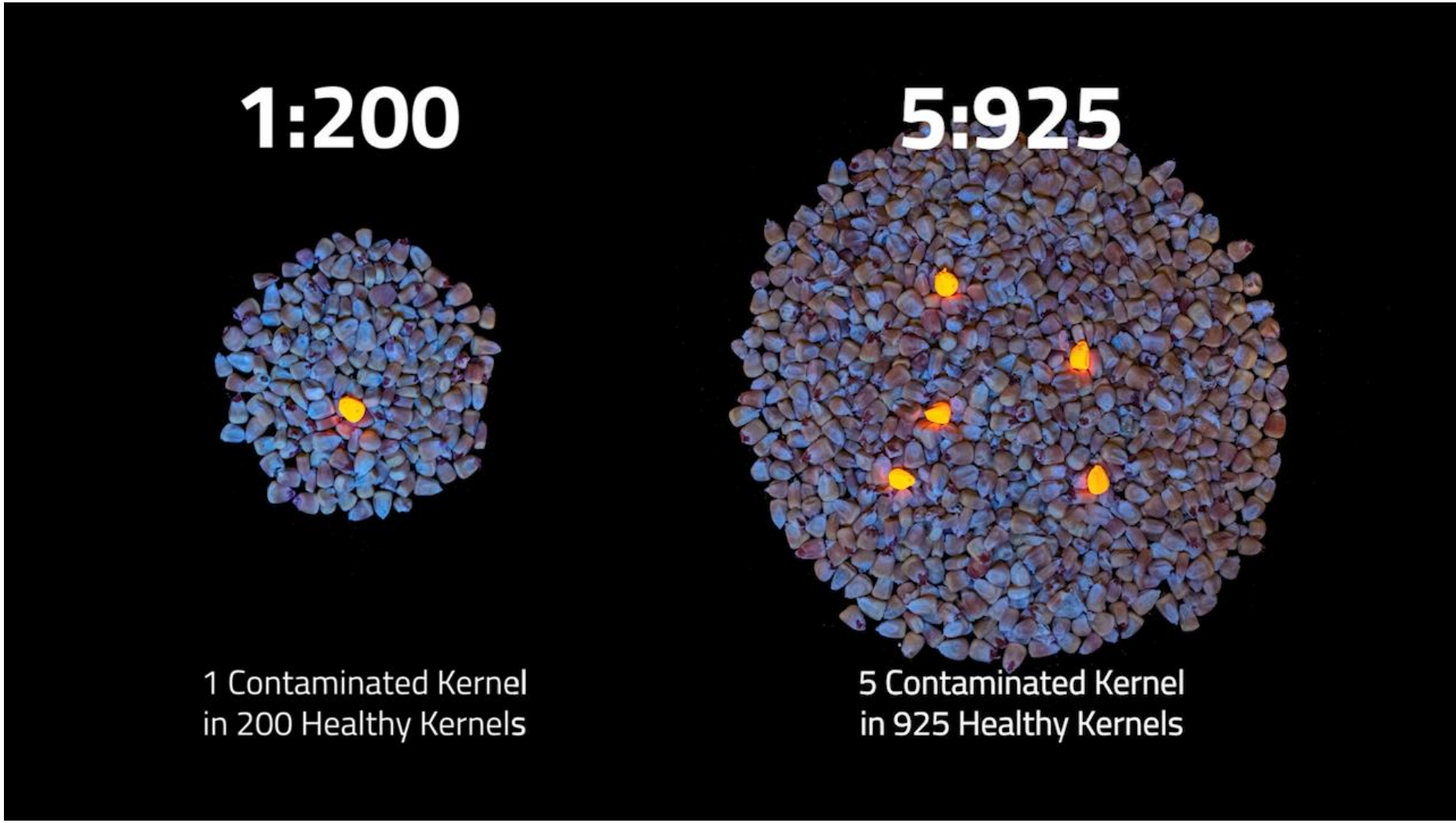
DON – < 100 ppb | DON – 7.0 ppm | DON – 0.6 ppm

Mycotoxins:

Importance of Proper Sampling & Grinding Practices

Mycotoxins:

Fluorescent Kernel Riffling



Mycotoxins:
Final Result Accuracy

3.2 ppm DON

What goes into an accurate result?

- Sampling and Sub-Sampling Techniques
- Sample Preparation
- Purchasing Parameters
- Quantification Limits
- Sample Submittal
- Confirmation of Results
- Equipment Performance
- Employee Education
- Manufacturing Process
- Storage Conditions
- Technician Training
- Weather Conditions
- Outside Lab Competence
- Commodity Selection
- Testing Frequency
- Lot Size
- Analytical Variability
- Extraction Efficiency
- Extraction Size
- Method Suitability
- Particle Size of Analytical Sample

Mycotoxins:

Mitigating Risk & Establishing a Testing Program

What steps are available to mitigate risk and introduce a robust testing program?

- **Evaluate** and control parameters that you can.
  Including: Suppliers, testing and sampling programs, purchasing specifications, method selection
- **Educate** yourself about parameters out of your control.
  Including: weather conditions, toxin contamination probability, insect damage
- **Focus** on the critical but simple elements.
  Including: storage conditions, sampling procedures, result validation and interpretation

Mycotoxins:

Testing Options

Choose a rapid test method that can accommodate your testing needs.

There are a variety of different methods -

RAPID Tests

- **Lateral** Flow – rapid: many times only minutes from extraction to final quantitation, easy to use: on site training, or web training is easily learned, no dedicated expensive equipment, pipettor and cell phone reader for quantitation, single sample can be run, great for point of purchase: when receiving many lots at different times

- **ELISA** – great for running many samples together: 20+ samples can be completed in one run, automation is available for facilities that run large numbers and want robotic automation, more complex data manipulation available with computer connection

Mycotoxins:

Testing for Mycotoxins is Here to Stay

- Mycotoxin testing is performed by a wide variety of companies in many, many countries.
- Methodology is varied from rapid qualitative test methods to sophisticated reference laboratories
- Regulations are increasing worldwide
- Trends for lower and lower detection limits are already here
- Global trade is increasing and more testing is required

How can Trilogy help you reach your quality goals?

QualiT Products

Trilogy Analytical Laboratory has the expertise to help you establish your quality control program and to keep up with industry regulations. Using our years of knowledge and experience, we can offer you a comprehensive line of quality products to meet the ever-changing needs of the mycotoxin industry.

- Certified Reference Standards
- Analytical Standards
- Certified Reference Materials
- Quality Control Materials
- Rock-It 360
- Purification Columns

Analytical Services

Trilogy Analytical Laboratory has the expertise to help you establish your quality control program and to keep up with industry regulations. Using our years of knowledge and experience, we can offer you a comprehensive line of quality products to meet the ever-changing needs of the mycotoxin industry.

- Mycotoxin Analysis
- Mycotoxin Binder Analysis
- Biogenic Amines
- Drug Residues

Contact

For information regarding any analytical services, products, or proficiency programs, we encourage you to contact us directly or speak with your sales representative.

Carrie Maune

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Trilogy Analytical Laboratory