

Last fall's unseasonal moisture created several complications for those needing to harvest crops across the US, and the above-average precipitation has resulted in further issues with feed quality

# MYCOTOXINS

by SGS America, US

**T**he rapid surge of mycotoxins in commodities from the 2018 harvest is a growing concern for those who are storing grain or feeding livestock.

## 2018 mycotoxin recap

Mycotoxins are a global threat to commodities. Currently, over four hundred mycotoxins have been isolated, with still more being identified. Their

toxicity represents a serious threat to human and animal health and, because they remain chemically stable at high temperatures, the threat can be passed along the entire supply chain.

The SGS Mycotoxin Monitoring Programme in Europe has served as a good risk mitigation tool for many customers. Using our early warnings, many companies avoid major issues related to contamination. Even before harvesting the corn crop in 2018, SGS highlighted potential issues in Russia and other select countries based on weather monitoring and preharvest testing.

It is now confirmed that for the 2018 corn crop, Russia is the country at greatest risk for contamination and is seeing multiple mycotoxin issues, including aflatoxins, ochratoxins, and fumonisins.

Several regions across the US and Canada are also battling with mycotoxin contamination, especially in corn, wheat, and barley. Due to a wet fall and delayed harvest, vomitoxin (DON) has been widespread across the country, with Minnesota and Pennsylvania reporting DON contamination in barley.

DON was also detected in the wheat harvest across Wisconsin, Michigan, New Jersey, Pennsylvania, Indiana, Illinois, Maryland, Delaware, North Carolina, Virginia, and Ohio, while DON has been present in corn across Nebraska, South Dakota, Wisconsin, Minnesota, Michigan, New York, Indiana, Ohio, Vermont, Iowa, Pennsylvania, and Ontario, Canada.

Various mycotoxin issues have been plaguing the corn crop aside from DON. Aflatoxin has become an issue in Texas, Oklahoma, Kansas, Georgia, Iowa, Missouri, Arkansas, Illinois, and North Carolina. Fumonisin were detected in the corn crop in Texas, Missouri, Kansas, Arkansas, Oklahoma, New York and Nebraska. Zearalenone was reported in Iowa, South Dakota, Vermont, Nebraska, Illinois, and Ohio, while T-2/HT-2 toxin has been found in the Canada corn crop in Ontario.

Mycotoxins pose a significant risk to crop quality across the world, making the protection of crops and commodities against

such contamination a critical issue. Understanding the conditions that cause mycotoxins, how to identify them, and how to prevent them are crucial in ensuring that your commodity value is not compromised.

## What's your risk?

Mycotoxins are secondary metabolites produced by fungi which contaminate crops and feed products. The formation of mycotoxins is dependent on weather and environmental conditions, making them difficult to control. In addition, mycotoxins can become concentrated in some processing and production of products from these crops and feeds.

Some of the most common mycotoxins your commodities may be at risk for include:

**Aflatoxins** – This class of mycotoxins includes aflatoxins B1, B2, G1, G2 and M1. Aflatoxins are commonly induced by drought or heat stress and are produced by *Aspergillus* species. Livestock are very sensitive to aflatoxins, and high concentrations in feeds can lead to liver damage and death.

**Deoxynivalenol (DON)/Vomitoxins** – This mycotoxin is produced by various *Fusarium* species and may become prevalent in crops due to wet humid weather at flowering. DON increases when moisture content is high during grain storage and commonly results in feed refusal and immunosuppression. In extreme cases vomiting may occur.

**Fumonisin** – This category includes B1, B2, and B3 fumonisins, which are commonly found in contaminated corn. Drought stress followed by warm wet weather significantly increases the risk for the presence of fumonisins. These mycotoxins are notorious for deteriorating coordination in horses, pulmonary edema in pigs, reduced feed intake and gain in cattle, and esophageal cancer in humans.

**Ochratoxins** – including strains A, B, and C, these contaminants are often produced within grains during commodity storage. Ochratoxins can cause kidney failure in swine, hinder fetal development in utero, and harm the immune system. Ochratoxin A is most prevalent and is a carcinogen.

**T-2 toxins** – These contaminants are produced by various *Fusarium* species. These mycotoxins commonly infect grains such as barley, wheat, millet, and mixed feeds. T-2 toxins drastically harm animal feed intake, gastrointestinal health, and reproductive success.

**t** – This estrogenic metabolite results in corn ear and stalk rots and can also contaminate weathered soybeans, hay, silage,



and grains such as wheat, barley, oats, and sorghum. Both high moisture and late harvest can increase zearalenone concentrations in crops. Due to its high oestrogen content, zearalenone has been noted for contributing to reproductive complications in livestock.

### **What's your remedy?**

Prevention is the only practical option for businesses trying to keep their supply chains clear of mycotoxins because, once contaminated cargo is mixed with non-contaminated cargo, it cannot be separated. One infected kernel of corn in one kilogramme of grain can produce

toxin levels which exceed permitted concentrations. A small amount of contaminated corn is sufficient to turn an entire Panamax shipment into an unsafe and unusable commodity.

Since the consequences of mycotoxin poisoning can be fatal, manufacturers must employ effective early warning systems to protect their customers and their reputations. Commodities cannot be visually assessed to appropriately determine the level of contamination from mycotoxins. To ensure that mycotoxins are not present, commodities need to be sampled and tested for contamination.

## Instrumentation

The most prevalent technologies for mycotoxin testing include enzyme-linked immunosorbent assays (ELISAs) and liquid chromatography with tandem mass spectrophotometry (LC/MSMS). ELISAs are a popular detection tool that calculate the amount of a particular substance within biological samples. ELISAs target a diverse number of analytes and are cost effective in handling high sample traffic. Output from an ELISA provides an overall amount of a mycotoxin class present in a sample.

Other technologies provide greater differentiation of contaminants within a mycotoxin class. Best-in-class instrumentation, such as LC/MSMS, provides very accurate identification of variant mycotoxins. SGS is committed to investing in high-quality instrumentation.

With the recent state-of-the-art upgrade to the Sciex 6500+ Triple Quadrupole Mass Spectrometer, SGS' instrumentation provides unparalleled capabilities in detection, speed, and performance. Heightened instrumentation sensitivity pushes the boundaries of diagnostic analyses by determining previously unreachable detection limits and will serve in accurately analysing a host of compounds, including mycotoxins, pesticides, and antibiotics.

“We have several highly trained technicians who are skilled in running both ELISA tests and LC testing,” said SGS Brookings Analytical Laboratory Manager Dustin Edmison. “We make sure we’re running the latest updated methods and that our staff is trained regularly across all contaminant testing.”

These methods of detection are critical in identifying toxic contaminants, as mycotoxins can become an issue at almost any point in the supply chain.

## Mycotoxin Monitoring Programme

SGS developed its Mycotoxin Monitoring Programme as an effective early-warning and monitoring program to replace the costly and error-prone system of laboratory analysis and strict threshold-based regulations. Begun in 2014, the program focuses primarily on corn and wheat crops, covering ten south-east European countries – Ukraine, Russia, Bulgaria, Hungary, Croatia, Romania, Poland, Serbia, Slovakia, and the Czech Republic.

The program has been proven highly effective at detecting early notifications of mycotoxins, such as aflatoxin (B1 and total), ochratoxin, deoxynivalenol, zearalenone, fumonisins, and HT-2/T-2.

The monitoring programme is aligned with the requirements of several certification schemes, including Good Manufacturing Practices (GMP+), the Feed Chain Alliance Standard (OVOCOM), Good Trading Practice (Coceral GTP), Agricultural Industries Confederation AIC, European Feed and Food Ingredient Safety Certification (EFISC), and Quality Scheme (QS).

Sampling is administered using Grain and Feed Trade Association (GAFTA) rules. 15-20 percent of tests are carried out while the crops are still standing, giving clients advanced knowledge of crop quality. The rest of the samples are then taken when grain is in storage or at the first collection point, and all sampling is completed within four months of the harvest. All samples are then analysed by SGS's accredited laboratories in Ukraine, Russia, Bulgaria, Hungary, Romania, and Serbia, using LC/MSMS and high liquid performance chromatography (HPLC).

The data produced by SGS is targeted and specific and can help identify potential problem areas at an early stage. Food manufacturers can use this data to identify potential supply

chain problems, giving them valuable time to make alternative arrangements. In this way, they can protect their brand from potential contamination and/or supply chain interruptions.

Food companies and feed mills need to be aware of the dangers of mycotoxins. Their ability to travel from the farm to the plate unaffected by the many stages of the supply chain pose a serious risk to human health. The SGS Mycotoxin Monitoring Programme provides a realistic, affordable approach to mitigating the potentially devastating effects of mycotoxin contamination.

SGS's global network of laboratories deliver mycotoxin testing, while our European Mycotoxin Monitoring Programme has effectively reduced the level of risk associated with mycotoxins in corn. The SGS Mycotoxin Monitoring Programme provides an effective risk mitigation tool for businesses looking to protect their brands and their customers. SGS is currently developing a solution towards mycotoxin monitoring that will be available in the United States as well.

## What's our reputation? GMP+ B11 Certification

SGS North America in Brookings, South Dakota, is the first laboratory in the United States to be certified to the new GMP+ International Registered Laboratories programme, with the ability to conduct critical contaminant testing of mycotoxins, heavy metals and pesticides for feed manufacturers certified under the GMP+ Feed Safety Assurance (FSA) scheme. With a network of laboratories across the world, SGS also holds GMP+ B11 certification in Hungary as well as Bulgaria.

The new B11 standard for Registered Laboratories has been developed in response to several cases of inaccurate laboratory results for animal feed analysis. In an effort to reduce confusion





and stress among feed supply chain companies, the B11 certification defines performance standards for the analysis of four critical contaminants, including aflatoxin B1, dioxins (dioxin-like PCBs and non-dioxin-like PCBs), heavy metals and fluorine, and pesticides.

“We understand the challenges that companies are facing to meet consumer demand for safety throughout the supply chain,” said SGS Brookings Business Manager Nichole Berkenhoff. “As a GMP+ registered laboratory, we can offer the resources that GMP+ certified businesses need to ensure that their products are performing at the required level.”

GMP+ International is a regulatory industrial organisation for businesses in the animal feed production chain. GMP+ certification ensures compliance with the requirements of the Animal Feed Hygiene Regulation of the European Union and enables certified companies to export their products to the EU.

To more accurately verify results for contaminants, GMP+ International requires that GMP+ FSA certified companies have contaminant analysis conducted by GMP+ registered laboratories beginning July 1, 2019.

As the third registered GMP+ laboratory in the world, SGS America is ISO 17025 accredited and Non-GMO Project approved. SGS provides companies with access to state-of-the-art instrumentation and technology, which deliver best-in-class detection of contaminants and superior performance. Our scientists, technicians, and specialists are equipped with the expertise, skill, and knowledge to turn around your test results with increased accuracy and efficiency. SGS’ reputation as an independent third-party laboratory provides you an unrivaled testing network for all your analytical needs.



### Local presence, global reach

SGS provides a network of laboratories accredited to assist in sampling, inspection, and testing across the globe for both domestic sales and export. Our trade experts across the world specialise in trade valuation, product certification and validation, and advance cargo information services to bring the most up-to-date, international best practices and information available.

SGS teams conduct field inspections of vessels, barges, trains, and trucks while monitoring previous shipments and cleaning methods in accordance with the International Transport Database for Feed. Samples are taken, and testing is completed under accredited methods in accordance with the GMP+ annexes for contaminants detection.

In addition, under its remit as a certification body, SGS also provides qualified animal feed auditors to verify GMP+ FSA requirements are met regarding quality management systems, contaminant monitoring, animal feed regulation fulfilment,

and traceability/recall procedures.

With the goal to be a one-stop shop providing solutions across the supply chain, SGS certification programmes equip our auditors to facilitate certification against the FAMI-QS, EFISC, and GMP+ feed schemes. With auditors across 60 countries, the company offers a worldwide service, giving businesses access to a wide range of complimentary services.

The risk that mycotoxins present against your commodities cannot be underestimated as you seek to protect the quality of your product. The most important process you can implement as mycotoxins continue to persist in the 2018 crop is to identify any issues as quickly as possible, which will allow you to dispose of contaminated products and locate alternative sources.

Our global network of inspectors, scientists, and food and feed testing laboratories are prepared to help you design the safety program you need to ensure that mycotoxin contamination is not a threat against your business success this year.

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