Mycotoxins in feedstuffs – determining the real risk to poultry

Feedstuffs are often contaminated with multiple mycotoxins. Mycotoxins are produced by plant moulds during times of stress, either due to disease or, more importantly, the surrounding environment.

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Moulds can produce mycotoxins in the field due to different growth conditions. For example, wet or drought conditions may encourage different mycotoxin growth.

Alternatively, moulds can produce mycotoxins in different storage conditions where there may be excess moisture or high oxygen penetration. Storage moulds can occur alone or in addition to the mycotoxin contamination from the field. In a single feedstuff, one mould could produce several mycotoxins, or there could be several moulds, each producing a mycotoxin. Any commodity may be contaminated by multiple mycotoxins, whether it is due to field conditions or due to storage. Once a mycotoxin has developed, they can remain for a long time as they are highly stable.

There are several mycotoxin detection strategies available that vary in cost, sensitivity and accuracy. The best method for sensitivity and accuracy is liquid chromatography-tandem mass spectrometry (LC-MS/MS). This strategy can screen for multiple mycotoxins simultaneously in grains and finished feeds. Other strategies used include an ELISA-based lateral flow test. This test is a quick and easy way to screen certain grains for a limited number of mycotoxins. This method is rapid and inexpensive but is not as sensitive as other methods.

European mycotoxin survey

Each year, Alltech conducts a harvest analysis to determine the potential mycotoxin risk in new crop grains and forages. This survey takes in many different geographical regions. The European Harvest Analysis for 2019 grains received 46 samples of wheat, 31 samples of barley and 20 samples of corn grain.

Mycotoxin analysis was then conducted at the Alltech 37+ mycotoxin analytical services laboratory in Dunboyne, Ireland.

The Alltech 37+ laboratory makes use of high-tech screening techniques based on the LC-MS/MS method. With this method, the laboratory can detect over 50 mycotoxins in animal feed.

Wheat samples represented a wide geography, with samples from the Iberian Peninsula to Scandinavia to Eastern Europe, and averaged 2.39 mycotoxins per sample. The mycotoxin content varied by region, with Hungary showing greater risk to broilers and layers due to the type B trichothecenes (DON) levels. The average DON level in wheat across Europe was 750ppb, but a high level was analysed at 7,282ppb.

Barley samples had the highest risk from DON, with an average level of 679ppb, and 3.03 mycotoxins per sample. However, the highest level analysed was 6,444ppb, which can pose the same risk as the wheat inclusions.

There is also an added risk from type A trichothecenes (T-2/HT-2), with a high level identified at 49ppb. The most significant risk was identified in samples from Hungary, but caution risk was also identified in Danish barley.

The corn analysed had the fewest samples (20) but averaged 5.30 mycotoxins per sample. Fumonisin showed the higher levels on average, at 2,928ppb, but maximum levels identified with risk were DON at 4,425ppb, T-2/HT-2 at 30ppb, fumonisin at 19,816ppb, zearalenone at 2,200ppb and emerging mycotoxins at 1,806ppb.

The combination of these mycotoxins will add to the risk. The increased number of mycotoxins in corn may be explained by the later harvest date, which can expose the corn to more weather conditions including rainfall and cooler temperatures. This situation can be more conducive to Fusarium moulds that produce mycotoxins such as trichothecenes, fumonisin and zearalenone.

Why should we care about mycotoxins in poultry?

Sensitivity to mycotoxins in poultry can differ depending on multiple factors, such as the mycotoxin type, bird age, health status or species.

Additionally, mycotoxin contamination in finished feed may occur at low, medium or high risk levels to poultry production.

It is commonly thought that mycotoxins are only an issue for long living poultry, such as layers and breeders, and are not a challenge in short living poultry, such as broilers.

Mycotoxin contamination can build up over time and become a problem, but short term exposure, whether to high or low levels, can also pose a risk to poultry production.

Short term exposure, or exposure to low levels of mycotoxins, can be a common occurrence in poultry production, but diagnosis is difficult.

Whether at low or high risk in finished feeds, mycotoxins have been shown to have an impact on bird health and performance.

Mycotoxins, when ingested, act to impair rapidly dividing cells. These rapidly dividing cells are found in many parts of poultry, including the skin, gastrointestinal tract, reproductive tract, immune system and skeletal system.

Different mycotoxins can impact these systems either directly or indirectly and, ultimately, have an impact on production and performance. Different challenges that can relate to mycotoxins include mouth lesions, altered liver and pancreatic function, damaged intestinal integrity, reduced feed intake, reduced nutrient absorption, immunosuppression and wet manure.

The main mycotoxins identified in the European Harvest Analysis were DON (type B trichothecenes), T-2/HT-2 (type A trichothecenes), fumonisin and zearalenone. All these mycotoxins have been found to negatively impact the gastrointestinal tract and suppress the immune system. As a result, these mycotoxins have a direct impact on intestinal health and how the bird can protect itself.

Sometimes, at realistic low-level risk, these mycotoxins can impact the immune system but may not impact observable performance.

When the immune system is suppressed, there is a greater risk of secondary infections, whether bacterial or viral. These mycotoxins can cause extensive damage on their own, especially at high risk levels, but can cause even more damage when found in combination.

Even if there is a low risk level for a single mycotoxin, the multiple mycotoxin contamination can present a medium or higher risk situation. This type of multiple contamination has been shown to lead to many issues, including:

- Increased intestinal cell damage.
- Decreased intestinal cell growth.
- Increased intestinal permeability.
- Impaired intestinal recovery.
- Indirectly altered microbial communities.
- Suppressed immune protection.

Overall, the grains collected for the European Harvest Analysis showed the most significant risk for poultry production when they originated from Hungary.

Nevertheless, grains originating from other European locations had low and medium risk levels for poultry production that can still impact intestinal health and the immune system.

Managing contaminaton by mycotoxins requires a multi-factorial approach that includes diluting the contaminated grain and the use of broad-spectrum mycotoxins binders.

Over 25 years of published research has verified that Mycosorb from Alltech contributes to the control of mycotoxins in poultry, including aflatoxins, zearalenone, ochratoxin and others. ■