Technical Bulletin

Information from Phibro Technical Services

Mycotoxin Levels of Concern for Poultry

Introduction

Molds are fungi which may colonize in poultry feed or grains, reducing their nutritional value by utilizing energy and protein for growth. Several mold species may produce metabolites toxic to poultry (mycotoxins) and the predominating mycotoxins may vary based on climates in different global geographies[1].

Key Outcomes of Mycotoxin Exposure in Poultry

Mycotoxins may alter the microbiome or damage organ systems in poultry, decreasing performance. They have been shown to aggressively affect the G.I. tract, liver and kidneys, impacting several aspects of health and performance. Mycotoxins may also negatively impact the immune system, resulting in increased susceptibility to pathogens and disease, further complicating long-term productivity of poultry which may have been even temporarily exposed[2]. Ultimately, animal performance and health events are the primary outcomes of interest when producers face mycotoxin challenges. Table 1 outlines key outcomes when poultry are exposed to mycotoxins.

Table 1. Concentrations of Dietary Mycotoxins That Raise Concern for Health and Performance of Poultry

Mycotoxin	Levels of Concern*	Effects on Health & Peformance
Zearalenones (ZEN) produced primarily by *Fusarium* spp. on corn and cereal grains such as wheat and barley		
Chicks, Broilers, Layers, Breeders and Turkeys	0.5 ppm	Poultry are typically less sensitive to ZEN when compared to other livestock. Concentrations up to 0.5 ppm have been shown to have no detrimental performance effects on broiler chicks[3] (from one to 35 days of age) nor on turkey poults4 (from 55 to 79 days of age). Reproductive effects in layers and breeding birds may be of greater concern, though limited work has studied zearalenone independent of its co-contamination with DON..
Deoxynivalenol (DON) produced primarily by *Fusarium* spp. on corn and cereal grains		
Chicks, Broilers, Layers, Breeders and Turkeys	5 ppm	Expect compromised immunity above 5 ppm DON[5]. No negative effects on performance of broilers fed 5 ppm DON throughout the growing period[3]. Also, no effects in turkeys fed 5 ppm DON for 14 d[4].
Fumonisins (FUM) produced primarily by *Fusarium* spp. on corn and cereal grains		
Chicks	10 ppm	Feeding 20 ppm FUM during the broiler growing period had no ill effects on broiler performance[3] yet significantly increased the sphinganine to sphingosine ratio (indicating early fumonisin toxicity). Concentrations as low as 18.6 ppm FUM altered intestinal microflora, predisposing broilers to necrotic enteritis and other digestive upsets6. No effects in turkeys fed 20 ppm FUM (FB1 + FB2) for 14 d[4].
Broilers	20 ppm	
Layers and Breeders	30 ppm	
Turkeys	20 ppm	
Aflatoxins (AFL) produced primarily by *Aspergillus* spp. on corn, cereal grains, peanuts, cottonseed and DDGs		
Chicks	0.005 ppm[a]	The previous EU value of 0.01 ppm AFL for chicks has since been lowered[7].
Broilers, Layers, Breeders and Turkeys	0.02 ppm	Because AFL are known carcinogens, the maximum allowable concentration in poultry feed is 0.02 ppm (20 ppb) in the EU and US. Lower performance, greater liver weights and immunosuppression may occur at higher concentrations[2].

T-2 & HT-2 toxins produced primarily by *Fusarium* spp. on corn and cereal grains		
Chicks, Broilers, Layers, Breeders and Turkeys	0.25 ppm	Broilers fed as low as 1 ppm T-2 toxin for six weeks had significantly lower body weights after four weeks than broilers fed no mycotoxins[8]. Fifty percent of laying hens consuming 2 ppm T-2 toxin had mouth lesions, significantly decreased egg production and feed intakes[9]. Turkey poults also developed oral lesions when fed 0.24 ppm T-2 toxin for 32 d but performance was not affected[10].
Ochratoxin A (OTA) produced by *Penicillium* spp. on corn, cereal grains and peanuts		
Chicks	0.05 ppm[b]	Feeding 0.05 ppm OTA showed numerically decreased performance and thymus weights for a 35 d feeding period[11].
Broilers	0.10 ppm	No negative performance effects of 0.1 ppm OTA reported in broilers but biomarkers indicated immunosuppression[12].
Layers	0.10 ppm	Decreased egg production, feed efficiency and shell thickness observed in Leghorn hens fed 2 ppm or more of OTA[13].
Breeders	0.01 ppm[c]	Eggs from breeder hens fed 0.1 ppm OTA for three weeks had decreased hatchability and immunosuppression was observed in chicks from those hens[14].
Turkeys	0.10 ppm	Turkey poults fed 3 ppm OTA for three weeks gained 8% less body weight than controls fed no mycotoxins[15].

* The European Union has some of the most stringent guidelines for mycotoxin levels of concern. Dietary mycotoxin concentrations are based on "as is" feeds containing approximately 88% dry matter (12% moisture).
[a] Agriculture and Horticulture Development Board recommendations based on in vivo poultry studies.
[b] Not an EU recommendation but a precautionary measure based on results from in vivo poultry studies[5].
[c] Not an EU recommendation but a precautionary measure based on results from in vivo poultry studies[4].

Mycotoxins are becoming more prevalent in feeds due to changes in farming practices16 and more advanced mycotoxin analytics17. In poultry, DON is often considered the mycotoxin of greatest concern – due both to its prevalence in poultry feed products and its deleterious effects on performance. Local climate, harvesting and storage practices, along with species, age, stage of production and other stressors will contribute to the relative risk of each of these mycotoxins.

Although the recommendations presented here focus on individual mycotoxin analytical results, multiple mycotoxin occurrences are more common. In a study conducted in 2013, between seven and 69 mycotoxins, "emerging" mycotoxins and "masked mycotoxins" were identified in grains17. When multiple mycotoxins are encountered, overall animal toxicity is not the sum of the individual toxins but instead reflect additive and/or synergistic interactions which lead to multiple effects of toxicity18. When multiple mycotoxins are encountered, the levels of concern may be even lower.

References

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This information has been prepared for industry technical professionals.