



How Mycotoxins Aggravate Coccidiosis in Poultry

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Mycotoxins, even at low levels, can increase *Eimeria* infection and disease severity in poultry.

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Editorial

Antibiotic Reduction, Profit and Innovation

Our readers of **Science & Solutions** know the extent to which efforts to reduce antibiotics in poultry production and improve gut health are revolutionizing the industry. Swift change has come to many markets, including the United States where regulators have taken steps to eliminate the use of medically important antibiotics in livestock production.

BIOMIN is a pioneer in delivering practical, innovative feed additive solutions, including novel growth promoters, to help the industry cope with such changes. Phytogenic feed additives, organic acid-based products, and synbiotics all offer ways to support birds' gut performance—as we discuss here in the case of pullet weight management and egg production.

Again looking to the United States, controlling coccidia, improving gut health and antibiotic-free production top the recent list of poultry health priorities identified by the USDA's National Institute of Food and Agriculture (NIFA) and Agricultural Research Service (ARS). In this issue of *Science & Solutions*, we explore new research findings on how mycotoxins can increase *Eimeria* infection and disease severity in poultry—highlighting the importance of robust mycotoxin risk management.

Overall, good gut health and mycotoxin risk management constitute two pillars upon which the poultry industry will build a foundation for healthy profits—both today and in the future.

Enjoy the reading!



Paolo DONCECCHI

Head of Global Gut Performance Products

Deoxynivalenol, fumonisins and the incidence and severity of coccidiosis

Coccidiosis is estimated to cost poultry industry US\$3 billion annually, and is also a well-known predisposing factor for necrotic enteritis—widespread in broilers and responsible for losses of US\$5-6 billion worldwide each year.

Mycotoxins in feeds, even at permitted levels, aggravate coccidiosis in poultry. They can facilitate *Eimeria* colonization in the gut, and poultry producers looking to reduce the impact of coccidiosis on their flocks would do well to monitor feed for contamination.

Gate openers to infection

Further research is required to fully understand the underlying mechanism that results in mycotoxins' amplification of coccidiosis, however, possible explanations include increased immunosuppressive effects on modern high performing broilers, chronic low level mycotoxin exposure, and the potential for synergistic effects between mycotoxins.

Deoxynivalenol and fumonisins are known to interfere with several vital functions of cells, and disrupt intestinal cells that act as a barrier between pathogens and the birds' bodies. These disrupted intestinal cell components can be used as a growth substrate for pathogens such as *Eimeria*, *Clostridium* and *Escherichia coli*.

In this way, these mycotoxins play a main role as 'gate openers' favoring pathogen colonization throughout the host.

Unsafe at any level

Even at concentrations allowed under European and US guidelines for mycotoxins (Table 1), deoxynivalenol, fumonisins and a combination of the two can worsen the incidence and severity of coccidiosis in challenged poultry, studies have shown.

Chickens fed mycotoxin-contaminated feed at levels well below regulatory guidelines in starter and grower diets (Table 2) displayed considerably higher lesion scores, higher numbers of oocysts in both the jejunum and in excreta, and higher lymphocyte (white blood cell) counts.

Table 1. Mycotoxin guidelines (maximum levels) in poultry.

	DON	FUM
EFSA		
Maize and maize by-products	12 ppm	60 ppm
Poultry feed	5 ppm	20 ppm
FDA		
Poultry feed	10 ppm	30 ppm

Source: BIOMIN

Table 2. Experimental diets containing low levels of mycotoxins.

	Starter diet (0-20 days)	Grower diet (21-34 days)
DON	1.6 ppm	2.9 ppm
FUM	-	20.5 ppm
DON+FUM	1.3 ppm	20.8 ppm

Source: BIOMIN

Lesion scoring in the cecum was 1.33 for the mycotoxin groups versus 0.42 for birds fed control diets (Figure 1). The number of oocysts found in the jejunum was three times higher for birds fed mycotoxins versus control. Similarly, the number of oocysts recorded in feces was 29 percent higher for the deoxynivalenol + fumonisins group and 46 percent higher for the fumonisins group.

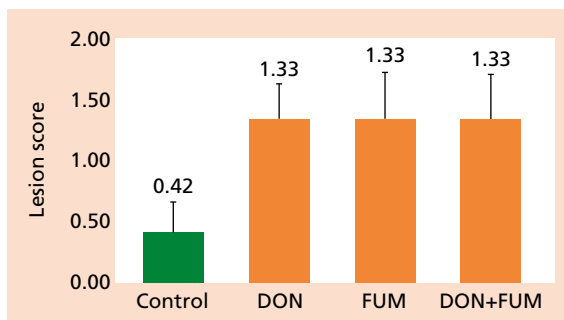
Overlooked risk

While the poultry industry has a general awareness of the dangers linked to certain mycotoxins, the threat posed by deoxynivalenol and fumonisins has been largely overlooked.

Yet, these mycotoxins occur frequently in the most common poultry diet ingredients, including finished feed, maize, wheat and soybean meal.

combination of the two can worsen in challenged poultry

Figure 1. Lesion scoring in the cecum of birds that received the coccidian challenge.



Groups fed mycotoxins all had considerably higher lesion scoring than the control group

Adapted from Grenier et al., 2016

Figure 2 reveals that deoxynivalenol was detected in 61 percent of maize, 54 percent of wheat, 71 percent of finished feed and 61 percent of soybean meal samples

analyzed. Fumonisin were detected in 80 percent of maize, 27 percent of wheat, 66 percent of finished feed and 40 percent of soybean meal samples.

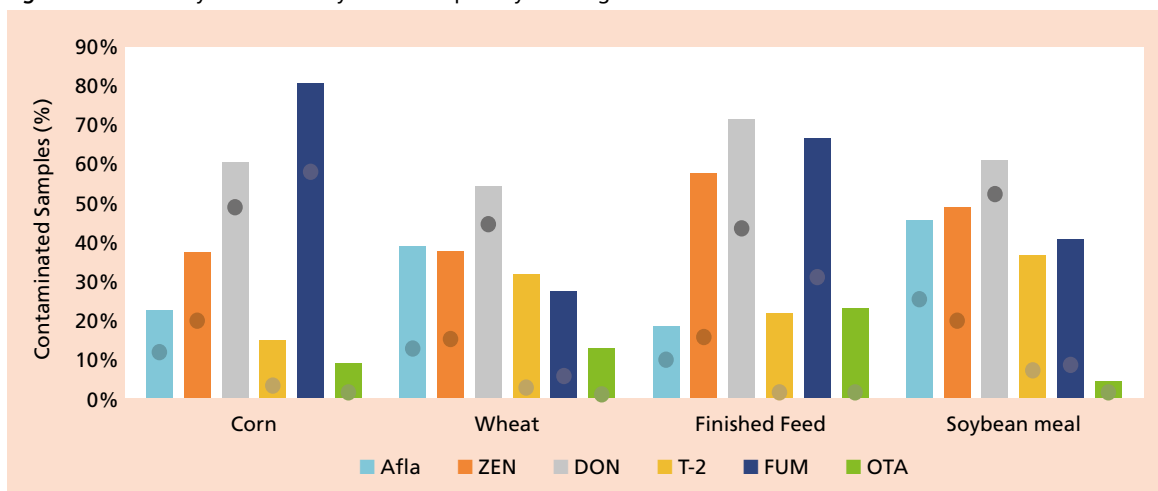
The implication for poultry producers looking to limit the use of antibiotics is to adopt robust mycotoxin risk management in order to protect flocks.

Antibiotic-free

For antibiotic-free feeding that does not permit the use of ionophores—a class of antibiotics used solely for the purpose of preventing coccidiosis—coccidiosis management must rely on non-antibiotic coccidiostats, or live coccidiosis vaccines, or more likely, a rotation between the two.

Probiotics and phytogetic feed additives, with or without the use of coccidiostats or vaccines, can help alleviate the negative effects of coccidial infection, having been shown to reduce oocyst shedding, severity of intestinal lesions, and adverse effects on performance. 🍃

Figure 2. BIOMIN Mycotoxin Survey results for poultry feed ingredients.



Mycotoxin contamination of maize (735), wheat (394), finished feed (1638), and soybean meal (298) samples analyzed from Jan. to July 2016. Dots display the occurrence of mycotoxins above risk threshold levels.

Source: BIOMIN