# Recent results on the prevalence of mycotoxins and the risks to breeders

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Research and analysis of mycotoxins have progressed a lot in recent years. More than 1,000 mycotoxins have been identified so far. Modern LC-MS/MS technology can detect more than 380 mycotoxins and fungal metabolites in one go. Many mycotoxins have a detrimental impact on the immune system and liver function of livestock, consequently harming performance. So far only some mycotoxins have been extensively investigated for their effects on breeders, egg quality, embryos and newly hatched chicks.

Although breeder birds under normal conditions always receive feed of the best available quality, they can still be affected by mycotoxins, especially considering their long life compared to broilers. More than 30,000 analyses from the Biomin Mycotoxin Survey over the last 10 years confirm that mycotoxins are our steady companion in feed and raw materials (Fig. 1).

Corn is the most important component of breeder diets. Analysis of corn samples in 2014 confirms that corn is a big contributor to the total mycotoxin load of breeder feed. Here we examine each of the six major mycotoxins and their effects on breeders.

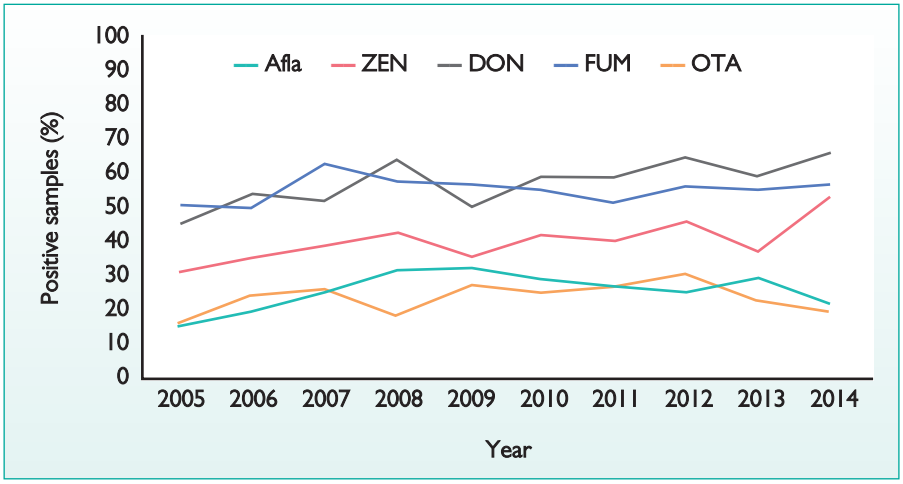


***Fig. 1. Contamination of all samples (including raw materials and finished feeds) with aflatoxin (Afla), zearalenone (ZEN), deoxynivalenol (DON), fumonisins (FUM) and ochratoxin A (OTA) from 2005-2014. Coloured dots indicate the percentage of samples that were contaminated with the respective mycotoxin in the respective year.***

## Aflatoxins

Globally seen, over the last 10 years 15-35% of all analysed samples were contaminated by aflatoxins (Fig. 1). Especially in regions with hot climates this mycotoxin is a real threat to breeder production. In 2014 22% of 2,103 corn samples were contaminated with an average level of 45ppb and a maximum contamination of 1,352ppb was found (Fig. 2 and Table 1).

Aflatoxins are the most toxic mycotoxin and even very low contaminations can have a destructive effect on the liver and immune system of breeder birds and their progeny. They accumulate in the genitals of poultry resulting in a transfer to the egg via albumen and yolk. Although only very low levels of the aflatoxins in feed can be found in the egg they still damage DNA of T and B lymphocytes of the immune system of the developing bird. Embryos exposed to maternal transfer of aflatoxins develop a compromised immune system and thus are more susceptible to diseases.

***Table 1. Global contamination of corn in 2014 with aflatoxin (Afla), zearalenone (ZEN), deoxynivalenol (DON), T-2 toxin (T-2), fumonisins (FUM) and ochratoxin A (OTA).***

| Corn 2014 | Afla | ZEN | DON | T-2 | FUM | OTA |
|---|---|---|---|---|---|---|
| Number samples tested | 1,203 | 1,834 | 2,164 | 861 | 1,103 | 1,012 |
| Average contamination of positive corn samples (ppb) | 45 | 409 | 2,425 | 79 | 2,859 | 4 |
| Maximum contamination of positive corn samples (ppb) | 1,352 | 16,495 | 29,600 | 852 | 154,000 | 52 |

## Zearalenone (ZEN)

Zearalenone and deoxynivalenol are both produced by Fusarium graminearum and are often detected together. Looking over the last 10 years, high occurrence of deoxynivalenol did in fact coincide with high occurrence of zearalenone (Fig. 1).

In 2014, 58% of 1,834 corn samples analysed were contaminated with an average level of 403ppb with a maximum of 16,495ppb (Fig. 2 and Table 1).

As zearalenone acts similarly to the female hormone oestrogen it impacts female and male breeders' reproductive systems, especially through compromised fertility and hatchability. Egg production and egg shell quality also decrease.

## Deoxynivalenol (DON)

In nine out of 10 years more than 50% of all samples analysed worldwide were contaminated with deoxynivalenol, the most common Fusarium-produced trichothecene

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(Fig. 1). The 2014 corn harvest in Central and Southern Europe was highly contaminated with deoxynivalenol. In 2014, 75% of all corn samples globally were contaminated with an average value of 2,425ppb and a maximum contamination found of 29,600ppb (Fig. 2 and Table 1).

Deoxynivalenol, as other trichothecenes, impairs protein production in animals as its main toxic entity, the epoxide ring, interferes with the replication of DNA. This leads to many different negative effects on growth and performance of breeder birds but also health of the progeny.

Recent research also confirms that deoxynivalenol directly impairs bird gut health by making the gut more 'leaky' thereby allowing pathogens to pass the intestinal barrier. Deoxynivalenol negatively affects the integrity and morphology of epithelial cells of the small intestine leading to a greater susceptibility to enteric infections, even at concentrations below the European guidance level of 5,000ppb feed for poultry. Scientific experiments showed that deoxynivalenol acts as a very important co-factor in the development of necrotic enteritis.

## T-2 toxin (T-2)

Some 19% of analysed corn samples were contaminated up to 852ppb in 2014. The average contamination of T-2 was 79ppb (Fig. 2 and Table 1).

Fortunately, T-2 which has a very high acute toxicity, is not as common as deoxynivalenol. It can cause lesions of beak, tongue and the intestinal tract in birds.

Carryover of T-2 toxin into the egg leads to infertile eggs and death of the embryo. Fully developed embryos may fail to hatch or die shortly after hatching.

## Fumonisins (FUM)

Fumonisins are also produced by Fusarium fungi and occur almost exclusively only in corn. Data over the last 10 years show that fumonisins are as common as deoxynivalenol and that in each year except 2005 the contamination was between 50 and 70% of all analysed samples (Fig. 1).

In 2014, 72% of analysed corn samples were contaminated with 2,859ppb of fumonisins with a maximum of 154,000ppb found (Fig. 2 and Table 1).

Due to a low absorption of fumonisins in the chicken gut, they are considered less toxic for chickens in general, though ducks and turkeys are more sensitive.

However, an excessively high contamination of corn (154,000ppb), a high level of occurrence in corn, the combination with other mycotoxins, such as deoxynivalenol, and also a possible direct effect on gut microflora and gut epithelial cells, and the potential negative impacts in breeders, means that fumonisin contamination cannot be ignored.

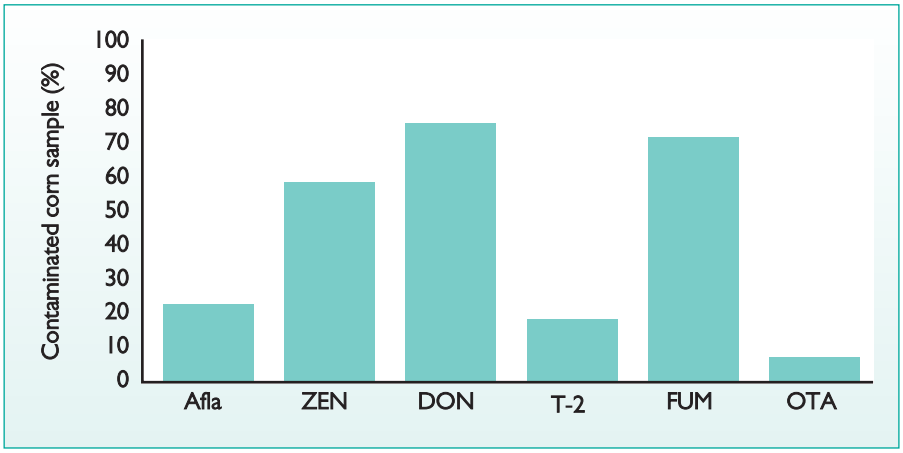


***Fig. 2. Global contamination of corn in 2014 with aflatoxin (Afla), zearalenone (ZEN), deoxynivalenol (DON), T-2 toxin (T-2), fumonisins (FUM) and ochratoxin A (OTA). Bars indicate the % of corn samples that were contaminated with the respective mycotoxin.***

## Ochratoxin A (OTA)

Contamination with OTA is generally limited to moderate and cooler climates. Between 2005 and 2014, 15-35% of all samples were contaminated with OTA (Fig. 1). In 2014, only 7% of 1,012 corn samples analysed were contaminated on average with 4ppb of OTA and a maximum level of 52ppb (Fig. 2 and Table 1).

OTA can stay bound to proteins in the blood for a longer period of time. Therefore hatchability and fertility can be compromised although no OTA is detected in the feed.

## Conclusion

According to the results of the Biomin Mycotoxin Survey over the last 10 years mycotoxins are a steady companion in animal husbandry. Results of analysis of corn in 2014 confirm that corn can be highly contaminated with several different mycotoxins. Even sparing the best feed for breeding animals cannot guarantee mycotoxin-free diets.

Combinations of different mycotoxins lead to unpredictable effects. While research on mycotoxins and their impact on breeder birds is ongoing, their potential negative impacts make mycotoxin detection essential for producers. A mycotoxin risk management strategy that counteracts a broad range of mycotoxins is key for successful breeder management. ■