

The effects of mycotoxins in breeders

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Mycotoxins are highly toxic secondary metabolic products of moulds, mainly belonging to the Fusarium, Aspergillus, Penicillium, and Claviceps species.

Fungal infection can occur during the growth and storage of crops, but also later on in processed feeds. Even with the use of prevention techniques in the field or during storage, it is actually impossible to avoid their presence in agricultural commodities.

Global problem

The occurrence of mycotoxins is ubiquitous, and represents a global problem for the animal industry. In a worldwide survey published by K. Naehrer and I. Rodrigues in 2013, a total number of 4,023 samples were analysed for the presence of mycotoxins.

Of all samples collected worldwide, 25%, 46%, 64%, 56% and 31% tested positive for contamination with aflatoxin (Afla), zearalenone (ZEN), deoxynivalenol (DON),

fumonisin (FUM), and ochratoxin A (OTA), respectively. Fig. 1 shows the percentage of positive results for each mycotoxin group in each region.

Impact of mycotoxins

In the last few years, research has increasingly focused on further understanding the impact of mycotoxins on the health of poultry. In general, symptoms may vary greatly and are influenced by the interactions between mycotoxins, animal- and environmental-related factors. General problems, such as feed refusal, decreased feed intake, egg shell quality, hatchability and higher mortality are well known problems caused by contaminated feed. As most of the commodities are contaminated with more than one mycotoxin, the complex synergistic effects are to be considered as well.

Effect on laying hens

In 2012 J. T. Lee et al. conducted a feeding trial with 384 Lohmann LSL-LITE laying hens starting at 25 weeks of age. The birds were fed a diet contaminated with a combination



Corn infected by fungi.

of aflatoxin and deoxynivalenol for six weeks: 0.5mg/kg Afla + 1.0mg/kg DON, 1.5mg/kg Afla + 1.5mg/kg DON, and 2.0mg/kg Afla + 2.0mg/kg DON.

Due to the combined contamination of aflatoxin and deoxynivalenol in the feed, relative liver and kidney weights increased and feed consumption, egg weights, and egg production decreased, in correlation with the mycotoxin concentration.

Other scientists reported similar decreases in performance parameters due to mycotoxins. A reduction in egg production attributed to aflatoxin-contaminated feed was published by Fernandez et al. (1994). In 1989, Branton et al. described reduced egg production due to the combination of zearalenone and deoxynivalenol.

Dänicke et al, published in 2002, showed decreased feed consumption, daily egg mass, and serum antibody titres to Newcastle disease virus in laying hens fed zearalenone and deoxynivalenol contaminated corn. In addition to the loss in performance, breeders need a robust immunity to respond to vaccination programs and to ensure the transfer of maternal immunity to their offspring.

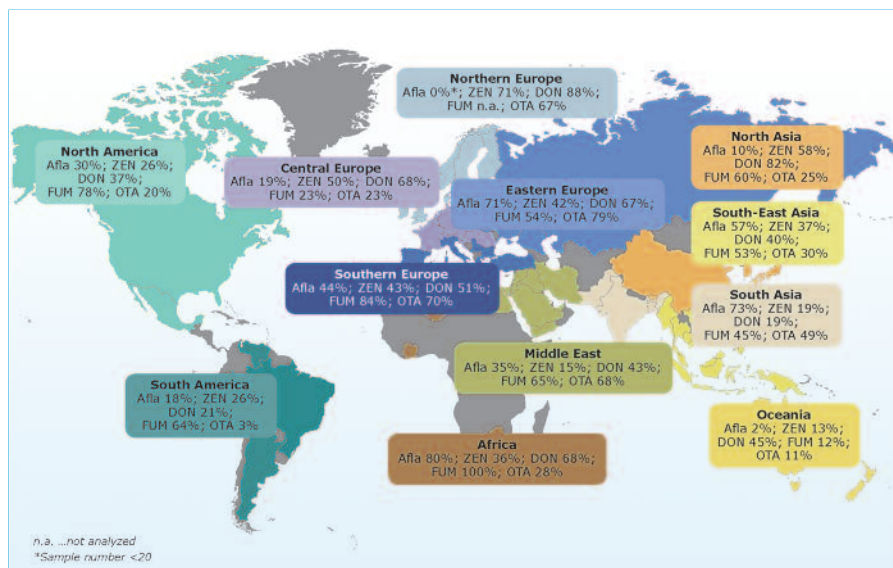
Egg quality characteristics

Eggs produced within the feeding trial of J. T. Lee et al. were analysed biweekly using all eggs laid within a 24-hour period. Several egg quality parameters were negatively affected due to the presence of aflatoxin and deoxynivalenol.

The mycotoxins in the diet reduced egg quality, egg size, yolk weight, and altered egg

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Fig. 1. Worldwide mycotoxin contamination (Biomin Survey 2012).



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shape. Albumen height and Haugh unit value were depressed as well. Taken together, these results illustrate the significant negative effect of mycotoxins not only on the performance of breeders, but also on egg quality.

Effects of ochratoxin A

Y. D. Joo and his co-workers published in 2013 a new study on the negative effects of ochratoxin A in broiler chickens. 200 one-day-old Ross 308 male broiler chickens were divided into groups and fed ochratoxin A contaminated diets for five weeks. The concentration for ochratoxin A was 1mg and 2mg per kg feed.

Compared to the control group without ochratoxin A, feed intake and weight gain were significantly reduced with the increasing amount of ochratoxin A in the diet.

The relative weights of liver and kidney, the activities of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were significantly higher and the level of serum total-cholesterol was significantly reduced.

Risk management

Mycotoxin risk management is crucial to eliminate the effect of mycotoxins and their



Ochratoxin A producing *Aspergillus niger*.

toxicity. To prevent the uptake of mycotoxins in the gastrointestinal tract, binders are commonly used. In the case of adsorbable mycotoxins like aflatoxins, binders can be very successful. For others, such as zearalenone, trichothecenes, ochratoxin A and fumonisins, other additional strategies like biotransformation to counteract the negative impact on the animals are necessary.

Biotransformation enables the conversion of mycotoxins into non-toxic metabolites by means of micro-organisms and their enzymes.

Mycotoxin risk management should be carried out on a continuous basis, but during some critical periods of the breeder production cycle, greater awareness is necessary:

- Young animals up to eight weeks of age have an increased sensitivity towards mycotoxins.

- Pullets need to reach the necessary laying weight, which can be delayed by mycotoxins due to reduced feed intake.

- The third critical period is from the start of laying until the laying peak, when the animals are under intense production conditions.

Conclusion

The economic effects of mycotoxins on the poultry industry have become better understood only in recent times. Even with the use of prevention techniques in the field or during storage, it is actually impossible to avoid the presence of mycotoxins in feed, as shown by mycotoxin surveys conducted worldwide.

Specifically in breeders, the effects of mycotoxins are wide ranging, from immunosuppression, decreased egg production, egg quality and hatchability, oral, dermal, and gizzard lesions through to liver and kidney damage.

Mycotoxins affect animals directly due to their exposure to mycotoxins in feed, and affect consumers indirectly as the products derived from these exposed animals eventually enter our food chain. ■

**References are available from
the author on request**