Three ways mycotoxins undermine poultry health



The general effects of mycotoxins on animals are well known and documented. Recent research also proves that mycotoxins detrimentally affect the intestinal integrity of poultry. This leads to bacterial overgrowth, pathogen translocation and resulting overall health problems, and in the worst case mortality.

Mycotoxins

1. Impairment of intestinal morphology:

- Deoxynivalenol (DON) and fumonisin (FUM) cause villi fusion.
- DON decreases epithelial cell proliferation.
- DON reduces the height and area of intestinal villi and therefore reduces the surface available for nutrient uptake.

As a consequence, the reduced nutrient utilization leads to more feed for pathogens in the intestine, which results in overgrowth and dysbiosis.

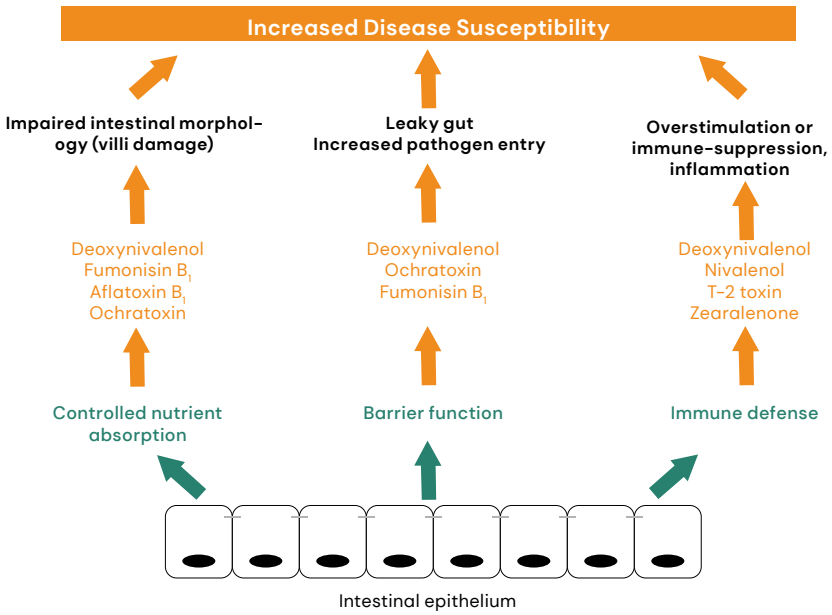
In the following figure the main impacts of mycotoxins on the intestinal tract of animals are depicted (adapted from Bouhet and Oswald, 2005).

2. Decreased intestinal barrier function:

- DON and FUM decrease the production of the tight junction proteins and cause leaky gut leading to undesired translocation of pathogens and higher mycotoxin absorption.
- DON causes an altered intestinal barrier function which leads to decreased nutrient digestion and leakage of plasma amino acids and proteins.

Leaky gut predisposes poultry to necrotic enteritis, increased levels of lesions and oocysts in *Eimeria* challenged birds.

Additionally, it allows an increase in transepithelial passage of *Salmonella* and *E. coli*.



3. Impairment of immunesystem and stimulation of gut inflammation:

- Mycotoxins affect cytokine and immunoglobulin production of the intestinal epithelia.
- Mycotoxins reduce efficiency of coccidiostats (e.g. Lasalocid).
- Mycotoxins decrease the vaccine efficiency reflected in a decrease in antibody titres.

The impact on the gut immune system and inflammation response reduces appropriate immune response to challenges and decreases efficiency of antimicrobials and vaccines.



Trials with broilers to show negative impact of *Fusarium* mycotoxins

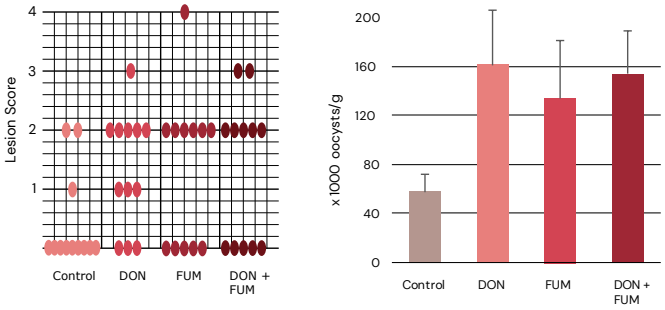
Mycotoxins increase severity of coccidiosis

A broiler trial was performed to evaluate the impact of deoxynivalenol (DON) and fumonisin (FUM) on the severity of coccidiosis. Animals were divided into 4 groups: control; DON; FUM; DON + FUM and each group challenged with a mix of four strains of *Eimeria* at day 14 as well. (Grenier et al., 2016)

Results of *Eimeria* challenged groups:

Left side: Cecum lesion score. One dot represents one sample.

Right side: Number of oocysts (x 1000) found in intestinal mucosa.



Adapted from Grenier *et al.*, 2016

DON and FUM presence in combination with a challenge with *Eimeria* resulted in:

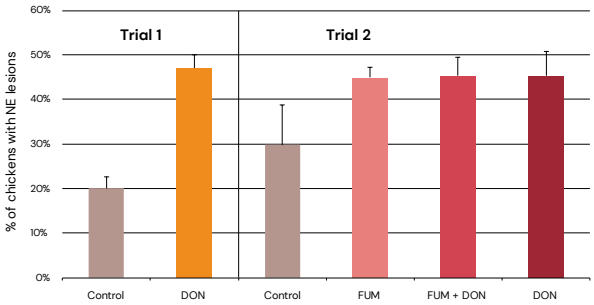
- Higher proportion of broilers with lesions in ceca
- Increased severity of lesions
- Increased shedding of oocysts
- Higher risk of intestinal tissue damage

Mycotoxins increase susceptibility to *Necrotic Enteritis*

Two broiler trials were performed to evaluate the impact of DON and FUM on susceptibility of birds towards *Clostridium perfringens*-induced necrotic enteritis. Accordingly, different groups fed with and without DON and FUM and with and without a *Clostridium* challenge were investigated. (Antonissen et al., 2016)

Results of *Clostridium perfringens* challenged groups:

The graph shows the % of broilers with lesions typical for necrotic enteritis when challenged with *Clostridium perfringens* (including controls).



Adapted from Antonissen *et al.*, 2016

DON and/or FUM presence in combination with a challenge with Clostridium perfringens resulted in:

- Disrupted intestinal barrier
- Higher proportion of broilers with lesions in small intestine
- Increased severity of lesions
- Higher risk of pathogen transmission

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