

Poster:

Chronic exposure to the mycotoxin deoxynivalenol affects the intestinal barrier function in broilers

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The intestinal epithelium is a critical physical but selective barrier between the external and internal environment. This barrier function is maintained by well-organized intercellular structures like tight junction proteins, and by continuous regeneration of epithelial cells. The trans-epithelial electrical resistance (TEER or R_t) is considered to be a good indicator of the epithelial integrity, while the villus length and crypt depth give information on the intestinal morphology.

The aim of this study was to evaluate the effect on the intestinal barrier of feeding DON at contamination levels below the maximum European guidance level of 5000 $\mu\text{g}/\text{kg}$ feed to broiler chickens in the first three weeks of life.

A total of 18 one-day-old Ross 308 broilers were randomly divided into two groups of 9 birds. Throughout the entire experiment one group received a blank diet, while the other group received a diet experimentally contaminated with DON. Immediately after euthanasia the gastrointestinal tract was removed, and segments from mid-duodenum of each chicken were mounted in three Ussing chambers after stripping the underlying serosal layer. After an equilibration period of 30 minutes the transepithelial potential difference (PD) and TEER were monitored for 30 minutes. Current (I_{sc}) was calculated from Ohm's law. Additionally, samples of mid-duodenum, mid-jejunum and mid-ileum were taken immediately after euthanasia, and fixed in neutral-buffered formalin, processed according to the conventional methods for hematoxylin and eosin staining, and evaluated using light microscope. Villus height was defined as from the tip of the villus to the crypt, and crypt depth from the base of the villi to the submucosa.

In the chickens who received the DON contaminated feed the duodenal tissue resistance was significantly lower ($P < 0.001$) and the villi in the mid-duodenum were significantly shorter ($P = 0.014$) relative to birds fed the blank diet. Villus length was respectively $2009.72 \pm 52.87 \mu\text{m}$ (mean \pm SEM) in the chickens receiving the DON contaminated feed and $2175.15 \pm 26.75 \mu\text{m}$ in the chickens receiving the blank diet.

In conclusion, feeding DON contaminated feed in concentrations below the maximum European guidance contamination level to broilers up to three weeks affects the intestinal barrier function.

Key Words:

Broiler – Deoxynivalenol – Intestinal barrier

Reference:

Bouhet S., Oswald I.P. (2005). The effects of mycotoxins, fungal food contaminants on the intestinal epithelial cell-derived innate immune response. *Veterinary Immunology and Immunopathology* 108, p.199-209