



Mycotoxins and the Immune System

Mycotoxins are toxic products produced by naturally occurring metabolic processes in fungi that can be present in fields, or from mold growth that can occur in storage. The effects of feeding mycotoxin contaminated grain to pigs are very diverse ranging from reduced growth performance in finishing pigs to symptoms like immune suppression, diarrhea, hemorrhages or reduced growth and reproductive performances in the breeding herd.

Once feed is contaminated with mycotoxins, there is not much that can be done by swine producers to alleviate the negative impacts on the animals. The use of feed additives, the dilution of contaminated feed with clean feed or the diversion of contaminated feed to less susceptible species are the only options, but these alternatives result in increased cost to the producer.

Consumption of mycotoxins may result in impaired immunity and decreased resistance to infectious diseases. There is a concern among some veterinarians, that mycotoxins even at sub-clinical levels, may affect the efficacy of some vaccines used in pig production to reduce the costs of different illnesses, such as PCV2 and PRRSV.

Martin Lessard, a researcher for Agriculture and Agri-Food Canada in Sherbrooke, Quebec in collaboration with Dr. Younes Chorfi, Faculty of Veterinary Medicine of University of Montreal, set out to evaluate the effects of vomitoxin (DON) contaminated feed on systemic and intestinal immune responses in pigs. The project, funded through Swine Innovation Porc, evaluated pigs fed a non-contaminated DON diet against diets contaminated with DON at 1.5 ppm and 3.5 ppm for a period of 42 days.

Growth Performance

Adverse effects of DON consumption on pigs differ depending on the rate ingested, but various studies have indicated a reduction in feed intake when DON levels exceed 1.0 ppm. The research team observed no significant difference in average daily gain between pigs fed 0 and 1.5 ppm DON. However daily gain of pigs fed 3.5 ppm DON diet was significantly decreased compared to control and 1.5 ppm DON groups.

Intestinal defences and antibody response

Intestinal defences and antibody response were impaired in pigs fed diet contaminated with 3.5 ppm DON, compared to control. Indeed, consumption of DON contaminated feed by pigs modulated the expression of several intestinal genes that are involved in epithelial defense such as antimicrobial peptide (AMP) and barrier function (BF), oxidative stress such as superoxide dismutase (SOD) and glutathione peroxidase (GPX) and regulation of inflammatory immune response such as the chemokine CXCL10 and interleukin-8 (IL-8) and the cytokines IL-6 and gamma-interferon (IFN)) (Figure 1).

Benefit to the Producer

The results of Dr. Lessard's study suggest that consumption of feed contaminated with DON may predispose animals to infections by enteric pathogens through an alteration of intestinal barrier and immune functions, as well reducing performance of piglets.

Producers must carefully assess management strategies to best utilize DON contaminated grains within their operations. Careful consideration needs to be given to those producers in pig dense areas where the potential for disease interaction is higher.

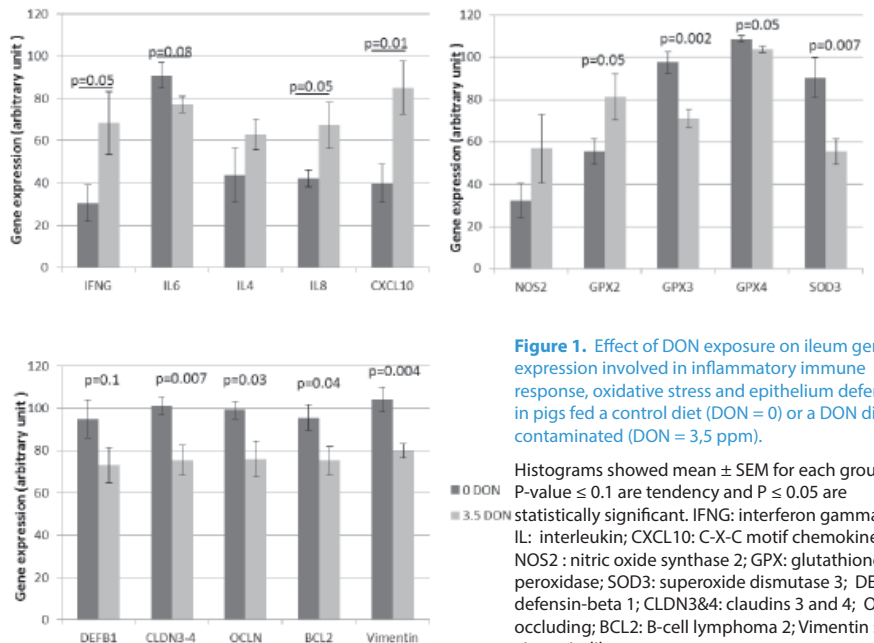


Figure 1. Effect of DON exposure on ileum gene expression involved in inflammatory immune response, oxidative stress and epithelium defence in pigs fed a control diet (DON = 0) or a DON diet contaminated (DON = 3,5 ppm).

Histograms showed mean ± SEM for each group. P-value ≤ 0.1 are tendency and P ≤ 0.05 are statistically significant. IFNG: interferon gamma; IL: interleukin; CXCL10: C-X-C motif chemokine 10; NOS2: nitric oxide synthase 2; GPX: glutathione peroxidase; SOD3: superoxide dismutase 3; DEFB1: defensin-beta 1; CLDN3&4: claudins 3 and 4; OCLN: occluding; BCL2: B-cell lymphoma 2; Vimentin: vimentin-like.