Deoxynivalenol in pigs: An exclusive effect on the appetite?

Dillenburger T¹, Lauber U¹*, Klobasa F², Drochner W¹

¹ Institute of Animal Nutrition (450), Hohenheim University, Emil-Wolff-Strasse 10, D-70599 Stuttgart
² Institute of Animal Breeding and Ethology, FAL Braunschweig, Mariensee, D-31535 Neustadt
* Corresponding Author

Abstract

A feeding-trial was conducted to determine the effects of a deoxynivalenol (DON)-contaminated diet in growing pigs. DON was added as either the purified toxin or as naturally contaminated wheat. Growth performance, biochemical and hematological parameters and DON-transformation through intestinal bacteria were monitored throughout the study. Epithelial tissues along the gastro-intestinal tract were also examined for pathological changes and selected enzyme activities (oxoglutarat dehydrogenase, alanine-amino-transferase). There were no differences among the dietary treatments in all parameters measured except for feed intake and weight gain in the naturally contaminated diets fed ad libitum. Effects in vivo could not be explained exclusively by cytotoxicity of DON found in vitro. These observations may reflect the presence of other unidentified (toxic) compounds in the naturally contaminated grain or the influence of further factors. In future studies synergistic/additive interactions with substances promoting appetite should be taken into consideration.

Keywords: Deoxynivalenol, natural contamination, pure DON, weight gain, pig, histopathology, serum IgA

Introduction

Consumption of deoxynivalenol (DON), a Fusarium Trichothecene mycotoxin, causes growth depression, loss of appetite and lesions in the gastrointestinal tract [1]. In
several studies with swines, moreover, equal DON-concentrations revealed diverse effects [2, 3, 4]. Purified DON, however, has been shown to be less toxic to pigs than DON from naturally contaminated feedstuffs when equivalent amounts were fed [5, 6, 4]. Histopathological findings suggested that DON affects the immune system and is a potential gastrointestinal irritant [7]. Furthermore, DON was found to induce dysregulation of IgA production. This is strikingly similar to human IgA nephropathy (Berger's disease), which is the most common glomerulonephritis worldwide [8].

To set up a clear dose response relationship a non-cereal potato-based diet spiked with pure DON was compared to a DON naturally contaminated wheat-based diet. The results of an experiment described in Dillenburger et al. (2000) [9] were completed and discussed.

**Materials and Methods**

A feeding trial was conducted with growing pigs, initial body weight 11-12 kg, fed DON-contaminated diets over a 28-d period. DON was incorporated into the feed at 0, 4 and 6 mg/kg, added as either the purified toxin (p) in a non-cereal diet (based on potato) or as naturally contaminated wheat (n). Blood samples were collected at 14-day intervals from day 0 to 28 and cellular compounds, enzymes, hormones, substrates and proteins (esp. IgA) were measured. Faeces were collected weekly from day 0 to 28 and were incubated with DON (in-vitro), followed by HPLC analysis of DON and de-epoxy-DON [10].

Pigs were necropsied, samples of duodenal tissues were freezed in liquid nitrogen to determine several enzyme activities [11] and organ samples from selected animals were examined histologically.

**Results and Discussion**

No clinical signs of overt toxicity or unusual behavior were observed in all groups. Neither pure DON nor naturally contaminated diet caused any effect with a restricted feeding regimen. Significantly lower feed consumption and body weight gains were evident immediately after feeding naturally contaminated diet *ad lib.* (6 mg DON/kg), while weight gains of pigs fed the pure DON diet *ad lib.* were unaffected. Values for pigs fed the naturally contaminated diet remained depressed over the course of the study (4 weeks).

Reduced feed intake and growth depression were the only effects observed using naturally DON-contaminated material. Whereas pure DON in a non-cereal diet showed no effect. Despite obvious losses in performance, no alterations in blood parameters were found. While several clinical parameters of pigs exposed to DON did not differ occasionally from controls, most blood parameters reflect no change or were too inconsistent to be reliable.

Histological examination of intestinal tissues revealed focal lesions in the fundic region, removal of duodenal epithelium and submucosal edema. Tissue damages, however, did not correlate with DON-exposition.