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Effects of deoxynivalenol and T-2 mycotoxins on *Salmonella* Typhimurium infection in pigs

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Introduction

Deoxynivalenol (DON) and T-2 toxin are trichothecene mycotoxins frequently contaminating maize and small grain cereals in moderate climate regions of Europe, North America and Asia. Among farm animals, pigs appear to be particularly sensitive to the dietary intake of DON and T-2 toxin. Depending on the dietary dose, exposure to these toxins results in anorexia, altered feed intake, reduced weight gain and even vomiting, diarrhea and immunesuppression can occur. Nontyphoidal *Salmonella* represents an important human and animal pathogen worldwide. In pigs, most of *Salmonella* infections are subclinical. However, these carrier pigs can be a major reservoir of *Salmonella* and thus a source of *Salmonella* contamination of pork meat resulting in human infection and disease [1]. With the mycotoxins DON and T-2 toxin and salmonellosis being emerging issues with possible deleterious consequences for both animal and human health, the effects of both toxins on the course of a *Salmonella* Typhimurium infection in pigs were investigated.

Materials and methods

I. Porcine intestinal ileal loop experiments with DON

Two 5-week-old piglets were used in a gut loop experiment. Under anesthesia, twelve loops were constructed commencing at the distal ileum. Four test conditions (1 ml) were injected in the loops: negative control (LB medium), 1 µg/ml of DON in LB, *Salmonella* Typhimurium or the combination of 1 µg/ml of DON and *Salmonella* Typhimurium. After 6 hours, the pigs were euthanized and samples were taken for RNA isolation. Using qRT-PCR the mRNA expression of IL-1β, IL-6, IL-8, IL-12, IL-18, TNFα, IFNγ and MCP-1 was quantified.

II. Experimental infection of pigs with *Salmonella* Typhimurium, fed a T-2 toxin supplemented diet

Three groups of 5 piglets received during 23 days a blank feed (control group), feed contaminated with 15 ± 6.5 µg/kg T-2 toxin (15 ppb group) or 83 ± 31.5 µg/kg T-2 toxin (83 ppb group), respectively. After 18 days feeding the pigs were orally inoculated with *Salmonella* Typhimurium, followed by euthanasia 5 days after the inoculation. Tissue samples and content of the gastrointestinal tract were collected for bacteriological analysis.

Results

I. DON potentiates the intestinal inflammatory response to* Salmonella *Typhimurium in the ileal loop model.

Exposure to 1 µg/ml of DON did not affect the mRNA expression level of any cytokine and chemokine tested. Co-exposure of the ileal loops to 1 µg/ml of DON and *Salmonella* for 6 hours resulted in an increased mRNA expression of IL-1β, IL-6, IL-8, IL-12, TNFα and MCP-1, when compared to loops incubated with *Salmonella* alone. This increase was significant for TNFα and IL-12.

II. T-2 toxin decreases the intestinal colonization of* Salmonella *Typhimurium in pigs.

Pigs receiving feed with T-2 toxin had lower numbers of *Salmonella* per gram in the content and tissue samples of the intestinal tract in comparison to the control group receiving blank feed.

Discussion and conclusions

Our studies demonstrate that at relevant concentrations, both DON and T-2 toxin affect the pathogenesis of *Salmonella* Typhimurium infections in the pig. DON potentiates the early intestinal inflammatory response induced by *Salmonella* Typhimurium, whereas the interaction of T-2 toxin with *Salmonella* results in reduced intestinal colonization.

References

1. Authority EFSA (2008) The EFSA Journal 135: 1-111.

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