

PORK SAFETY

Title: The effects of water delivery of probiotics or organic acids on weanling pig performance, intestinal health and integrity, and immune status – **NPB #05-181**

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Abstract:

Pigs (n=88) weaned at ~ 19 d were used in a 14 d study to evaluate the effects of water delivered DFM (Bioplus DP, Chr. Hansen: *Enterococcus faecium*, *Bacillus subtilis* and *Bacillus licheniformis* - 10^9 cfu/L) or organic acids (2.58 mL/L of a propionic acid based blend; Kemin Americas) on immune status, nutrient uptake, *Salmonella* shedding, intestinal morphology, and intestinal microbial population following nasal inoculation of *Salmonella typhimurium* (10^9 cfu/pig). Pigs were challenged with *Salmonella* 6 d post commencement of water treatments. Serum samples were taken on d 6, 8, 10, and 14 for determination of TNF α concentration. Fecal samples were taken on d 0, 5, 7, 11 for detection of *Salmonella* shedding and enumeration of *Enterobacteriaceae*. Pigs (n=22/d) were harvested on d 6, 8, 10, and 14. Intestinal and cecal tissue and contents and mesenteric lymph nodes (MLN) were taken for *Salmonella* detection. Jejunum samples were taken for determination of nutrient uptake in modified Ussing Chambers. Duodenal, jejunal and ileal mucosal scrapings and tissue were taken for measurement of mucosal TNF α concentration and intestinal morphology, respectively. All treatments, in particular water administration of DFM improved ADG on d 2 to 6 post-challenge above the negative control ($P < 0.05$). Duodenal villus height also tended to be improved ($P=0.08$) by DFM administration on d 4 post-challenge. *Salmonella* presence was reduced ($P=0.001$) in MLN, feces and ileal and cecal tissue over time. Antibiotic and DFM treatment tended to reduce ($P=0.09$) *Salmonella* presence in ileal contents. Serum TNF α tended to increase ($P=0.10$) up to d 4 post-challenge while TNF α concentrations in duodenum tended to linearly decrease ($P=0.10$) post-challenge and TNF α in the ileum decreased ($P=0.008$) immediately post-challenge. *Salmonella* infection resulted in a linear decrease in phosphorus ($P=0.001$) active transport, and an increase ($P=0.001$) in glutamine uptake up to d 4 post-challenge. Glucose uptake was increased immediately post-challenge by in-feed antibiotics or water delivered DFM ($P=0.009$). Active ion transport was reduced by *Salmonella* infection, however water delivered DFM or organic acid treatment were most successful at attenuating this decline ($P=0.001$). Water acidification and antibiotic treatment tended to reduce carbachol induced chloride secretion ($P=0.07$). In conclusion, water administration of DFM and water acidification, following a *Salmonella enterica* var Typhimurium challenge affected weanling pigs in a similar and in some cases more beneficial manner than low dose antibiotics, lending support for their use as an antibiotic alternatives.

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