

SWINE HEALTH

Title: Effect of Probiotics on Enteric Colibacillosis – NPB #98-052

Investigator: Rodney A. Moxley

Institution: University of Nebraska-Lincoln

Date Received: 10/1/1999

Abstract:

Enterotoxigenic *Escherichia coli* (ETEC) is an important cause of diarrhea and septicemia (toxic, blood-borne infection) in neonatal and recently weaned swine. A better understanding of the pathogenesis of enteric and septicemic colibacillosis is needed before more effective therapeutic and preventative measures can be developed. One aspect that is poorly understood is the mechanism by which bacteria spread from the intestine to the blood and other organs; this process has been termed translocation. Studies in laboratory animals have shown that translocation may be reduced by the presence of nonpathogenic indigenous bacteria, similar to the bacteria commonly found in probiotic preparations, in the intestine. Because the feeding of probiotics is a management strategy currently available to producers, we sought to determine whether the feeding of probiotic bacteria would reduce translocation of ETEC bacteria and the severity of enteric and septicemic colibacillosis in the gnotobiotic piglet model.

In the present study, *Lactobacillus acidophilus* and *Enterococcus faecium* strains were isolated from a commercial probiotic product for swine. *In vitro* competition experiments and *in vivo* challenge experiments were conducted with the probiotic strains and two serotype O8:K87:NM:F4ac ETEC challenge strains. The two ETEC strains included hemolytic strain WAM2317 and an isogenic nonhemolytic mutant, WAM2335. Neither probiotic bacterial strain was inhibitory to the growth of either ETEC strain in *in vitro* competition experiments. *In vivo* challenge experiments were conducted. Principal gnotobiotic piglets from 3 to 7 days of age were fed daily, $1-2 \times 10^9$ colony-forming-units (CFU) each of the *L. acidophilus* and *E. faecium* strains, whereas controls were fed sterile culture broth. Principals and controls were challenged at 9 days of age by feeding $1-2 \times 10^9$ CFU of WAM2317 or WAM2335. Severe weight loss and septicemia occurred only in phenotype A piglets, i.e., those susceptible to ETEC bacterial adherence due to binding of K88 (F4) fimbria. Microscopic examination of the small intestines of these pigs indicated that epithelial cells lining the villi had sloughed, causing atrophy (shortening) of the villi. Epithelial sloughing was the result of ischemia (loss of blood supply to the region) caused by hypovolemia (decreased blood volume) and thrombosis; hypovolemia was the result of dehydration caused by diarrheal water loss. Severe dehydration in these piglets caused relative increases in serum concentrations of albumin, total protein, globulin, blood urea nitrogen, and creatinine. Severe metabolic acidosis with compensatorily increased concentrations of serum chloride and potassium were further manifestations of hypovolemic shock. The feeding of probiotic bacteria did not reduce the severity or progression of disease in phenotype A piglets, nor did it significantly reduce translocation of ETEC bacteria. Additional studies are needed to address the effects of probiotic bacteria inhibitory to ETEC on enteric colibacillosis, especially in piglets genetically predisposed to severe ETEC infection.

These research results were submitted in fulfillment of checkoff funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer reviewed

For more information contact:

National Pork Board, P.O. Box 9114, Des Moines, Iowa USA

800-456-7675, Fax: 515-223-2646, E-Mail: porkboard@porkboard.org, Web: <http://www.porkboard.org/>