

Development of an *In Situ* Model for Measuring *E. Coli* Adherence and Immune Response in Newly Weaned Piglets

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Infection of newly weaned piglets by Enterotoxigenic *E. coli* (ETEC) has major economic consequences and represents a major concern to the swine industry. Factors that predispose newly weaned piglets to infection include genetics, expression of glycolipid attachment sites in the mucus and brush border of the gut and poor development of the gut-associated lymphoid tissue (GALT).

A systemic *E. coli* challenge enabled a demonstration of the immune benefits of dietary supplementation with the "immunonutrient" glutamine. There was less *in vivo* activation (mean fluorescence) of neutrophils (11.6 ± 3 gln, 41.9 ± 10 control), but a greater ability to respond (mean fluorescence) to challenge at 10 min. (86.8 ± 17.5 gln, 43.2 ± 8.4 control) and 15 min. (155.1 ± 37.6 gln, 68.8 ± 13.0 control). Immune cell populations were also influenced, including the proportion of peripheral CD4+ ($22.1 \pm 1.8\%$ gln, $17.6 \pm 0.6\%$ control) and CD4+CD25+ ($14.5 \pm 2.2\%$ gln, $10.8 \pm 0.4\%$ control).

We have also developed a novel *in vivo* experimental model that enables quantification of the initial steps of *E. coli* infection (adherence) and the resulting immune response by piglets. Piglets can be fed from weaning for 7 days prior to the *in vivo* challenge with *E. coli*. By performing a simple surgical incision and gut loop isolation, this unique model enables us to study the effects of 4 (or more) physiologically relevant bacterial suspensions in a controlled environment in a single piglet. This requires a smaller number of animals, and results in an increased power to test the hypothesis that nutritional intervention will improve piglets' resistance to infection and alter the adherence of bacteria.

Implications:

This ongoing research will improve the understanding of the function of the swine immune system, thus enabling new methods of treatment or prevention. Supplementation with inexpensive nutritional supplements could lead to improvements in production and a reduction in the use of antibiotics. (This research was funded by the Alberta Pork, AARI and Nutri-Quest Inc.)