Effects of Bacillus Licheniformis PF9 on Growth, Nutrient Absorption, gut Barrier Integrity, Immunity, and Intestinal Microbiota of Weaned Piglets Challenged with Enterotoxigenic Escherichia Coli F4. Haoxiang Xu1, Peng Lu1, Joshua Gong2, Hai Yu1, Paula Azevedo1, Joshua Gong2, Chengbo Yang1, 1University of Manitoba, Department of Animal Science, 2Guelph Research and Development Centre, Agriculture Agri-Food Canada

Abstract: This study aimed to evaluate the effects of Bacillus licheniformis PF9 on growth performance and gut health of weaned piglets challenged with enterotoxigenic Escherichia coli (ETEC) F4. Thirty-two weaned piglets susceptible of ETEC F4 were randomly allocated to 4 treatments 1) NNC, basal diet and non-challenged; 2) NC, basal diet; 3) PC, basal diet + 80 mg·kg⁻¹ of Avilamycin; and 4) PF9, basal diet + 10⁹ cfu/kg of Bacillus licheniformis PF9. ETEC F4 decreased average daily gain and increased feed conversion ratio of the NC group. An increase was found in FCR of the PC group during the post-challenge period (P < 0.05). ETEC F4 induced the severity of diarrhea at 3-, 36- and 40-hours post-inoculum (hpi) in the NC group (P < 0.05). Bacillus licheniformis relieved diarrhea severity at 3 hpi (P < 0.05). ETEC F4 reduced the duodenal, jejunal and ileal villus height of the NC group. A decrease in duodenal villus height in the PC group (P < 0.05). ETEC F4 reduced the relative mRNA level of Na⁺-glucose cotransporter 1 in the NC group (P < 0.05). Compared to the NC and NNC groups, Bacillus licheniformis increased relative mRNA levels of Aminopeptidase N, Occludin, Zonula occludens-1, and SGLT1 (P < 0.05). Bacillus licheniformis increased the relative mRNA level of excitatory amino acid transporter 1 (P < 0.05). Bacillus licheniformis showed a lower relative abundance of Bacteroidetes in the colon than piglets from the NNC group (P < 0.05). The non-challenged group had a higher relative abundance of Firmicutes in the ileum than the challenged piglets, meanwhile, a lower relative abundance of Proteobacteria in the ileum and colon in the NC group (P < 0.05). This study provides evidence that Bacillus licheniformis can be a potential antibiotics alternative to improve the gut health of piglets.

Keywords: Bacillus licheniformis, Escherichia coli, weaned piglets