Application of the Escherichia Coli Challenge Model in Developing Strategies to Improve gut Health and Function in Weaned Pigs. Martin Nyachoti¹, Jinyoung Lee¹, Chengbo Yang¹, ¹University of Manitoba, Department of Animal Science

Abstract: Post-weaning diarrhea in piglets, caused primarily by enterotoxigenic Escherichia coli is a major cause of productive and economic losses to the swine industry. Traditionally, the swine industry has managed this disease by utilizing starter diets containing highly digestible and specialized ingredients such as spray-dried porcine plasma and sub-therapeutic levels of antibiotics as growth promoters. However, there has intense public pressure to discontinue the use of animal products and antibiotics in pig diets for fear that these products represent a risk to human health. This has sparked great interest in swine nutrition is to identify effective, safe, and environmentally friendly nutritional interventions that could be used in place of in-feed antibiotics. This requires that any such intervention is rigorously tested under conditions that represent those that are encountered in production settings. To this end, the Escherichia coli K88 (or F4) disease challenge model has been used to test the potential of these interventions to support gut health and function in piglets and to allow investigations into the mode of action underlying any such effects. Although this model has been applied successfully to examine the efficacy of different nutritional interventions, including diet formulation strategies and addition of various feed additives, the degree of success achieved varies due to among other factors such as dose used, age of the pigs, and study duration. Being a disease challenge model, animal care oversight, regulatory requirements for Containment Level II facilities, and trial site managements to avoid cross-contamination among treatment groups add to the complexity of protocols for running trials involving this model. Nonetheless, the enterotoxigenic Escherichia coli model has been an effective tool in our hands to test the efficacy of various nutritional interventions in protecting piglets against post-weaning diarrhea disease and to elucidate their modes of action.

Keywords: challenge model; gut health; piglets; post-weaning diarrhea

Pathogenic Escherichia Coli Populations within the gut Microbiota of Commercial Swine Herds in the U.S. Ellen Davis¹, ¹Arm & Hammer Animal and Food Production

Abstract: Enteropathogenic E. coli (ETEC) is a common infection in neonatal and nursery pigs resulting in significant economic losses from morbidity, mortality, and production inefficiencies. Due to the plasticity of its genome, E. coli can be particularly challenging to manage in swine production systems. Populations of E. coli are continuously changing their genome content via multiple methods of genomic modification to better adapt and compete within ecological niches in the intestinal tract. This ability to acquire genetic information allows individuals within E. coli populations to exchange virulence and antibiotic resistance genes, developing into disease-causing ETEC strains that are difficult to manage with therapeutic antibiotics and other antimicrobial methods. Virulence genes associated with ETEC are harbored within healthy swine populations and usually result in disease when individual strains acquire four or more genes associated with virulence. Monitoring and enumerating the virulence gene pool of E. coli populations within U.S. commercial swine herds indicates that incorporating methods to manage the potentially pathogenic E. coli population in its entirety may be a more effective strategy than focusing on disease mitigation.

Keywords: pigs, microbiome, disease