PSX-A-2 Effects of Dietary Crude Protein Level and Corn Grain Processing on Whole-Body Urea Kinetics and in-Vitro Urea Secretion Into the Rumen of Sheep. Kaitlin Burns1, Gregory B. Penner1, Timothy Mutsangwa1, 1University of Saskatchewan

Abstract: In ruminants, urea-N salvaging allows secretion of endogenously-produced urea (UER) into the rumen, where it can provide N for microbial growth. Our objective was to determine the effects of dietary crude protein content and corn grain processing on whole-body urea kinetics and in vitro serosal-to-mucosal urea flux (J_sm-urea) across ruminal epithelia. Thirty-two Rideau-Arcott ram lambs were blocked by BW into groups of 4 and then randomly allocated within block to one of 4 dietary treatments (n = 8) in a 2 × 2 factorial design. Dietary factors were crude protein content (10.9% [LP] vs. 15.8% [HP]) and corn grain processing (whole-shelled [WSC] vs. steam-flaked [SFC]). Feeding SFC was expected to provide more ruminally-fermentable energy than WSC. Four blocks of animals (n = 4) were used in 4-d continuous infusions of 15N-15N with concurrent collections of urine and feces to determine whole-body urea kinetics. After 23 d of dietary exposure, lambs were killed to collect ruminal epithelia which were mounted in Ussing chambers to determine J_sm-urea. Lambs fed HP had greater N intake (P = 0.01) and total N excretion (P = 0.002) than those fed LP; however, retained N (g/d or % of N intake) was similar between the 2 groups. When expressed as absolute amounts, urea-N secreted into the gut (GER) and urea-N used for anabolic purposes (UUA) were similar across diets; however, lambs fed the LP diet had a greater GER/UER ratio (P = 0.02) and tended to have a greater UUA/GER ratio (P = 0.05) than lambs fed the HP diet. Diet had no effect on ruminal J_sm-urea. Grain processing had no effects on GER, UUA and J_sm-urea. These results suggest ruminants fed protein-restricted diets have a greater dependence on urea secretion into the gut to provide N for anabolic use.

Keywords: sheep, urea-N, Ussing

PSX-A-4 Effects of Dietary Protein Content and Crystalline Amino Acid Supplementation Patterns on Intestinal Bacteria and Their Metabolites in Weaned Pigs Raised Under Different Sanitary Conditions. Jinyoung Lee1, John K. Htoo2, Martina Kluenemann2, Caroline González-Vega2, Martin Nyachoti1, 1University of Manitoba, 2Evonik Operations GmbH

Abstract: The objective of this experiment was to investigate the effects of dietary crude protein (CP) content and crystalline amino acids (CAA) supplementation patterns on the bacteria and their metabolites in the intestine of weaned pigs raised under clean (CSC) or unclean sanitary conditions (USC). One hundred forty-four piglets (6.35 ± 0.63 kg BW) were assigned to 1 of 3 diets to give 8 replicates, each with 3 pigs, over a 21-days period. Diets consisted of a high CP (HCP; 21%) and two low CP (LCP; 18%) diets supplemented with all 10 essential AA as CAA or only 6 CAA (Lys, Met, Thr, Trp, Val, and Ile). The CSC room was washed weekly, whereas the USC room had sow manure spread in the pens and was not washed throughout the experiment. Digesta from jejunum and colon were analyzed for ammonia N, short-chain fatty acids, and biogenic amines, but only colonic digesta was analyzed for microbiome composition (16S rRNA sequencing on MiSeq). Data were analyzed using R software for 16S rRNA and the MIXED procedure of SAS for microbial metabolites. Sanitation, CP content, and CAA supplementation patterns did not affect colonic bacterial composition or diversity in weaned pigs. Pigs raised under USC had greater (P < 0.05) jejunal ammonia N than those under CSC. Pigs fed LCP diets had reduced (P < 0.05) jejunal ammonia N compared to those fed HCP diet. No difference was found in colonic ammonia N. Interactions between sanitation and dietary CP content were observed (P < 0.05) for jejunal acetate and colonic spermidine and spermine. In conclusion, reducing dietary CP lowered ammonia N content regardless of the sanitation and increased microbial metabolites in weaned pigs raised under USC. However, colonic bacterial composition and diversity were not influenced by dietary CP, sanitary conditions, or CAA supplementation patterns.

Keywords: crystalline amino acids, low protein diet, microbiome, sanitation