

Nonruminant Nutrition: Protein and Amino Acids

TH131 Determination of the order of limiting amino acids in milk-based liquid diets for pigs from 1.5 to 5.5 kg. A. I. Broome¹, R. J. Harrell², J. Odle¹, K. E. Sullivan¹, and J. H. Eisemann^{*1}, ¹*North Carolina State University, Raleigh*, ²*Novus International Incorporated, St. Louis, MO*.

This experiment was designed to determine the order of limiting amino acids (AA) beyond lysine (LYS) in a whey-skim milk-caseinate diet to be fed to low birth weight pigs. Initial pig weight was 1.71 ± 0.30 kg (Rep. 1) and 1.62 ± 0.11 kg (Rep. 2). The order was determined using a deletion assay. This was done using a positive control (PC) diet with AA concentrations and ratios to LYS at or above NRC recommendations, a negative control (NC) diet that reduced AA concentrations and ratios to LYS to 60% of the PC diet ratios, a supplemented negative control (Supp. NC) diet with AA supplemented to provide concentrations and ratios to LYS similar to the PC diet, and deletion diets which removed threonine (THR), tryptophan (TRP), sulfur amino acids (SAA), or phenylalanine (PHE) from the Supp. NC diet to levels in the NC diet. All diets contained 4.2 Mcal GE and 20.6 g LYS/kg DM. Diets were fed ad libitum ($n=8$ /diet). Gain, intake, G:F, and PUN concentration were analyzed for effects of diet, replicate, and interaction. The SEM values were 7.33 g/d, 7.72 g DM/d, 0.02, and 0.33 mM, respectively, for diet main effect. Gain for animals fed PC (346 g/d), NC (269 g/d), and Supp NC (315 g/d) diets differed ($P<0.05$). Gain of pigs on all deletion diets was similar. The SAA deletion diet produced less gain (291 g/d, $P<0.05$) than Supp. NC diet. Intake was similar in pigs fed PC (306 g DM/d) and NC diets (310 g DM/d) and greater ($P<0.05$) than for pigs on all other diets. Feed efficiency decreased for pigs fed NC diet (0.87, $P<0.05$) compared to all other diets. Pigs fed SAA deletion diet had the greatest ($P<0.05$) PUN concentration (6.96 mM). Pigs fed THR deletion diet (5.70 mM) and PC diet (5.55 mM) had similar concentrations. Based on increased PUN concentration and decreased gain in pigs fed the SAA deletion diet relative to the Supp. NC diet, it is likely that SAA were next limiting. Threonine would likely be next limiting after SAA, also based on increased PUN concentrations.

Key Words: Limiting Amino Acids, Liquid Diets, Pigs

TH132 Use of distillers dried grains with solubles and soybean hulls in nursery pig diets. F.F. Barbosa*, S.S. Dritz, M.D. Tokach, J.M. DeRouchey, R.D. Goodband, and J.L. Nelssen, *Kansas State University, Manhattan, Kansas, United States*.

Two 21-d experiments with 1,584 pigs in each experiment were conducted to evaluate growth performance of nursery pigs fed different levels of distillers dried grains with soluble (DDGS) or soybean hulls. In each experiment, pigs (10.9 kg in Exp. 1 and 12.4 kg in Exp. 2) were allotted to 72 pens (36 pens of barrows and 36 pens of gilts) with 22 pigs per pen on day 21 after weaning. A pen of barrows and gilts shared a common feeder and, thus, feeder was the experimental unit. In Exp. 1, treatments were a corn-soybean meal based control diet or the same diet with 7.5%, 15%, or 22.5% added DDGS. Increasing DDGS from 0 to 22.5% did not influence ADG ($P>0.26$; 506, 512, 516, or 515 g/d) or ADFI ($P>0.21$; 758, 754, 737, or 743 g/d); but linearly ($P<0.004$) increased G:F (0.67, 0.68, 0.70, and 0.69). The survival rate (99.0 to

99.5%) was not affected ($P>0.60$) by diet. In Exp. 2, treatments were arranged as a 2 x 2 factorial with either 0 or 15% DDGS and 0 or 4% soybean hulls. Adding DDGS, soybean hulls or the combination of DDGS and soybean hulls to the control diet did not influence ($P>0.17$) ADG (557, 555, and 542 vs. 555 g/d). There was an interaction ($P<0.01$) between DDGS and soybean hulls for ADFI and a trend for an interaction ($P<0.09$) for G:F. Adding DDGS reduced ADFI and increased ($P<0.04$) G:F to a greater extent when added to the control diet (786 vs 822 g/d; 0.71 vs 0.68) than when added to the diet containing soybean hulls (789 vs 804 g/d; 0.69 vs 0.69). Adding soybean hulls to the control diet did not affect ($P>0.17$) pig performance. The survival rate (99.5 to 100%) was not affected ($P>0.31$) by treatments. In summary, 15 to 22.5% DDGS and up to 4% soybean hulls were added to diets for 12 to 24 kg pigs without influencing ADG while increasing levels of DDGS (up to 22.5%) improved feed efficiency in these experiments.

Key Words: Distillers Dried Grains with Solubles, Soybean Hulls, Nursery Pigs

TH133 Amino acid supplementation of hydrolyzed feather meal diets for finisher pigs: I. Growth performance and serum metabolite profile. K. C. Divakala^{*1}, L. I. Chiba¹, R. B. Kamalakar¹, S. P. Rodning¹, E. G. Welles¹, K. A. Cummins¹, J. Swann², F. Cespedes², and R. L. Payne³, ¹*Auburn University, Auburn, AL*, ²*American Proteins, Inc., Hanceville, AL*, ³*Evonik-Degussa Corp., Kennesaw, GA*.

The objective of this study was to determine the possibility of replacing soybean meal (SBM) in pig diets completely with feather meal (FM). Corn-SBM, finisher (F) 1 and 2 positive control diets (PC) were formulated to contain 6.1 and 4.7 g apparent ileal digestible (AID) Lys/kg, respectively, and corn-FM, negative control diets (NC) were formulated to be iso-N to the PC. The NC were supplemented with AA to satisfy all the AID indispensable (Ind) AA requirements based on the 1998 NRC AID AA (NRC; NC + Lys and Trp) and the assumption that the apparent ileal digestibility of all Ind AA in FM is 40% (40-2AA = NC + Lys, Trp, and Thr, but no His and Ile, and 40All = NC + Lys, Trp, Thr, His, and Ile). Forty-five gilts and 45 barrows (57.8 ± 0.8 kg; 3 gilts or 3 barrows/pen) were randomly assigned to 5 F-1 diets. At 81.0 ± 1.4 kg, pigs were offered F-2 diets. Pigs had ad libitum access to feed and water, and blood samples were collected at the end of the study (112.1 ± 1.8 kg). As expected, overall ADFI, AID Lys (representing Ind AA) intake (LysI), ADG, and G:F were greater and G:LysI was lower in pigs fed the PC than those fed the NC ($P<0.001$). Overall G:LysI tended to be lower in pigs fed the NRC than those fed the PC ($P=0.083$) or 40-2AA and 40All ($P=0.094$), and pigs fed the 40All had numerically higher G:F ($P=0.119$) and G:LysI ($P=0.160$) than those fed the 40-2AA. Pigs fed the PC had more serum albumin and total protein (TP; $P<0.001$) but less glucose ($P=0.031$) and cholesterol ($P<0.001$) than those fed the NC, and TP was higher ($P=0.031$) in pigs fed the 40All than those fed the 40-2AA. Diets had no effect on urea N or triglycerides. The results seemed to indicate that pigs fed the FM diet supplemented with the necessary AA can utilize AA for weight gain as efficiently as those fed the corn-SBM diet.

Key Words: Finisher Pigs, Feather Meal, Growth Performance