result of larger group size do not have higher vitamin requirements than pigs in smaller groups.

Key Words: Group size, Vitamin level, Growing pigs

172 Effects of combinational uses of zinc sulfate and zinc-amino acid chelate on zinc bioavailability in broiler chickens. S. J. Park*[1], B. J. Min[2], R. A. Royce[3], and S. W. Kim[2], [1]*Texas Tech University, Lubbock,* [2]*North Carolina State University, Raleigh,* [3]*Albion-Advanced Nutrition, Clearfield, UT.*

A total of 447, 1 d old, broiler chickens was used to determine bioavailability of zinc when 2 zinc sources were combined or used individually. Fifteen birds were killed at d 0 and ground for carcass sampling. Remaining 432 birds were allotted to 4 dietary treatments: **ZS** (with 40 ppm Zn from Zn sulfate); **ZAA** (with 40 ppm Zn from Zn amino acid chelate, Albion-Advanced Nutrition); **ZA1** (with 40 ppm Zn from Zn sulfate and Zn amino acid chelate with 2:1 ratio); and **ZA2** (with 40 ppm Zn from Zn sulfate and Zn amino acid chelate with 1:2 ratio). There were 6 replicates per treatment with initially 18 birds per stainless steel brooder cage with the heater. Birds had feed and water *ad libitum* during 21 d feeding period. Body weight and feed intake were measured on d 1, 3, 5, 7, 14, and 21. Groups of 3 birds were randomly selected and killed at d 1, 3, 5, 7, 14, and 21, ground together for each day, sampled, and analyzed for Zn. The ADG, ADFI, and gain:feed ratio did not differ among treatment groups. Content of Zn (mg/bird) in bird carcass did not differ among treatment groups at d 21. Bioavailability of Zn from ZAA (39.2%) was greater (P<0.05) than ZS (33.1) and ZA1 (33.9) at d 14. However, bioavailability of Zn did not differ among treatment groups at d 21. This study indicates that Zn from Zn amino acid chelate can be better absorbed than Zn from Zn sulfate by broiler chickens until d 14 of age when Zn was supplemented at 40 ppm in the diet. However, combinational uses of Zn amino acid chelate with Zn sulfate (1:2 or 2:1 ratio) did not improve the Zn absorption by broiler chickens.

Key Words: Bioavailability, Broilers, Zinc

173 Effects of single or multi-enzyme preparations supplementation in corn distillers dried grains with solubles diet on growth performance, nutrients digestibility and serum characteristics in 50 kg pigs. Y. Wang*[1], J. H. Cho[1], Y. J. Chen[1], J. S. Yoo[1], Y. Huang[1], H. J. Kim[1], S. O. Shin[1], I. H. Kim[1], H. K. Moon[2], and I. C. Kim[2], [1]*Dankook University, Cheonan, Choongnam, Korea,* [2]*National Institute of Animal Science, Seonghwan, Choongnam, Korea.*

Ninety six crossbred pigs (47.5 kg), 6 pens/treatment and 4 pigs/pen, were used in a 4 week growth trial. Pigs were randomly allocated to four dietary treatments, which included: 1) HC, high nutrient-corn-soybean meal diet; 2) LC, low nutrient-DDGS included diet; 3) LCS, low-nutrient DDGS included diet + single enzyme (β-mannanase); 4) LCM, low nutrient-DDGS included diet + multi-enzyme (blend of α-1,6-galactosidase and β-1,4-mannanase). Through the entire experimental period, average daily gain (ADG) in LC treatment (0.707kg) was significantly lower (P<0.05) than HC treatment (0.848kg), however, LCS (0.759kg) and LCM (0.756kg) treatments tended to be higher (P<0.10) than LC treatment (0.707kg). The three low nutrient-DDGS treatments (1.75kg, 1.82kg and 1.78kg) had lower (P<0.05) average daily feed intake (ADFI) than HC treatment (2.00kg). There was no notable difference in gain/feed among the treatments. HC treatment (80.65%) had higher dry matter (DM) digestibility than LC (72.21%) and LCM (75.29%) treatments (P<0.05), furthermore, LCS (77.60%) had higher (P<0.05) DM digestibility than LC treatment (72.21%). Nitrogen digestibility was higher (P<0.05) in HC treatment (79.79%) than LC treatment (73.81%). A significant difference (P<0.05) was obtained for energy digestibility, with the highest value in HC treatment (79.13%), intermediate values for LCS (73.21%) and LCM (78.06%) treatments, and lowest value in LC treatment (74.67%). No significant difference was observed on blood urea nitrogen (BUN) and creatinine. In conclusion, single or multi-enzyme supplementation in low nutrient-DDGS included diet can improve growth and digestibility in 50 kg pigs.

Key Words: DDGS, Digestibility, Pig

174 Amino acid and energy digestibility of two different sources of soy hulls for swine. J. Y. Jacela*, J. M. DeRouchey, S. S. Dritz, M. D. Tokach, R. D. Goodband, J. L. Nelssen, and R. C. Sulabo, *Kansas State University, Manhattan.*

This study was conducted to determine the digestibility of amino acids (AA) and energy of soy hulls from two different sources. Five barrows (initially 68 kg) fitted with T-cannulas were fed three diets in a crossover design. The first two diets contained 66.7% soy hulls from two different sources (SH-A and SH-B). The third diet was N-free to determine endogenous AA losses. Each period was 7 d with the first 4 d as adaptation period to the diet. Fecal samples were collected on d 5 and 6. Digesta samples were collected between 0600 and 1800 of d 6 and 7. Samples were analyzed for AA and energy content. Apparent (AID) and standardized (SID) ileal digestibilites and GE, DE, ME, and NE values were calculated from these analyses. Only four pigs were used for all data analyses due to poor flowability of digesta through the T-cannula in one pig when fed the soy hull diets. The analyzed composition were 15.9% CP, 5.1% ash, 1.6% EE, 37.5% ADF, and 50.8% NDF for SH-A; and 12.1% CP, 5.6% ash, 2.3% EE, 40.3% ADF, and 53.6% NDF for SH-B. Soy hull-A had higher (P<0.03 to 0.12) AID and SID values for most amino acids. However, when expressed as a ratio to CP, there were no differences in actual SID AA content. As a percentage of CP; SID Lys, Met, and Thr values were 4.1, 0.8, and 2.2% for SH-A; and 4.0, 0.9, and 2.0% for SH-B, respectively. Energy digestibility was similar between sources; however, GE was higher (P<0.05) for SH-A. The GE, DE, ME, and NE values were 4,190; 2,670; 2,551; 1,777 kcal/kg for SH-A and 4,075; 2,399; 2,308; 1,565 kcal/kg for SH-B.

Table 1.

	SH-A			SH-B			*P* < (A vs B)	
Item	AA, %	AID	SID	AA, %	AID	SID	AID	SID
Arg	0.87	71.4	76.5	0.69	62.8	69.6	0.03	0.05
His	0.41	57.9	61.9	0.33	49.6	54.7	0.06	0.08
Ile	0.65	58.4	62.5	0.52	43.3	48.9	0.03	0.04
Leu	1.08	58.9	63.1	0.87	45.4	51.0	0.05	0.06
Lys	1.06	58.4	61.1	0.89	51.1	54.6	0.06	0.07
Met	0.19	65.9	69.5	0.17	57.5	62.3	0.02	0.03
Phe	0.66	66.3	70.4	0.50	57.6	62.9	0.07	0.09
Thr	0.55	50.7	62.3	0.47	37.5	52.0	0.06	0.12
Trp[a]	0.08	N/A	N/A	0.06	N/A	N/A	N/A	N/A
Val	0.72	57.5	62.2	0.59	43.8	50.1	0.04	0.05

[a]Values were too low to be determined in some samples

Key Words: Swine, Soy hulls, Digestibility