M166 Influence of dietary Quantum phytase on bone strength and bone phosphorus contents of weaned pigs. S. K. Baidoo*[1], Q. Yang[1], G. He[1], T. D. Crenshaw[2], C. L. Wyatt[3], and J. A. Jendza[1], *[1]University of Minnesota, SROC, Waseca, [2]Department of Animal Science, University of Wisconsin, Madison, [3]AB Vista Feed Ingredient, Stillwell, KS.*

A total of 180, 18-d crossbred pigs (GAP English Belle × Duroc) with BW of 7.0 ± 1.1 kg were randomly allotted to 6 treatments with 5 replicate pens/treatment for 3 phases with 11, 11 and 12 d in each feeding phase, respectively. Six corn-soybean meal mash diets were formulated: a positive control (PC) diet (0.32% available P (aP); met NRC, 1998 recommendations), a negative control (NC) diet with approximately 10% reduction of aP (0.28% aP), NC + 200 FTU/kg Quantum (QP: *E. coli* phytase expressed in *Pichia pastoris*), NC + 500 FTU/kg QP, NC + 1,250 FTU/kg QP, and NC + 500 FTU/kg Natuphos (NP; fungal phytase expressed in *Aspergillus niger*). On d 42, 9 pigs from each treatment were randomly selected and euthanized for metatarsal collection to measure breaking strength and to determine ash and P content. Ash and P content of the metatarsal bone was not different among the dietary treatments. However, sex influenced ($P < 0.01$) metatarsal ash, and P content. In general, the average ash and P content of both fresh and dry metatarsal bone in female pigs was higher ($P < 0.05$) than in male pigs. There were no differences ($P > 0.05$) for the P content per unit of ash among the dietary treatments or between sexes. The metatarsal bone breaking strength was reduced ($P < 0.05$) in pigs fed the NC diet compared with pigs fed the PC diet or pigs fed the NC + 1,250 FTU/kg QP or NC + 500 FTU/kg NP. There were no other differences in bone breaking strength between the dietary treatments. In conclusion, Quantum supplementation at 1,250 FTU/kg and Natuphos at 500 FTU/kg improved the bioavailability of P. In addition, metatarsal P content was higher in female pigs than male pigs.

Key Words: piglet, phytase, bone strength

M167 Dietary effects of Quantum phytase on performance and phosphorus utilization of weaned pigs. S. K. Baidoo*[1], Q. Yang[1], G. He[1], C. L. Wyatt[2], and J. A. Jendza[1], *[1]University of Minnesota, SROC, Waseca, [2]AB Vista Feed Ingredients, Stillwell, KS.*

A total of 180, 18-d old crossbred pigs (GAP English belle × Duroc) with BW of 7.0 ± 1.1 kg were divided into 6 treatments with 5 replicates pens/treatment for 3 phases with 11, 11 and 12 d in each phase, respectively. Corn-soybean meal mash diets were formulated with a positive control (PC) diet (NRC, 1998 requirement), a negative control (NC) diet with approximately 10% reduction of available phosphorus (aP), NC + 200 FTU/kg Quantum (QP; *E. coli* phytase expressed in *Pichia pastoris*), NC + 500 FTU/kg QP, NC + 1,250 FTU/kg QP, and NC + 500 FTU/kg Natuphos (NP; *Aspergillus niger* phytase). Growth performance was not influenced ($P > 0.05$) by diet during phase 1 or phase 3. However, in phase 2, ADG of pigs fed the NC diet was reduced ($P < 0.05$) compared with pigs fed the PC, NC + 1,250 FTU/kg QP, or NC + 500 FTU/kg NP. Quantum supplementation to the NC at 200 or 500 FTU/kg improved ADG comparable to the PC diet, but not different than the NC diet. Overall, ADG was reduced ($P < 0.05$) in pigs fed the NC diet compared with pigs fed the NC + 1,250 FTU/kg Quantum. Phosphorus digestibility was reduced ($P < 0.05$) in pigs fed the PC diet compared with all other diets. Quantum supplementation to the NC diet at 1,250 FTU/kg improved ($P < 0.05$) P digestibility compared with pigs fed the PC or NC diet. Crude protein (CP) digestibility was reduced ($P < 0.05$) in pigs fed the PC diet, but this was not different than pigs fed the NC diet. Quantum supplementation to the NC diet at 200 or 500 FTU/kg improved ($P < 0.05$) CP digestibility compared with the PC, but not different than the NC diet. Quantum supplementation at 1,250 FTU/kg or NP at 500 FTU/kg improved ($P < 0.05$) CP digestibility compared with all other diets. In conclusion, phytase supplementation improved ADG and digestibility of P and CP in diets for early-weaned pigs fed reduced P diets.

Key Words: piglet, phytase, phosphorus digestibility

M168 Evaluation of phytase with different calcium and phosphorous density diet on the growth performance, nutrient digestibility, blood characteristics, and fecal noxious gas emission in growing pigs. L. Yan*[1], S. Zhang[1], D. S. Nam[2], and I. H. Kim[1], *[1]Department of Animal Resource and Science, Dankook University, Cheonan, Choongnam, South Korea, [2]Nonghyup Feed Co. Ltd., Seoul, South Korea.*

A 6-week trial with 96 growing pigs [(Landrace × Yorkshire) × Duroc, BW = 22.49 ± 1.38 kg] were conducted to investigate the effects of phytase with different calcium and phosphorous density diet on the growth performance, nutrient digestibility, blood characteristics, and fecal noxious gas emission in growing pigs. Pigs were assigned to 1 of 4 treatments in a randomized complete block design according to their sex and BW. Each treatment contained 6 replication pens with 4 pigs (2 gilts and 2 barrows) per pen. Treatments included: 1) T1, CON, basal diet (0.70% Ca, 0.65% P); 2) T2, CON + 0.01% phytase (0.65% Ca, 0.60% P); 3) T3, CON + 0.015% phytase (0.60% Ca, 0.55% P); 4) T4 + 0.02% phytase (0.55% Ca, 0.50% P). Pigs were housed in an environmentally controlled, slatted-floor facility in 24 adjacent pens and were allowed ad libitum access to feed and water through a self-feeder and nipple drinker throughout the experimental period. No differences were observed in growth performance and nutrient digestibility throughout the experimental period. Pigs fed CON diet had a lower ($P < 0.05$) red blood cell concentration than other treatments. Pigs fed T2 and T4 had an increased ($P < 0.05$) serum calcium concentration compared with those fed T3. Pigs fed T1 had higher ($P < 0.05$) ammonia and acetic acid emissions compared with pigs fed T3 and T4 on d 7. Higher ($P < 0.05$) total mercaptan emission was also observed in the CON group compared with T4 and the other treatments on d1 and d7, respectively. Pigs fed T1 also had higher ($P < 0.05$) H_2S and acetic acid emissions compared with those fed T3 and T4 during 3–5 d of the study. In conclusion, our results indicate that dietary phytase supplementation with lower calcium and phosphorous density could reduce the fecal noxious gas emission without any negative effects on the growth performance and digestibility in growing pigs.

Key Words: growing pigs, phosphorous, phytase

M169 Nutritional balance of broilers at starter and grower phase fed diets containing multienzyme complex and lipid sources. G. do Valle Polycarpo*[1], V. C. da Cruz[2], J. C. M. Cravo[3], P. de Assunção Pimenta Ribeiro[3], C. C. do Valle Polycarpo[1], and A. C. Pezzato[1], *[1]São Paulo State University, Botucatu, Brazil, [2]São Paulo State University, Dracena, Brazil, [3]University of São Paulo, Pirassununga, Brazil.*

The aim of this paper was to evaluate the nutritional balance of broilers fed diets containing multienzyme complex (MeC) and different lipid sources during starter (16 to 21 d-old) and grower (30 to 35 d-old) phases. A total of 150 1-d-old male Cobb chicks were allotted in a completely randomized design featuring a 2x2+2 factorial arrangement of soybean oil or poultry fat added at 2 or 4% to diets supplemented with MeC. Two control diets without added lipids were without or with added MeC. There were 5 replications with 5 birds per experimental unit. The diets were corn and soybean meal-based and had similar energy and amino acid levels within each phase. The MeC contained enzymatic activities of pectinase, protease, phytase, β-glucanase, xylanase, cellulase and amylase. Water and feed were supplied ad libitum. There was no interaction ($P > 0.05$) between lipid source and inclusion level for the metabolizability coefficient of dry matter (MCDM), nitrogen (MCN), fat (MCF) and energy (MCE). Lipid sources did not influence ($P > 0.05$) the nutritional balance, which can be attributed to the higher ratio of unsaturated and polyunsaturated fatty acids in poultry fat as compared with other animal fat sources, making it a good alternative to soybean oil. In the starter phase, higher levels of lipid reduced the MCDM ($P < 0.01$); however, this seems to be related to the greater amount of content of inert material added to keep diets isocaloric. Birds fed diets containing lipids showed greater MCF ($P < 0.01$) in both periods compared with birds fed lipid-free diets, and this was also observed when comparing the diets with 4% and 2% added lipids ($P < 0.01$). Addition of MeC to diets without lipid resulted in greater MCF ($P < 0.01$) at starter and grower phase. Treatments did not affect MCN and MCE ($P > 0.05$). In conclusion, the increasing levels of lipid in feed increase the MCF in broilers at starter and grower phases, regardless of lipid source. Addition of a multienzyme complex shows better MCF in diets without lipid inclusion in both phases.

Key Words: poultry fat, soybean oil

M170 Performance of 1- to 42-day-old broilers fed diets supplemented with multienzyme complexes. V. C. da Cruz*[1], G. A. M. Pasquali[1], P. A. B. Aiello[1], G. do Valle Polycarpo[2], R. Crivellari[1], R. F. de Oliveira[1], A. Barbieri[1], L. H. Zanetti[1], and C. C. do Valle Polycarpo[3], *[1]São Paulo State University, Dracena campus, Dracena, Brazil, [2]University of São Paulo, Pirassununga campus, Pirassununga, Brazil, [3]São Paulo State University, São José do Rio Preto campus, São José do Rio Preto, Brazil.*

The aim of this work was to evaluate the effect of 2 multienzyme complexes (MeC) on the performance of broilers from 1 to 42 d old. A total of 868 Cobb chicks were allotted into 7 treatments, distributed in a completely randomized design with 4 replications. Diets and water were provided ad libitum according to the following treatments: T1 = basal diet; T2 = basal diet with MeC-A (SSF Allzyme); T3 = replacement of MeC-A by inert material; T4 = basal diet with MeC-B (Vegpro Allzyme); T5 = replacement MeC-B by inert material; T6 = basal diet with MeC-A and MeC-B; T7 = replacement MeC-A and MeC-B by inert material. MeC inclusions were made considering nutritional value of the enzyme as follows: MeC-A provided in the diet 75 kcal/kg ME, 0.20% CP, 0.029% Lys, 0.02 Met+Cys, 0.014% Thr, 0.004% Trp and 0.1% of P and Ca; MeC-B provided 7 kcal/kg ME, 7% CP and 7% in amino acid values of soybean meal. Treatments T3, T5, and T7 differed from T1 in nutrient content due to substitution of an inert material (kaolin) for the MeCs. The MeCs were composed by pectinase, protease, phytase, β-glucanase, xylanase, cellulase and amylase (MeC-A) and protease and cellulase (MeC-B). All experimental diets were formulated based on corn and soybean meal. The BW and ADG of broilers fed with multienzyme complexes were lower ($P < 0.05$) than those fed basal diets. However, AFI was not affected by the treatments ($P > 0.05$). The G:F ratio was worse in diets with MeC-A and with MeC-A + MeC-B supplementation compared with the basal diet ($P < 0.05$). The comparison between diet with MeC-A supplementation (T2) and diet without MeC-A (T3) indicated that the inclusion of MeC-A is not effective to improve G:F ratio of broilers, except in the diet containing both MeCs (A+B) which presented better results comparing to the T7 ($P < 0.05$). These results suggest that the supplementation with MeCs in diets with reduced nutrients is not effective to improve BW and ADG, and only MeC-B provides the same G:F ratio as basal diets to broilers from 1 to 42 d-old.

Key Words: enzymes, nutritional value, poultry

M171 Effects of Crina Poultry Plus and Ronozyme ProAct supplementation on growth performance, nutrient digestibility, relative organ weight, blood profiles, fecal microflora, and fecal noxious gas emission in broilers. Z. F. Zhang*[1], B. R. Lee[1], A. V. Rolando[2], D. H. Yoo[3], and I. H. Kim[1], *[1]Department of Animal Resource & Science, Dankook University, Cheonan, Choongnam, South Korea, [2]DSM Nutritional Products Philippines Inc., Bonifacio Global City, Taguig, Philippines, [3]All The Best Ltd., Seoul, South Korea.*

A total of 720 1-d-old male ROSS 308 (BW = 39.8 ± 1.8 g) broilers were randomly allotted to 1 of 8 treatments (15 birds/pen, 6 pens/treatment) to evaluate the effects of Crina Poultry Plus (Crina) and Ronozyme ProAct (Ronozyme) in different nutrient density diets on growth performance, apparent total tract digestibility (ATTD), relative organ weight, blood profiles, fecal microflora, and fecal noxious gas emission. Dietary treatments were: PC, basal diet; PCR, PC + 0.02% Ronozyme; PCC, PC + 0.03% Crina; PCRC, PC + 0.02% Ronozyme + 0.03% Crina; NC, 4% CP and AA lower than PC; NCR, NC + 0.02% Ronozyme; NCC, NC + 0.03% Crina; and NCRC, NC + 0.02% Ronozyme + 0.03% Crina. Crina contains an ultra-pure grade of benzoic acid and essential oils (thymol, eugenol and piperine), and Ronozyme is a preparation of serine protease produced by *Bacillus licheniformis*. During d 8–21, NCC treatment increased ($P < 0.05$) BWG compared with NC treatment. During d 22–35, BWG was higher ($P < 0.05$) in PCRC treatment than that in NC treatment. Overall, chicks in PCR, PCC, PCRC, and NCRC groups had greater BWG ($P < 0.05$) than those in NC group. The ATTD of DM, N, and energy were improved ($P < 0.05$) in PCR, PCC, PCRC, and NCC treatments compared with PC and NC treatments at 5 week. The relative weights of liver and breast muscle were heavier ($P < 0.05$) in PCC treatment than those in PC and NCC treatments. The gizzard relative weight was increased ($P < 0.05$) in PCRC and NCRC groups compared with PC group. NCRC treatment increased ($P < 0.05$) the fecal *Lactobacillus* population compared with NC treatment. Fecal H_2S, NH_3, and total mercaptans emission was decreased ($P < 0.05$) in NCR treatment compared with PC treatment. In conclusion, application of 0.02% Crina + 0.03% Ronozyme in low nutrient density diet could improve growth performance, and increase the fecal *Lactobacillus* population in broilers.

Key Words: Crina Poultry Plus, Ronozyme ProAct, broilers