Criteria	TC	TC+300	LP	LP+300	SEM
Initial W, kg	28.3	28.3	28.4	28.4	0.04
Final W, kg	127.1	126.0	126.8	127.5	0.82
ADF, kg	2.23	2.22	2.20	2.23	0.02
ADG, kg	0.85	0.84	0.84	0.85	0.01
G:F	0.378	0.377	0.380	0.377	0.003
Carcass Characteristics					
HCW, kg	95.4	94.5	95.4	95.6	0.68
BF, mm	16.3	16.3	16.5	16.5	0.25
Loin depth, cm	6.88	6.83	6.78	6.78	0.05
Lean, %	55.76	55.61	55.46	55.48	0.15
Fecal Composition					
Moisture, %	71.32	70.71	71.08	70.09	0.94
Phosphorus, % of DM	2.27^a	1.69^b	1.71^b	1.05^c	0.05
Bone breaking force, kg	209	202	212	198	5.70

Means in same row with unlike superscripts differ (P < .05)

Key Words: Low Phytate Corn, Phytase Enzyme, Phosphorus Excretion

175 Efficacy of different phytase products for young chicks and pigs.

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Two chick trials and one pig trial were done to investigate the phosphorus-releasing efficacy of different phytase products when added to corn-soybean meal diets containing no supplemental inorganic P (Pi). All phytase premixes were assayed (Na-phytate assay) for phytase activity (U/g) prior to use. In the chick trials, five pens of four chicks were fed each diet from 8 to 22-d posthatching. The first chick assay involved feeding five levels of Pi (0, 0.10, 0.20, 0.30, 0.40%) from KH_2PO_4 with and without 500 U/kg of Natuphos® in diets containing 1.0% Ca. Broken-line least-squares regression analysis of tibia ash (mg) vs dietary available P (%) for each series resulted in good fits (r^2 = 0.98). Inflection points occurred at 0.347% and 0.314% available P for chicks fed diets without and with Natuphos®, respectively. The data also showed constant phytase-induced Pi-release at all levels of available P up to 0.30% of the diet. In the second chick assay, graded levels of Pi (0, 0.05, 0.10, 0.15%) from KH_2PO_4 were fed and compared to two sources and levels (U/kg) of supplemental phytase in diets containing 0.75% Ca. Linear (P < 0.01) responses in tibia ash and weight gain resulted from Pi supplementation. Tibia ash regressed on supplemental Pi intake (r^2 = 0.95) provided a standard curve from which bioefficacy (Pi release) could be calculated for each phytase product. At 500 U/kg diet, Natuphos® released 0.032% Pi whereas Ronozyme® released 0.028% Pi. At 1,000 U/kg, Pi-release values were 0.048% for Natuphos® and 0.038% for Ronozyme®. The pig trial involved 10 individually-fed pigs (9 kg) per diet, and all phytase products were supplemented to provide 400 U/kg in diets containing 0.60% Ca. Based on the linear regression of fibula ash on supplemental Pi intake (r^2 = 0.87), Pi-release values were calculated to be 0.081% for Natuphos® and 0.043% for Ronozyme®. Three experimental E. coli phytase products (expressed in yeast) were also evaluated: ECP1, ECP2, and ECP3 released 0.116%, 0.136%, and 0.108% Pi, respectively. All three of the E. coli phytases released more (P < 0.05) Pi than either Natuphos® or Ronozyme®. An in vitro enzymatic Pi-release assay showed promise in predicting phytase efficacy values that were in good agreement with in vivo efficacy values.

Key Words: Phytase, Chicks, Pigs

176 Release of phosphorus from two phytase products.

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Phytases are a group of enzymes that degrade phytate to yield inorganic phosphorus and various isomers of inositol. Microbial phyatse enzymes are known to differ in their ability to react with phytate and to release phosphorus. A series of studies, three consecutive trials identical in design were conducted to determine the relative efficacy of phytase from *Aspergillus niger* (Natuphos) and from *Peniophora lycii* (Ronozyme). For each trial, 400 male broiler chicks were randomly placed in 40 battery cages and assigned to one of ten treatments (4 replications). An industry-typical corn/soy basal diet was formulated to be adequate in all nutrients except phosphorus and calcium, mixed and subdivided into ten aliquots. The basal diet contained 0.20% aP and 0.5% calcium. Treatments 1-4 were created by adding monocalcium phosphate (MCP) to yield diets containing 0, 0.05%, 0.10% and 0.15% added aP. Limestone was added to maintain Ca at a 2.5:1 ratio with aP. Each enzyme product was analyzed for phytase and added at levels of 150, 300 and 450 FTU/kg diet. (Treatments 5-7 and 8-10 for Natuphos and Ronozyme, respectively). Data from the three trials were combined and treatment responses evaluated using the slope ratio procedure. Significant linear responses for bone ash were found for MCP (R^2 = 0.983, P = 0.008) and for Natuphos (R^2 = 0.986, P = 0.007). For Ronozyme the linear response was not significant (R^2 = 0.779, P = 0.117). A prediction of aP release for Ronozyme was not made based on the non-linearity of the response. Based on these data, the calculated release of available phosphorus relative to MCP for 450 FTU from Natuphos is 0.109%.

Key Words: Phytase, Natuphos

177 Available phosphorus requirement for 33 to 55 kg pigs reared in commercial facilities.

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Two experiments were conducted in commercial research barns to determine the appropriate dietary phosphorous level for pigs from 33 to 55 kg. In Exp 1, 600 gilts (initially 43.2 kg) were randomly allotted by weight to one of two dietary treatments (high or low P) for a 98 d trial. Diets where calculated to have low (.30, .28, .27, .27, .24, and .19%) or high (.37, .33, .30, .28, .27, or .26%) available P (aP) in six phases and diets were fed according to a feed budget. There were 25 pigs per pen, and 12 pens per treatment. In Exp 2, 1,260 gilts (initially 33.8 kg) were blocked by weight and randomly allotted to one of five dietary treatments for a 26-d experiment. The corn-soybean meal based diets contained 6% added fat and were formulated to 1.25% total lysine. Available P levels were 0.5, 0.6, 0.7, 0.8, or 0.9 g aP/Mcal ME (.18, .22, .25, .29, or .32% aP). A constant Ca:P ratio (1.1:1) was maintained in all diets. On d 26, one pig from each pen was randomly selected for harvest of the right femur, third and fourth metatarsals (MT3 & MT4), and sixth rib to determine bone properties. In Exp 1, there were no differences (P>0.15) in overall ADG, ADFI or feed efficiency. In Exp 2, from d 0 to 14, ADG increased linearly (P<0.02; 794, 839, 825, 853, and 839 g/d) and gain/feed increased quadratically (P<0.05; .53, .58, .56, .59, and .57) with increasing available P. There were no differences (P>0.69) in ADFI. From d 14 to 26 or overall, there were no differences in growth data between treatments. There were no differences (P>0.66) in bone properties for MT4; however, strain for MT3 was quadratic (P<0.05) with increasing levels of available P (.80, .71, .73, .69, and .79). Bending moment increased (P<0.01) for both the 6th rib (18.7, 25.5, 24.8, 27.7, and 27.6 kg-cm) and femur (289, 338, 319, 339, and 338 kg-cm) with increasing available P. These results indicate that 0.6 aP/Mcal of ME is adequate to promote growth and maintain bone strength for finishing pigs from 33 to 55 kg. This is equivalent to 8 g/d of total P or 3.2 g/d of available P.

Key Words: Phosphorus, Bone Strength, Pigs

178 Effect of zinc oxide and copper sulfate interactions with sodium chloride in nursery pig diets.

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Previous research suggested that the addition of NaCl to nursery diets improved pig performance, largely due to the Cl ion improving N digestibility. Other research has demonstrated that the addition of dietary zinc oxide or copper sulfate can also enhance pig growth during the postweaning period. Because the Cl ion can alter the pH in the intestinal tract, it could affect the microbial population and mineral status in the intestinal tract. Therefore an experiment was conducted using a 2 X 2 X 2 factorial arrangement in a RCB design conducted in 5 replicates to evaluate if an interaction exists between added dietary levels of NaCl (0 or 0.30%), zinc oxide (0 or 2000 ppm) or copper sulfate (0 or 250 ppm). A total of 176 pigs weaned at 17±2 d of age averaged 6.27 kg BW, and were housed with 4 to 5 pigs per pen in an off-site nursery. Diets for Phase 1 (0-14 d) and Phase 2 (14-28 d) were formulated using feeds typically used for nursery pigs. Dietary treatment levels of NaCl, zinc oxide and copper sulfate were constant during the 28 d trial period. The results showed that the addition of NaCl had no effect (0 vs 0.30%) on daily gain, feed intake or gain: feed ratio. Zinc oxide at 2000 ppm did appear to improve daily gain and daily feed, particularly during the initial 0-14 d period, but responses were not significant (P > 0.15), nor