Diet	NC	NC+T	NC+V	NC+T+V	SEM
PUN, mg/dl	6.43	5.18	6.62	5.33	0.40

Key Words: Sows, Lactation, Limiting Amino Acids

134 Sow and litter responses to dietary organic or inorganic selenium over four parities.

D. C. Mahan* and J. C. Peters, *The Ohio State University, Columbus*.

Ninety crossbred (L × Y) gilts evaluated the effects of Se source and levels on sow reproductive performance, and the Se status of the sow and litter. Experimental diets contained inorganic or organic Se (0.15 or 0.30 ppm Se) in a 2 × 2 factorial. A fifth group was fed an equal combination of the Se sources to 0.30 ppm Se. In addition, a basal non-Se fortified diet (0.06 ppm Se) served as a negative control. Diets were C-SBM based and met 1998 NRC nutrient requirements, except for Se. Six treatments were fed to each of three groups over a four parity period. Sows were bled at 70, 110 d postcoitum and at weaning with serum Se and glutathione peroxidase (GSH-Px) determined. Milk was collected at farrowing and weaning from all sows. Blood Se and serum GSH-Px activity were determined from three weanling pigs/litter. Data were analyzed as a repeated measures design. Sow and litter served as the experimental unit. Total and live pigs born were lower ($P < 0.07$) when the basal was fed. There was no increase in litter size beyond 0.15 ppm Se. Organic and inorganic Se resulted in similar sow and litter performances, except that fewer sows fed the 0.30 ppm Se diets completed the study. There was a trend ($P < 0.07$) for sows fed 0.30 inorganic Se to have more spraddle-legged pigs. Sows fed 0.30 ppm Se had higher serum Se ($P < 0.01$) but similar serum GSH-Px levels as 0.15 ppm Se; both being higher than the basal. Sows fed the combination of Se sources had serum Se and GSH-Px values similar to sows fed other 0.30 ppm Se diets. Colostrum and milk Se concentrations were higher ($P < 0.01$) when organic Se was fed, while feeding the combination of Se sources had colostrum and milk Se concentrations similar to the 0.15 ppm organic Se. Weaning pig serum Se increased as the sow Se level increased but GSH-Px activity values were similar when sows were fed 0.15 or 0.30 ppm Se. These results indicate that reproductive performance of sows can be attained with 0.15 ppm Se from either Se source, but the Se status of the sow and weaned pig was higher with 0.30 ppm Se from organic Se.

Key Words: Selenium, Reproduction, Sows

135 Available phosphorus requirements for finishing pigs reared in a commercial facility.

C. Hastad*, S. Dritz, J. Nelssen, M. Tokach, R. Goodband, and J. DeRouchey, *Kansas State University, Manhattan*.

We conducted an experiment in a commercial research barn to determine the appropriate dietary P level for pigs from 88 to 109 kg BW. We utilized 1,260 gilts allotted by weight to one of five dietary treatments. There were 28 pigs/pen and 9 pens/treatment. The corn-soybean meal-based diets contained 6% added fat and were formulated to 0.80% total lysine. Available P levels were 0.05, 0.10, 0.14, 0.19, or 0.23% which correspond to 0.152, 0.277, 0.402, 0.527, or 0.652 g aP/Mcal ME. A constant Ca:P ratio (1.1:1) was maintained in all diets. At the conclusion of the experiment, two pigs from each pen where randomly selected, tattooed, and slaughtered to obtain third and fourth metacarpals (MC3 & MC4) which were used to determine bone properties. From d 0 to 14, ADG increased linearly ($P < 0.01$; 621, 683, 691, 734, and 707 g/d) and gain/feed increased (linear $P < 0.02$; 0.325, 0.342, 0.344, 0.361, 0.361) with increasing aP. For d 14 to 26 or overall, there were no differences in growth performance between treatments ($P > 0.17$). For bone properties, MC3 bending moment increased (linear, $P < 0.01$; 100.2, 110.3, 118.4, 112.9, and 120.0 kg-cm) with increasing aP; however, bending moment was not different for MC4 ($P > 0.59$). The percentage ash increased, (linear, $P < 0.01$) for both MC3 (50.1, 50.7, 51.9 52.0, and 52.1%) and MC4 (51.2, 51.6, 51.8, 52.7 and 53.3.%) with increasing aP. Using the repeated measures analysis of SAS for combined MC3 and MC4; bending moment and percentage ash increased (linear, $P < 0.04$ and $P < 0.01$, respectively). Results from this study demonstrate the need for supplemental P in the final finishing diets of pigs raised in a commercial facilities. Using the result from this experiment and data presented last year [JAS 80(Suppl 2): Abstr.# 177] , a regression equation ($0.0000316*(\text{wt, kg})^2 - 0.00745*(\text{wt, kg}) + 0.95$) was developed to estimate the aP:Mcal ME ratio for pigs reared in commercial facilities.

Key Words: Pigs, Phosphorus, Commercial Facilities

136 Available phosphorus requirement to maximize growth and bone mineralization in 9 to 22-kg pigs.

R. W. Fent*[1], G. L. Allee[1], D. M. Webel[2], J. D. Spencer[2], A.M. Gaines[1], D. C. Kendall[1], and J. W. Frank[1], [1]*University of Missouri, Columbia,* [2]*United Feeds Inc., Sheridan, IN*.

A total of 128 barrows (9.5 kg BW) were used in a 21-d feeding experiment to determine the available phosphorus (aP) requirement that maximizes growth performance and bone mineralization. Pigs were allotted by weight to one of eight dietary treatments in a completely randomized design with two pigs/pen and eight replications/treatment. Dietary treatments were formulated to contain varying levels of aP through the addition of monosodium phosphate (MSP). Concentrations of aP ranged from 0.08% to 0.64% at 0.08% increments. All diets were corn-soybean meal-based and formulated to contain 1.25% true digestible lysine and a fixed 1.2:1 Ca:total P ratio. The basal diet contained no added MSP. Breaking load and ash content of the left fibula were determined on all pigs at the end of the 21-d test period. Pen served as the experimental unit. Average daily gain, ADFI, and gain:feed increased quadratically ($P < 0.01$) as aP concentration increased in the diet. Two-slope regression analysis indicated that the breakpoint for ADG (0.55 kg/d) and gain:feed (0.74) occurred at 0.22% and 0.29% dietary aP, respectively. Bone breaking load, grams of fibula ash, and percentage of fibula ash also increased quadratically ($P < 0.01$) as dietary aP concentration increased. Fibula ash, as a percentage of dried fat-free bone weight, was maximized in pigs fed the 0.56% aP diet. However, breakpoint analysis determined the point of inflection to be 0.36% dietary aP. Break-point analysis was not appropriate for evaluation of bone breaking load or grams of fibula ash content. Therefore, 90% of quadratic maximum response of these criteria was utilized to estimate the requirement. Both bone breaking load and grams of fibula ash were maximized at 0.56% aP, but 90% of quadratic maximum occurred at 0.41% and 0.39% dietary aP, respectively. These results indicate a differential aP requirement (growth performance, 0.29%; bone mineralization, 0.41%) for the 9 to 22-kg pig depending upon the evaluation criteria measured.

Key Words: Phosphorus, Pigs, Bone

137 Phosphorus balance in growing pigs fed semi-purified diets adequate or low in dietary phosphorus.

L. A. Pettey*, G. L. Cromwell, and M. D. Lindemann, *University of Kentucky, Lexington*.

An experiment was conducted to measure P balance of growing pigs fed semi-purified diets at or below the dietary requirement for P and to estimate the portion of excreted P attributable to endogenous origin. Twelve pigs (59.4 kg) were penned individually in metabolism crates and randomly assigned to three dietary treatments. Diets were: (1) a semi-purified sucrose-dextrose-cornstarch-casein diet (0.82% lysine, 0.08% P) with no added P; (2) as 1 with 0.07% added P from monosodium phosphate (MSP); and (3) as 1 with 0.14% added P from MSP. Calcium was added as Ca carbonate to each diet so that total Ca and P in Diets 1, 2, and 3 were 0.21 and 0.08; 0.39 and 0.15; and 0.57 and 0.22%, respectively. Cellulose (4%) and sand (1%) also were added to the diet. Pigs were fed twice daily equal amounts of feed per replicate to maintain incremental P intake. Pigs were adjusted to treatments for 7 d, followed by a 6-d marker-to-marker collection period. ADG was similar ($P > 0.10$) for each dietary treatment. DM and P intakes for Diet 1, 2, and 3 were 2220, 2237, and 2243 g/d; and 2.18, 3.69, and 5.32 g/d, respectively. Phosphorus excretion in the feces increased linearly ($P < 0.01$) with increasing P intake. Urinary P excretion was low for Diets 1 and 2 (0.018 and 0.102 g/d; $P > 0.10$) but increased ($P < 0.01$) for Diet 3 (0.901 g/d). Absorption and retention of P as a percentage of intake for Diets 1, 2, and 3 were 86.5, 89.8, and 91.1%, and 85.7, 87.1, and 73.9%, respectively. When P absorption (g/d) was regressed on P intake, the relationship was linear ($R^2 = 0.99$) with $y = 0.945x - 0.1556$. Similarly, as P intake increased, fecal P excretion (g/d) also increased linearly ($R^2 = 0.68$) with $y = 0.0608x + 0.1556$. From the two intercepts, excretion of endogenous P in the feces was estimated to be 156 mg/d. Based on