

156 Effect of dietary Ca:tP ratios on apparent absorption of nutrients in different sections of the digestive tract of pigs fed low-phosphorus corn-soybean meal diets supplemented with microbial phytase. J. Liu\*, D. W. Bollinger, D. R. Ledoux, and T. L. Veum, *University of Missouri, Columbia*.

An experiment involving 32 growing-finishing pigs (8 pigs/treatment) was conducted to investigate the effect of dietary Ca:total(t)P ratio on apparent absorption of nutrients in the ileum, cecum, and colon. Dietary Ca provided as ground limestone was reduced in the basal low P corn-soybean meal grower and finisher diets to obtain Ca:tP ratio treatments of 1.5:1, 1.3:1 and 1.0:1. Microbial phytase (Natuphos®, BASF) supplementation at 500 PU/kg replaced .1% of the inorganic (i) P in the low-P basal diets. The basal low P grower (23 to 54 kg) diet contained 0.7% iP, .39% tP, and 14.5% CP. The basal low P finisher (55 to 110 kg) diet contained 32% tP without added iP, and 12.4% CP. A positive control (PC) diet contained .6% Ca and .5% tP in the grower diet, and .5% Ca and .4% tP in the finisher diet with a Ca:tP ratio of 1.2:1. At 110 kg BW the pigs were humanely slaughtered and the small and large intestines collected. Lowering the dietary Ca:tP ratio linearly increased the apparent absorption of P ( $P < .08$ ) and N ( $P < .01$ ). Lowering the Ca:tP ratio also linearly increased the absorption of Ca ( $P < .09$ ) and DM ( $P < .03$ ). Ileal P absorption was 2.24, 4.33, 5.30, and 4.48 ( $\pm 5$ ) g/d, respectively, for the low-P treatments with Ca:tP ratios of 1.5:1, 1.3:1, and 1.0:1 and the PC. Decreasing the Ca:tP ratio from 1.5:1 to 1.3:1 and from 1.5:1 to 1.0:1 increased apparent ileal P absorption by 2.09 and 3.06 g/d, respectively. These results confirm the theory that high dietary Ca interferes with P absorption in the small intestine.

**Key Words:** Calcium, Phosphorus, Phytase, Swine

157 Menhaden fish meal and spray dried animal plasma in phase 1 and 2 diets for pigs at weaning. T. L. Veum\*, C. Tiemeyer, K. Jennings, J. Skaggs, J. Liu, D. W. Bollinger, and M. Eilersieck, *University of Missouri, Columbia*.

Two trials were conducted to evaluate the partial replacement of spray dried animal plasma (AP920®) with Menhaden fish meal (MFM) on a lysine basis in phase (P) 1 diets and complete replacement in the P2 diet. Crossbred pigs (total n = 312) were weaned at an average of 5.5  $\pm$  .01 kg BW and 20  $\pm$  .2 days of age and allotted to treatment by gender, litter and weight. Pens were the experimental units with 90 pens of 3 or 4 pigs/pen. The basal P1 (d 0-14) diet contained 6.0% AP920. Two more P1 treatments were obtained by replacing 2 or 4% of the AP920 with 2.9 or 5.8% MFM, respectively. Other ingredients were 30% dried whey, 15% soybean meal, ground corn, lard, L-lysine.HCl, D-L methionine, and mineral and vitamin supplementation. All diets contained 1.5% lysine, .45% methionine and 3.4 Mcal of ME/kg. In P2 (d 14-28), the P1 treatment replicates were allotted to one of two diets, either 2.0% AP920 or 2.9% MFM in a 3  $\times$  2 factorial arrangement. The P2 diets contained 20% dried whey, 20% soybean meal, 1.4% lysine, .42% methionine and 3.4 Mcal of ME/kg. There were no treatment interactions ( $P > .4$  to .9) between P1 and P2 for growth performance criteria. For P1 and overall, however, treatment and quadratic responses ( $P < .01$ ) occurred because ADFI, ADG and gain:feed ratio were increased with 2.9% MFM and decreased with 5.8% MFM replacements in P1 compared to the 6% AP920 treatment. There were no differences ( $P > 1$  to .9) between the P2 treatments in pig performance. In conclusion, replacement of 2.0% spray dried animal plasma with 2.9% Menhaden fish meal improved growth performance of pigs in phase 1 and overall.

**Key Words:** Swine, Fish meal, Animal plasma, Performance

158 Effects of phytase in low Ca, low P diets on performance and bone strength of finishing pigs. G. L. Cromwell\*, M. D. Lindemann, and H. J. Monegue, *University of Kentucky, Lexington*.

The effects of adding three levels of supplemental phytase (Natuphos-600®, BASF, Mt. Olive, NJ) to low Ca, low P diets on performance and bone strength of finishing pigs were investigated. Hampshire-Yorkshire pigs (n = 120) initially averaging 56.7 kg BW were randomly allotted to five dietary treatments from outcome groups of weight and sex. There were four replications of six pigs per pen. Fortified corn-soybean meal diets containing .75% lysine were fed for 26.5 d (56.7 to 79.5 kg BW) after which lysine was reduced to .65% for the remaining 35 d of the test (79.5 to 110.2 kg BW). During the initial phase, treatments were (1) .55% Ca and .45% P, (2) .45% Ca and .35% P, (3) as 2 + 250 PTU/kg, (4) as 2 + 500 PTU/kg, and (5) as 2 + 750 PTU/kg of added phytase. During the final phase, Ca and P levels in Diet 1 were reduced to .50 and .40%, and in Diets 2 to 5, they were reduced to .40 and .30%, respectively. Mono-dicalcium phosphate and ground limestone were the sources of supplemental Ca and P. All of the P in the .30% P diet was from corn and soybean meal. Analyzed P averaged 18% higher than targeted P levels due to higher than normal levels of P in corn (.30%) and soybean meal (.76%). ADG, feed:gain, and bone (3rd and 4th metacarpals) breaking strength (adjusted for final BW by covariance) for treatments 1 to 5 were 889, 860, 854, 857, 910 g/d; 3.23, 3.45, 3.33, 3.26, 3.29; and 188, 163, 179, 183, 190 kg, respectively. Growth rate tended to decrease, feed:gain increased ( $P < .05$ ), and bone strength decreased ( $P < .01$ ) when dietary Ca and P levels were reduced. Linear improvements in feed:gain ( $P < .05$ ) and bone strength ( $P < .01$ ) occurred with increasing levels of supplemental phytase. The results indicate that finishing pigs fed low P diets respond linearly to phytase additions of up to 750 PTU/kg.

**Key Words:** Pig, Phytase, Phosphorus

159 Effects of select menhaden fishmeal fed during lactation on sow and litter performance. R. E. Musser\*, R. D. Goodband, M. D. Tokach, J. L. Nelssen, and S. S. Dritz, *Kansas State University, Manhattan*.

Soybean meal has been the predominate protein source used in lactation diets in the U.S. Unfortunately, limited information is available to evaluate the effects of highly palatable and digestible protein sources such as select menhaden fishmeal on sow feed intake and performance. A total of 317 sows (PIC, C-15) was used to determine the effect of adding 5% select menhaden fishmeal to the lactation diet on sow and litter performance. During gestation, all sows were fed 1.8 kg/d of a milo-soybean meal gestation diet (.65% lysine) formulated to exceed NRC, (1988) requirement estimates for amino acids, vitamins, and minerals. During lactation, the two dietary treatments consisted of a corn-soybean meal-based control diet or a diet with 5% select menhaden fishmeal replacing soybean meal on a lysine basis. Both diets contained 2.5% added soybean oil and were formulated to 1.0% total lysine. No parity  $\times$  dietary treatment interactions were observed for any of the response criteria ( $P > .10$ ). Adding 5% select menhaden fishmeal to the lactation diet had no effect ( $P > .25$ ) on sow feed intake compared to those fed the control diet (5.19 vs 5.09 kg/d, respectively). The addition of 5% select menhaden fishmeal to the lactation diet had no effect ( $P > .10$ ) on number pigs weaned (9.76 vs 9.8), pig survival from birth to weaning (95.25 vs 95.6%), or litter weaning weight (55.40 vs 56.64 kg). Composition of milk samples taken between d 14 and 16 of lactation was not affected ( $P > .10$ ) by dietary treatment. These results suggest that 5% select menhaden fishmeal can replace soybean meal in a lactation diet with no adverse effects on sow or litter performance.

**Key Words:** Sow, lactation, select menhaden fishmeal