

144 Phosphorus and energy digestibility in enzyme treated soybean meal. K. P. Goebel* and H. H. Stein, *University of Illinois, Urbana*.

Two experiments were conducted to measure P and energy digestibility in soybean meal (SBM) that had been enzyme treated to remove antigens in the meals. The apparent total tract digestibility (ATTD) of P was measured in Exp. 1 in conventional SBM (SBM-CV) and in 2 enzyme treated SBM (HP-310 and HP-340; Hamlet Protein, Horsens, Denmark). During production, HP-310 had been treated with an enzyme mixture containing no phytase while HP-340 was treated with an enzyme mixture that contained microbial phytase. Three diets containing SBM-CV, HP-310, and HP-340 as the only source of P were formulated. Three additional diets were formulated by adding 500 units of microbial phytase (Optiphos 2000; Enzyvia, Sheridan, IN) to each of the original diets. Thirty-six barrows (BW: 21.9 kg) were placed in metabolism cages and randomly allotted to the 6 diets. Pigs were fed experimental diets for 14 d and feces were collected during the final 5 d. The ATTD of P in all SBM was greater ($P \leq 0.05$) as phytase was included in the diet (79.5 vs. 65.5, 77.7 vs. 59.8, and 87.7 vs. 83.8% for SBM-CV, HP 310, and HP 340, respectively). The ATTD of P in HP-340 was greater ($P \leq 0.05$) than in the other 2 meals. In Exp. 2, the DE and ME in corn, SBM-CV and in 2 sources of enzyme treated SBM (HP-200 and HP-300) were measured using 28 barrows (BW: 16.8 kg). A corn-diet (96.45% corn) and 3 diets containing corn and each source of SBM were formulated. Vitamins and minerals were included in all diets. Pigs were placed in metabolism cages and randomly allotted to the 4 diets. The experiment lasted 14 d and feces were collected during the last 5 d. The DE in SBM-CV, HP-200, and HP-300 was 4,347, 4,333, and 4,316 kcal/kg DM, respectively. These values were not different, but they were greater ($P \leq 0.05$) than the DE in corn (3,891 kcal/kg DM). The ME was 3,980, 3,926, 3,914, and 3,780 kcal/kg DM in SBM-CV, HP-200, HP-300, and corn, respectively. These values were not different. It is concluded that enzyme treatment of SBM to remove antigens does not change the digestibility of P or energy in the meals, but if microbial phytase is included in the enzyme treatment, P digestibility is increased.

Key Words: digestibility, pigs, soybean meal

145 Energy concentration and phosphorus digestibility in yeast products, fish meal, and soybean meal fed to growing pigs. B. G. Kim* and H. H. Stein, *University of Illinois, Urbana*.

Two experiments were conducted to measure DE and ME and the standardized total tract digestibility (STTD) of P in 2 novel yeast products (Y1 and Y2), and in brewers yeast (BY), fish meal (FM), and soybean meal (SBM) fed to growing pigs. The concentration of DM, GE, and P was 94.8%, 5,103 kcal/kg and 1.07% in Y1; 94.4%, 4,926 kcal/kg, and 2.01% in Y2; 93.6%, 4,524 kcal/kg, and 1.40% in BY; 91.4%, 4,461 kcal/kg, and 3.26% in FM; and 87.7%, 4,136 kcal/kg, and 0.70% in SBM. The DE and ME in each of the ingredients were measured using 42 growing barrows (28.9 ± 1.28 kg BW). A corn-based basal diet and 5 diets containing corn and 24 to 40% of each

test ingredient were formulated. The total collection method was used to collect feces and urine, and the difference procedure was used to calculate values for DE and ME in each ingredient. The concentrations of DE in corn, Y1, Y2, BY, FM, and SBM were 4,004, 4,344, 4,537, 4,290, 4,544, and 4,362 kcal/kg DM (SEM = 57), respectively, and the ME values were 3,879, 3,952, 4,255, 3,771, 4,224, and 4,007 kcal/kg DM (SEM = 76). The ME in Y2 and FM was greater ($P < 0.05$) than the ME in corn and BY, whereas the ME in Y1 and SBM were not different from that of any of the other ingredients. The STTD of P in the 5 ingredients was determined using 42 barrows (28.3 ± 7.21 kg BW) that were placed in metabolism cages. Five diets were formulated to contain each test ingredient as the sole source of P and a P-free diet was used to estimate the basal endogenous loss of P. Fecal materials were collected for 5 d based on the marker to marker principle after a 5-d adaptation period. The STTD of P in BY (85.2%) was greater ($P < 0.05$) than the STTD of P in all the other ingredients except Y2 (75.7%). The STTD of P in Y1 (73.9%) was not different from the STTD of P in Y2 and FM (67.3%), but greater ($P < 0.05$) than the STTD of P in SBM (56.7%). In conclusion, the 2 novel sources of yeast contain a similar or greater concentration of energy than BY, corn, FM, and SBM, and the STTD of P in the 2 products is not different from the STTD of P in FM.

Key Words: digestibility, pigs, yeast

146 Effects of porcine circovirus type 2 (PCV2) vaccine and increasing standardized ileal digestible lysine:calorie ratio on growth performance of growing and finishing pigs. N. W. Shelton*¹, M. D. Tokach¹, S. S. Dritz¹, R. D. Goodband¹, J. L. Nelssen¹, J. M. DeRouchey¹, and J. L. Usry², ¹*Kansas State University, Manhattan*, ²*Ajinomoto Heartland Inc., Chicago, IL*.

Four experiments were conducted to determine the effect of PCV2 vaccination on the lysine requirement of growing and finishing pigs (PIC 1050 \times 337). Experiments 1 and 2 evaluated 38 to 65 kg gilts and barrows, respectively, and Exp. 3 and 4 evaluated 100 to 120 kg gilts and barrows, respectively. Treatments were arranged in 2 \times 4 factorials with 2 PCV2 treatments (vaccinates and non-vaccinates) and 4 standardized ileal digestible (SID) lysine:ME ratios (2.24, 2.61, 2.99, and 3.36 g/Mcal in Exp. 1 and 2 and 1.49, 1.86, 2.23, and 2.61 g/Mcal in Exp. 3 and 4). There were 5 pens/ treatment with 18 to 27 pigs/pen. No PCV2 vaccination \times SID lysine:ME ratio interactions were observed ($P > 0.17$) in any of the 4 studies. In Exp. 1 and 2, PCV2 vaccinates had increased ($P < 0.001$) ADG compared with non-vaccinates. In Exp. 1, ADG and G:F improved (quadratic; $P < 0.04$) as the SID lysine:ME ratio increased. In Exp. 2, increasing the SID lysine:ME ratio improved (linear; $P < 0.001$) G:F. In Exp. 3, increasing the SID lysine:ME ratio increased (quadratic; $P < 0.05$) ADG and G:F. In Exp. 4, ADG increased (linear; $P < 0.001$) and G:F improved (quadratic; $P < 0.03$) as the SID lysine:ME ratio increased. Although PCV2 vaccination improved performance in Exp. 1 and 2, it did not increase the lysine requirement for growing and finishing barrows and gilts.

Table 1.

SID Lys:ME, g/Mcal	2.24	2.61	2.99	3.36	SE	Non- vacci- nates	Vacci- nates	SE
Exp. 1 (38-60 kg gilts)								
ADG, kg	0.75	0.80	0.82	0.79	0.01	0.73	0.84	0.01
G:F	0.43	0.46	0.48	0.47	0.008	0.46	0.47	0.006
Exp. 2 (39-65 kg barrows)								
ADG, kg	0.87	0.86	0.90	0.91	0.02	0.83	0.94	0.02
G:F	0.42	0.43	0.46	0.47	0.007	0.44	0.45	0.005
SID Lys:ME, g/Mcal	1.49	1.86	2.23	2.61				
Exp. 3 (102- 125 kg gilts)								
ADG, kg	0.75	0.83	0.84	0.84	0.02	0.80	0.83	0.01
G:F	0.28	0.31	0.32	0.32	0.004	0.30	0.31	0.003
Exp. 4 (98-118 kg barrows)								
ADG, kg	0.89	0.94	0.96	1.02	0.01	0.97	0.94	0.01
G:F	0.30	0.30	0.30	0.33	0.006	0.31	0.31	0.008

Key Words: growing pig, lysine, porcine circovirus

147 Lysine requirement for finishing barrows fed ractopamine.

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A total of 36 (Danbred × NE whilene) barrows was used during the final 4 wk of gain for the finishing phase (80 to 120 kg) to determine the total Lys (tLys) requirement of barrows fed ractopamine. Pigs were individually penned in an environmentally-controlled room. Pens were allotted to 1 of 6 dietary treatments in a completely randomized design. The 6 dietary treatments included: a control diet formulated to contain 0.7% tLys with no ractopamine; and 5 diets with 10 ppm ractopamine formulated to contain 0.5, 0.7, 0.9, 1.1 and 1.3% tLys, respectively. All diets were corn-soybean meal based with supplemented crystalline AA. Other AA, except Lys, were formulated at concentrations of at least + 10% of the true ileal digestible AA to Lys ratios (NRC, 1998). Increased Lys concentration was achieved by increasing soybean meal and Biolys inclusions. The addition of Biolys was formulated to provide 12.9% of the tLys concentration in all 6 diets. Treatment did not affect ($P > 0.10$) ADFI. There was no difference ($P > 0.10$) in BF or LM gain. Ractopamine tended to increase ($P = 0.08$) ADG for pigs fed 0.7% tLys (1.12 kg vs 1.28 kg; 0 vs 10 ppm ractopamine, respectively). Increasing Lys concentration of ractopamine diets increased ($P < 0.05$) ADG. Values for ADG ranged from 1.00 kg to 1.41 kg for pigs fed 0.5% and 0.9% tLys, respectively. Subsequently, G:F increased ($P < 0.05$) for pigs fed ractopamine and increased Lys. Values of G:F ranged from 0.29 to 0.42 for pigs fed 0.5 and 1.3% tLys, respectively. Non-linear, broken line, regression was used in order to determine the tLys concentration needed to maximize ADG or G:F for individually-penned barrows fed ractopamine. Regression analysis results indicate that 0.76% tLys (25.5 g/d) is needed to obtain maximum ADG. A tLys concentration of 0.77% (25.8 g/d) is needed in order to obtain maximum G:F. These results suggest that dietary Lys concentration affects growth rate and feed efficiency of barrows fed ractopamine.

Key Words: lysine, pigs, ractopamine

148 Effect of environment on the tryptophan:lysine ratio in nursery pigs. J. W. Frank^{*1}, C. L. Bradley¹, B. E. Bass¹, C. V. Maxwell¹, R. D. Boyd², and J. L. Usry³, ¹University of Arkansas, Fayetteville, ²The Hanor Company Inc., Franklin, KY, ³Ajinomoto Heartland LLC, Chicago, IL.

A total of 432 weaned pigs (GPK35 × PIC 380; 21 d of age; 4.3 kg BW) were housed in one of two environments: A conventional nursery located on the University of Arkansas sow farm (CONV) or an off-site nursery isolated from other pigs (OFF) in order to evaluate the effect of environment on Trp:Lys in nursery pigs. The CONV nursery was cleaned but not disinfected prior to the study. The OFF nursery was cleaned and disinfected. All pigs were housed 6/pen (6 replicates/treatment) and fed a common diet for 5 d prior to the start of the experimental period. During the experimental period (d 6 – 20; 4.9 kg BW), pigs were fed 1 of 6 diets: a positive control diet (1.3% TID Lys, 20.0% TID Trp:Lys), or a titration diet (1.2% TID Lys) with TID Trp:Lys of 14.8, 17.4, 20.0, 22.6, and 25.2%. All pigs were fed a common diet from d 21 – 42. Pigs in the OFF nursery had greater ADG, ADFI, and G:F than pigs in the CONV nursery throughout the experiment ($P < 0.001$). Although there were no statistical differences for the main effect of diet or environment by diet interactions during the experimental period, the growth performance responses to the titration diets in the two environments differed. Orthogonal contrasts of the titration treatments indicate that pigs housed in the OFF nursery had quadratic increases in ADG (244, 303, 329, 306, and 265 g/d; $P = 0.004$), ADFI (378, 458, 458, 444, and 393 g/d; $P = 0.005$) and G/F (0.628, 0.656, 0.698, 0.687, and 0.673; $P = 0.07$) as TID Trp:Lys increased from 14.8 to 25.2% during the experimental period. In the CONV nursery, there were no changes in ADG (186, 188, 193, 219, and 197 g/d) or G/F (0.551, 0.539, 0.522, 0.545, and 0.516) while there was a linear increase in ADFI (335, 344, 361, 382, and 381 g/d; $P = 0.06$) as TID Trp:Lys increased. In conclusion, there was a quadratic increase in the growth rate of pigs housed in the clean, high-health status environment in response to increasing Trp:Lys. Growth rate of the pigs housed in the dirty, low-health status environment did not respond to increasing Trp:Lys.

Key Words: pigs, tryptophan, environment

149 Determination of SID Trp:Lys requirement in grow-finish pig fed diets containing 30% DDGS. R. B. Hinson^{*1}, L. Ma¹, G. D. Gerlemann¹, G. L. Allee¹, J. D. Less², D. D. Hall³, H. Yang³, and D. Holzgraeffe³, ¹University of Missouri, Columbia, ²ADM Specialty Feed Ingredients, Decatur, IL, ³ADM Alliance Nutrition, Quincy, IL.

Three experiments were conducted to determine the optimum SID Trp:Lys ratio in 27-45, 67-85, and 96-117 kg pigs consuming 30% DDGS diets. Each experiment utilized the same group of pigs (PIC 327 × C22 barrows and gilts) that were offered a nutrient adequate diet for at least two wks in between experiments. Pigs were housed in a commercial wean-finish facility with 20-24 pigs/pen. Dietary treatments within each experiment included a corn-sbm diet (SID Trp:Lys = 16) and corn-sbm-30% DDGS diets with SID Trp:Lys ratios of 12, 14, 16, 18, and 20. SID Trp:Lys ratios were obtained by the addition of crystalline L-Trp to the diet. Diets from 96-117 kg diets contained 5 ppm Paylean. From 27-45 kg, a linear ($P < 0.001$) and quadratic ($P < 0.006$) ADG response was observed with increasing SID Trp:Lys ratio, with an ADG plateau at 0.83 kg/d at a SID Trp:Lys ratio of 16. There were no differences in F/G ($P > 0.05$) between the treatments. Broken line and quadratic regression estimation suggests a minimum SID Trp:Lys