

Although the maintenance requirement for threonine may increase during growth, its contribution to the total threonine requirement and the thr:lys ratio is relatively small.

Key Words: Pigs, Threonine, Growth

152 The optimal true ileal digestible (TID) lysine and threonine requirement for finishing pigs from 36 to 60 and 77 to 105 kg. N. Z. Frantz^{*1}, M. D. Tokach¹, S. S. Dritz¹, J. L. Usry², R. D. Goodband¹, J. M. DeRouchey¹, J. L. Nelssen¹, and C. L. Jones¹, ¹Kansas State University, ²Ajinomoto-Heartland LLC.

A total of 4,388 pigs (PIC 337 C22; Exp. 1, 1,070 gilts, initially 36 kg BW; Exp. 2, 3,318 pigs, initially 77 kg BW) were used in 28-d growth assays to examine the TID lysine and threonine requirements, and a TID threonine:lysine ratio for finishing pigs. In Exp. 1, four TID lysine (0.71, 0.81, 0.91, and 1.01%), and five TID threonine (0.50, 0.56, 0.62, 0.68, and 0.74%) levels were evaluated. In Exp. 2, four TID lysine (0.56, 0.64, 0.72, and 0.80%), and five TID threonine (0.43, 0.48, 0.53, 0.58 and 0.63%) levels were evaluated. The diet with the highest lysine and second highest threonine was combined as one diet to give a total of nine diets in each study. In Exp. 1, increasing TID lysine increased ADG (quadratic, $P < 0.06$), with the greatest response occurring from 0.71 to 0.81%. Increasing TID lysine also increased ADFI (quadratic, $P < 0.03$) up to 0.81% TID lysine and improved G:F (linear, $P < 0.01$). Increasing TID threonine did not affect ADG ($P > 0.69$) or ADFI ($P > 0.29$), but improved G:F (linear, $P < 0.05$), with the maximum response at 0.68% TID threonine. Values of 1.01% lysine and 0.68% threonine suggest an optimal TID threonine:lysine ratio of 67% for G:F. In Exp. 2, a treatment gender interaction ($P < 0.02$) was observed for G:F. Gilts had a greater response to increasing TID lysine, whereas barrows had a greater response to increasing TID threonine. Increasing TID lysine improved ADG (linear, $P < 0.05$) in gilts and barrows ($P < 0.07$), and increased G:F (linear, $P < 0.01$) in gilts as lysine increased to 0.72%. Increasing TID threonine improved ADG and G:F (linear, $P < 0.04$) in barrows and improved ADG and ADFI (linear, $P < 0.06$) in gilts as the threonine increased to 0.48%. Values of 0.72% TID lysine and 0.48% TID threonine suggest an optimal TID threonine:lysine ratio of 67%. The TID threonine:lysine ratio suggested by this study for pigs from 36 to 60 and 77 to 105 kg is 67%.

Key Words: Finishing pigs, Lysine, Threonine

153 True digestibility of amino acids in raw and heat-treated soy products: comparison of values obtained with cannulated pigs, cecectomized roosters, and an *in vitro* IDEATM assay. C. Schasteen¹, J. Wu^{*1}, G. Yi¹, C. Knight¹, C. Parsons², J. Li³, and D. Li³, ¹Novus International, Inc., ²University of Illinois, ³Ministry of Agriculture Feed Industry Center.

Two *in vivo* experiments were conducted to determine the essential amino acid (EAA) digestibility of 5 soy products using ileally cannulated pigs, and precision-fed cecectomized roosters. The soy products evaluated were 2 commercial solvent-extracted soybean meal (SBM, hulled and dehulled), and a commercially prepared raw soyflake which was further cooked for 0, 12 or 18 min in a small laboratory autoclave. The ileally cannulated pig assay yielded results for EAA digestibilities that were highly correlated ($r^2 = 0.81$ to 0.99) with those of the rooster assay. No differences in EAA digestibility were observed between the ileally cannulated pig assay and cecectomized rooster assay across soy products ($P=0.08$), except for lower cystine digestibility in pigs ($P<0.02$). Experiments were also conducted to assess the ability of an Immobilized Digestive Enzyme Assay (SBM IDEATM kit, a proprietary product of Novus) on predicting *in vivo* AA digestibility of the same soy products. The results indicated that there were strong correlations of IDEA assay with true ileal AA digestibility determined in swine ($r^2 = 0.79$ to 0.98) and true AA digestibility determined by cecectomized roosters ($r^2 = 0.86$ to 0.99). Results of this study indicated that AA digestibility obtained by the precision-fed cecectomized rooster assay provides good predictor of soy product digestibility in growing pigs. Results also demonstrated that the SBM IDEA kits can be used as a rapid and inexpensive predictor of soy product *in vivo* true AA digestibility for swine and poultry, and may be applied as a QC tool for feed manufacturers. (IDEATM is a trademark of Novus International, Inc.)

Key Words: soy product, true amino acid digestibility, IDEA assay

154 Effects of increasing meat and bone meal on finishing pig growth performance. R. O Gottlob^{*}, R. D. Goodband, M. D. Tokach, J. M. DeRouchey, S. S. Dritz, J. L. Nelssen, C. W. Hastad, K. R. Lawrence, and C. N. Groesbeck, Kansas State University.

A total of 156 finishing pigs (initially 49.9 kg) were used to determine the effects of increasing porcine meat and bone meal on finishing pig growth performance. Pigs were blocked by initial weight and sex, and allotted to one of six dietary treatments. There were two pigs per pen and 13 pens per treatment. Trial duration was 67 d. The dietary treatments were corn-soybean meal-based and formulated on a true ileal digestible (TID) lysine basis, and fed in three phases. In each phase, diets contained 0, 2.5, 5.0, 7.5, 10.0, or 12.5% porcine meat and bone meal. The diets were formulated to 0.85, 0.70, and 0.57% TID lysine in phases 1, 2, and 3, respectively, slightly below the pig/s anticipated requirements, so that if the amino acid digestibility of meat and bone meal was different than typical values, changes in growth performance could be observed. A TID of 80% (NRC, 1998) for meat and bone meal was used in diet formulation. Adding 2.5 or 5.0% meat and bone meal increased (quadratic, $P<0.02$) ADG, while feeding greater than 5.0% resulted in ADG similar to that of pigs fed the control diet. Overall, ADG was 0.99, 1.08, 1.05, 1.01, 1.02, and 0.99 kg for pigs fed 0, 2.5, 5.0, 7.5, 10.0, and 12.5% meat and bone meal, respectively. Increasing meat and bone meal also improved (quadratic, $P<0.01$) G:F compared with pigs fed the control diet. Overall, G:F was 0.33, 0.35, 0.34, 0.34, 0.34, and 0.34 for pigs fed 0, 2.5, 5.0, 7.5, 10.0, and 12.5% meat and bone meal, respectively. Increasing meat and bone meal decreased (linear, $P<0.02$) ADFI; however, the greatest decrease in ADFI was observed in pigs fed greater than 5.0% meat and bone meal. Because the diets were formulated slightly below the pig/s anticipated requirements, the results suggest that the meat and bone meal used in this study was relatively high quality and had greater amino acid digestibility than expected. In conclusion, replacing a portion of soybean meal with meat and bone meal had no negative effects on pig performance.

Key Words: Finishing pigs, Meat and bone meal

155 Portal appearance of amino acids in growing pigs fed diets containing crystalline amino acids as partial replacement for protein-bound amino acids. R. Tabet^{*1}, B. J. Kerr², J. T. Yen³, J. B. Moore¹, and N. L. Trottier¹, ¹Michigan State University, ²USDA National Swine Research Information Center, ³USDA Meat Animal Research Center.

The objective of this study was to determine if partial replacement of protein-bound AA with crystalline AA (CAA) increases portal blood appearance of AA. Six barrows (30 kg \pm 0.5 BW) were assigned to three diets in a repeated Latin Square design. Diets consisted of a 16.9% CP (Control: C), and a 14.5 (Medium: M) and 12.5 % CP (Low: L) containing CAA. The M diet contained L-lys, L-thr, and DL-met, and the L diet contained L-lys, L-thr, DL-met, L-trp, and L-cys to meet true ileal digestible requirements. Feed was given twice daily providing 2.6 times ME required for maintenance. A catheter was placed in the portal vein and blood samples were collected at times (t) -30, 30, 60, 90, 120, 150, 180, 210, and 240 min relative to feeding. Portal lys concentration ($\mu\text{mol/L}$) at t30 was higher ($P<0.001$) in pigs fed L (347.38 \pm 18.24) and M (296.4 \pm 18.38) compared to C (210.32 \pm 18.24). At t60, compared to C (268.42 \pm 18.24), lys was higher ($P<0.01$) in pigs fed L (362.01 \pm 18.23) but similar in pigs fed M (286.35 \pm 18.36). Post t60, lys did not differ between L, M and C. Portal thr concentration at t30 was higher ($P<0.05$) in L (311.37 \pm 17.13) than in M (257.61 \pm 17.23) and C (229.09 \pm 17.13). At t60, portal thr in L (333.08 \pm 17.13) was higher ($P<0.05$) compared to M (263.19 \pm 17.23) and C (284.96 \pm 17.13). Portal thr between M and C did not differ at any time point. Portal met concentrations at t30 and t60 were higher ($P<0.05$) in pigs fed L (102.01 \pm 7.37 and 104.82 \pm 7.37, respectively) compared to C (72.19 \pm 7.37 and 85.40 \pm 7.37, respectively) and did not differ between M (87.70 \pm 7.41 and 84.37 \pm 7.41, respectively) and C. Portal trp at t30 was similar in L (87.35 \pm 4.61) compared to C (81.49 \pm 4.61) and M (77.02 \pm 4.64), but at t60 was lower ($P<0.05$) in M (78.39 \pm 4.64) compared to C (94.17 \pm 4.61). At t60, portal trp was not different between L (88.60 \pm 4.60) and C. Partial replacement of protein-bound AA with CAA increases AA concentrations in portal blood, implying that CAA are absorbed more rapidly than protein-bound AA even in diets formulated on true ileal digestible basis.

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Key Words: Amino acid, Portal, Pig