

**614 The optimum threonine:lysine ratio in nursery diets to maximize growth performance of weanling pigs.** B. W. James\*, R. D. Goodband, M. D. Tokach, J. L. Nelssen, J. M. DeRouchey, and J. C. Woodworth, *Kansas State University, Manhattan.*

The objective of this 21-d growth assay was to determine the optimal apparent digestible threonine:lysine ratio in nursery pig diets to maximize growth performance. A total of 210 pigs (initially 8.2 kg and approximately 25 d of age, PIC C22 × 327) were blocked by weight and allotted randomly to seven dietary treatments. Each treatment had six replicates and five pigs per pen. Corn, soybean meal, and spray-dried whey were analyzed for amino acid concentrations prior to diet formulation. Crystalline L-threonine was added to the basal diet (14.1% CP; 1.07% apparent digestible lysine) to provide 0.48, 0.54, 0.59, 0.64, 0.70, and 0.75% apparent digestible threonine (45, 50, 55, 60, 65 and 70% of lysine). A negative control diet (Neg) contained less L-lysine-HCl and provided 0.97% apparent digestible lysine and 0.75% apparent digestible threonine to ensure that lysine did not exceed the pigs' requirement. During the 21-d experimental period, ADG increased (linear,  $P < 0.02$ ) as the ratio of apparent digestible threonine:lysine increased and was maximized for pigs fed 65% apparent digestible threonine:lysine. Feed intake tended to decrease (quadratic,  $P < 0.09$ ) with increasing concentrations of apparent digestible threonine. Feed efficiency (G:F) improved (linear,  $P < 0.01$ ) as the ratio of apparent digestible threonine:lysine increased and was maximized at 55% threonine to lysine. Plasma urea N measured on d 14 tended to decrease (linear,  $P < 0.08$ ) with increasing apparent digestible threonine. The two-slope broken-line method predicted an approximate apparent digestible threonine requirement of 65 and 52% of apparent digestible lysine for ADG and G:F, respectively.

Item	% Threonine:Lysine						Neg
	45	50	55	60	65	70	
Days 0 to 21							
ADG, g	442	447	460	448	485	447	479
ADFI, g	804	762	758	732	815	787	829
G:F	0.55	0.59	0.61	0.61	0.60	0.61	0.58

**Key Words:** Threonine, Lysine, Weanling pigs

**615 Effects of diet and crystalline glutamine supplementation on growth performance and small intestine morphology of weanling pigs.** S. J. Kitt\*, P. S. Miller, A. J. Lewis, and R. L. Fischer, *University of Nebraska, Lincoln.*

The objective of this experiment was to determine whether crystalline glutamine affects weanling pig growth and/or small intestine morphology. A total of 115, 18 ( $\pm 2$ )-d-old, mixed-sex pigs were used in this study. Four pigs were killed on d 0 to determine base-line intestine morphology. The remaining pigs were blocked by initial BW (6.1  $\pm$  1.1 kg) and randomly allotted to 16 pens and one of four dietary treatments in a 2 × 2 factorial arrangement. Treatments were two diet types (simple or complex) and two supplemental concentrations of crystalline glutamine (0 or 1%). The simple diet consisted primarily of corn and soybean meal. The complex diet consisted primarily of whey, corn, soybean meal, spray-dried plasma, and fish meal. All diets (total dietary lysine = 1.60%) were formulated to exceed all nutrient requirements (NRC, 1998). Average daily gain and ADFI were measured on d 4, 7, 14, and 21. Four pigs from each treatment were killed and duodenal and jejunal samples were collected on d 4. Intestine samples were fixed in 10% formalin and stored in 70% ethanol. Tissues samples were mounted on slides and villus height was analyzed using a commercially available software program. The complex diet improved ( $P \leq 0.10$ ) ADG of pigs during d 0 to 4, 7 to 14, and 14 to 21. The complex diet increased ( $P \leq 0.05$ ) ADFI during d 0 to 4, 4 to 7, 7 to 14, and 14 to 21. The simple diet increased ( $P \leq 0.05$ ) ADG/ADFI during d 7 to 14, and 14 to 21. The addition of glutamine increased ( $P \leq 0.05$ ) ADG/ADFI during d 14 to 21. Villus height was not affected ( $P \geq 0.10$ ) by diet type or glutamine supplementation during d 0 to 4. These data suggest that glutamine improves growth performance in weanling pigs but does not affect villus height during the first four days after weaning.

**Key Words:** Glutamine, Small intestine morphology, Pigs

**616 Responses of pigs and chicks to phosphorus supplementation in casein- vs soybean meal-based diets.** E. G. Xavier\*, G. L. Cromwell, and M. D. Lindemann, *University of Kentucky, Lexington.*

Previously, we have assessed the bioavailability of P in feedstuffs using a dextrose-dehulled soybean meal (SBM) diet (0.22% total P, 0.15% phytate P) with P sources substituted for dextrose. In some instances, it would be desirable to utilize a low-P basal diet containing no phytate P. This study was conducted to assess the suitability of semipurified diets with casein vs SBM as the protein source without and with added P (as monocalcium phosphate) for young pigs and chicks. In Exp. 1, 20 pigs (4 reps, 10.8 kg BW) were fed 5 diets (1.2% lys, 0.8% Ca) for 35 d: sucrose-dextrose (SD)-casein (15%) with 0, 0.1, and 0.2% added P or SD-SBM (40%) with 0.04 and 0.24% added P. The bioavailable P in both basal diets was 0.11%. AA (lys, thr, trp, met, arg) were added as needed. ADG, feed/gain, and breaking strength of the femurs and metatarsals were: 461, 520, 644, 470, 652 g; 2.04, 1.98, 1.89, 1.91, 1.74; 45, 80, 169, 48, 147 kg; 14.9, 22.7, 38.9, 19.6, 39.8 kg. Performance and bone traits of pigs fed the two basal diets were similar as were the linear ( $P < 0.01$ ) responses to added P in both diets. A 14-d study was conducted with 3-d-old chicks fed casein or SBM-based diets. Chicks (4 reps of 6 chicks/pen) were fed: dextrose-starch (DS)-casein (20%) with 0.10, 0.15, 0.20, 0.25, 0.30, and 0.35% added P or DS-SBM (40%) with 0.16, 0.26, and 0.36% added P. Ca was 1.0% in all diets. The two basal diets contained 0.25 and 0.43% total P, and 0.25% non-phytate P. AA were added as needed. ADG and tibia strength were: 20.6, 23.0, 25.1, 24.4, 23.8, 25.7, 19.6, 28.5, 33.7 g; 4.6, 7.4, 9.9, 10.9, 9.7, 11.2, 2.8, 7.8, 13.9 kg. Performance was similar for chicks fed the two basal diets. Growth and bone responses to added P were linear ( $P < 0.01$ ) for both diet types; however, responses were greater for the SBM vs casein diet, primarily due to greater feed intake (43 vs 35 g/d), thus greater P intake, of chicks fed the high-P, SBM diet. The results indicate that casein-based diets containing no phytate P should be acceptable for future P bioavailability studies with pigs and chicks.

**Key Words:** Pigs, Chicks, Phosphorus

**617 Ideal dietary tryptophan regimen for pigs as influenced by antigen exposure.** C. P. Machado\*<sup>1</sup>, T. S. Stahly<sup>1</sup>, and T. J. Stabel<sup>2</sup>, <sup>1</sup>Iowa State University, Ames, <sup>2</sup>National Animal Disease Center, Ames, IA.

Pigs from a high lean strain were reared via a SEW procedure and self-fed a basal diet containing 100% of ideal ratio (IR; NRC, 1998) of digestible tryptophan (Trp) to digestible lysine (Lys). At 30 d of age, pigs were allotted within litter to one of four dietary ratios of Trp:Lys: 50, 75, 100 or 125% (day 0). The basal diet consisted of a corn-SBM-gelatin mixture containing a growth limiting amount of digestible Lys (0.95%) and all other essential amino acids, except Trp, at ratios greater than 100% of IR. Tryptophan was added as L-Tryptophan at the expense of cornstarch. Half of the pigs were administered subcutaneously a non-replicating antigen, autoclaved BCG (13 × 10<sup>6</sup> CFU/mg), at a dose of 0.20 mg/kg BW on d 4, 8 and 12. BCG induces IFN-gamma synthesis and thus indoleamine 2-3 dioxygenase release, which degrades tryptophan in several body tissues. BW gain, gain:feed ratio (GF) and body nitrogen accretion (NA) were determined for three consecutive four-day periods (d 4-16). As dietary Trp:Lys ratios increased, daily BW gain (79, 280, 518, 528 g), GF (.26, .52, .71, .68) and daily NA (3.6, 8.7, 13.9, 14.3 g) increased quadratically ( $P < .01$ ) independent of BCG and period. BCG depressed ( $P < .05$ ) BW gain (316 vs. 386 g), GF (0.51 vs. 0.57) and NA (9.2 vs. 11.1 g) with the magnitude of the depression increasing from d 8 through 16. In conclusion, the IR of Trp:Lys (NRC, 1998) was not altered by exposure to autoclaved BCG, a non-replicating antigen.

**Key Words:** Pigs, Tryptophan, BCG

**618 Pyridoxine (B6) metabolism and requirement in weaned piglets.** J. J. Matte\*, A. Giguere, and C. L. Girard, *Dairy and Swine R & D Centre, AAC, Lennoxville, QC, Canada.*

Three trials were carried out in order to determine the effects of dietary B6 and its interactions with riboflavin (B2) on metabolic criteria such as blood B6 and B2 status, insulinemic responses to *i.v* and gastric glucose, and on growth performance of piglets weaned at 2 wks of age. In