80 Relationship between dietary tryptophan, serotonin synthesis and plasma growth hormone in finishing gilts. M. S. Carlson*, C. R. Hamilton and G. W. Libal, South Dakota State University, Brookings.

Twelve finishing gilts (66.9 kg) were individually fed to investigate a relationship between serotonin (5-HT), growth hormone (GH), and dietary tryptophan (TRP). The experimental design consisted of three complete blocks with a factorial treatment arrangement. Gilts were fed a corn-soybean meal basal diet with 0 or .09% added L-TRP and weekly intraventricular administration of 0 (placebo) or 3 mg/kg BW of para-chlorophenylalanine (p-CPA), an inhibitor of 5-HT synthesis. The basal diet was formulated to contain 11% CP, .12% TRP, and .45% lysine plus .15% added L-lysine. All other essential amino acids and other nutrients met or exceeded current requirements. Urea N (PUN) and growth hormone were determined from plasma samples collected on d 0 and d 28. The experiment was terminated on d 28 (91.3 kg final weight). For the overall 28-d period, a dietary TRP x p-CPA interaction occurred (P = .03) for ADG and ADFI. Among gilts fed similar TRP levels, administration of p-CPA reduced ADG (769 vs 938 g) when 0% L-TRP was added to the diet and increased ADG (1000 vs 901 g) when .09% L-TRP was added. Similar results occurred for ADFI; administering p-CPA decreased ADFI (2.66 vs 3.07 kg) with 0% added L-TRP and increased ADFI (3.05 vs 2.60 kg) when .09% L-TRP was added. Increasing TRP level decreased PUN concentration (P = .09) for the overall period. Administration of p-CPA reduced PUN (7.13 vs 9.17 μg/ml) when 0% L-TRP was added (P = .08) and also lowered PUN levels (6.08 vs 8.06 μg/ml) when .09% L-TRP was added (P = .09). Gain/feed increased (P = .01) as .09% TRP was added (.33 vs .29) but was not affected (P > .10) by p-CPA administration. Orts were significantly higher in diets containing 0% added L-TRP (P = .04). Plasma GH concentration decreased (P = .07) over time from d 0 (average 1.21 ng/ml ± .91) to d 28 (average .28 ng/ml ± .09) but was unaffected by treatment (P > .10). Inhibiting 5-HT synthesis depressed intake and gain when marginal TRP levels were fed but not when dietary TRP was in excess. A relationship between dietary TRP, 5-HT, and plasma GH concentration was not evident.

Key Words: Gilts, Growth hormone, Tryptophan

81 **Influence of dietary lysine (protein) level on growth performance and lean gain from 17 to 109 kg in Dekalb genetic line pigs.** J.A. Kerber*, J.E. Pettigrew, and L.J. Johnston. University of Minnesota, St. Paul.

Three experiments were conducted to determine the optimal sequence of dietary lysine concentrations from 17 to 109 kg in Dekalb genetic line pigs under commercial farm conditions. Twenty-one pigs of the same sex (barrow or gilt) were randomly allotted to each of 24 pens in each experiment. The trials consisted of four dietary treatment sequences divided into three phases (Phase 1 = 6 wk, 5 wk for Exp. 3; Phase 2 = 6 wk; Phase 3 = 2 to 7 wk). All diets contained .15% lysine•HCl and differed in the ratio of soybean meal to corn. Pen weights and feed disappearance were recorded every two weeks. In Phase 1 of Exp. 1, four lysine concentrations (.70, .85, 1.00, 1.15%) were used. ADG (P<.01) and gain efficiency (G/F; P<.05) were greater for pigs fed 1.15 and 1.00 than for pigs fed .85 or .70 (.72, .73 vs .66, .64 kg, SE=.01; .50, .49 vs .45, .43, SE=.01). Phase 1 lysine concentration for all treatments in Exp. 2 and 3 was 1.00%. In Phase 2, ADG (Table) and G/F were reduced by lysine levels below .70%. In Phase 3, lysine concentration was reduced by .10% in Exp. 1 and 2. Reduction of lysine level below .6% reduced ADG and G/F in Exp. 3, but not in Exp. 1. No improvement in ADG (Exp. 1, .64 kg; Exp. 2, .84 kg; Exp. 3, .62 kg) or G/F (Exp. 1, .27; Exp. 2, .28; Exp. 3, .30) resulted from increasing dietary lysine concentration above .60%. Daily lean gain was reduced (P<.01; .26 vs .28 or.29 kg/day, SE=.004) by the lowest lysine sequence in Exp. 1 (.7, .6, .5%) and Exp. 3 (1.0, .5, .5%). There were small differences in response to dietary lysine level between barrows and gilts. Based on these results, it appears that Dekalb genetic line pigs under these conditions should be fed about 1.0, .7, .6% (15, 18, 15 g/day) lysine in Phases 1, 2, and 3.

Phase 2 ADG, kg

		% Lysine							
Exp.	Initial wt, kg	.50	.60	.70	.75	.80	.90	1.00	1.05
1[a]	46.2		.85		.89		.88		.86
2	55.4			.91		.90	.90	.88	
3[b]	45.0	.68	.74	.79		.83			

[a] .75 > .60 (P<.05) or 1.05 (P<.10). [b] .70, .80 > .50, .60 (P<.05).

Key Words: Pigs, lysine, growth

82 **Lean growth response of pigs fed diets balanced on a lysine to digestible energy basis from 20 to 50 kg. B. V. Lawrence*, O. Adeola, and T. R. Cline, Purdue University, West Lafayette, IN.**

Ninety six crossbred pigs, (barrows:gilts, 1:1), were fed diets formulated to contain 2.5, 3.0, 3.5, or 4.0 grams of lysine per Megacalorie (Mcal) of digestible energy (DE) at 3.5 or 3.75 Mcal DE·kg^{-1} of diet in a 2 X 4 X 2 factorial experiment. The pigs, weighing 21.4 kg, were individually housed and allowed ad libitum access to feed and water. Final body composition at 50 kg was determined from equations obtained in a previous study at this research facility utilizing real-time ultrasound and bioelectrical impedence values. Data were analyzed by the GLM procedures of SAS to obtain least square means for the response criteria. Main effects were sex, lysine:DE ratio, and DE level, with no significant interactions detected. Quadratic regression analyses were conducted to describe the relationship between lean gain and lysine:DE ratios for both sexes at 3.75 Mcal DE. The model included the linear and quadratic effects of the lysine:DE ratio on lean growth. Barrows and gilts were similar with respect to lean growth, however, barrows were fatter, (P<.05) with difference between genders more apparent at 3.75 Mcal DE. Gain was unaffected by dietary treatment. Feed intake decreased (P<.0001) as the DE content of the diets increased, leading to an improvement (P<.05) in feed efficiency (G/F). Increasing the lysine:DE ratio at 3.5 Mcal DE did not affect pig performance or body composition, however, a quadratic response (P<.01) to the increasing lysine:DE ratio occurred for total fat free lean, lean gain, empty body protein, and protein gain, as well as empty body lipid. The results of this study indicate the lysine:DE ratio for optimal lean growth is approximately 3.23 grams of lysine per Mcal DE, regardless of gender, when pigs are fed diets containing 3.75 Mcal DE·kg^{-1} of diet.

	3.5 Mcal				3.75 Mcal			
g lysine/Mcal	2.5	3.0	3.5	4.0	2.5	3.0	3.5	4.0
Gain, g/d								
Body	900	891	927	875	911	969	925	899
Lean[a]	291.7	305.7	316.3	309.5	279.4	328.1	316.7	276.6
Protein[a]	96.1	97.1	101.6	97.4	90.7	106.5	99.7	88.3
Feed[b], kg	2.12	2.21	2.12	2.07	1.95	2.00	2.04	1.94
G/F[b]	.43	.40	.44	.42	.46	.49	.45	.47
Body lipid[c], kg	8.0	7.9	8.1	7.5	7.7	8.7	8.8	7.9

[a]Quadratic response (P<.001) to lysine:DE ratio at 3.75 Mcal DE.
[b]Energy response(P<.05). [c]Quadratic response (P<.01) to lysine:DE ratio at 3.75 Mcal DE.

Key Words: Pigs, Lysine, Energy, Lean, Gain

83 **A novel approach for assessing the response to dietary lysine by high-lean growth gilts.** K.G. Friesen*, J.L. Nelssen, A.P. Schinckel[1], R.D. Goodband, M.D. Tokach, and M. Einstein[1]. Kansas State University, Manhattan and [1]Purdue University, West Lafayette, IN.

Conventional response criteria for amino acid research include mean live weight gain or tissue accretion rate over a given weight interval. However, these methods potentially mask the changing response of protein accretion to dietary amino acids during the experiment. Thus, the reliability of modeling growth for 108 high-lean growth gilts was studied to characterize the response to digestible lysine from 34 to 72.5 kg. Gilts were fed diets ranging from .54 to 1.04% digestible lysine (15 to 24 g total lysine intake/d). Corn-soybean meal diets were formulated to assure that lysine was the first limiting amino acid. One pig/pen was selected randomly for slaughter when the mean weight of pigs in a pen reached 55 and 72.5 kg to determine carcass traits and composition. Analysis of variance was used to test linear and quadratic responses in cumulative weight gain on test as digestible lysine increased from .54 to 1.04%. A time by digestible lysine interaction (P < .001) was detected, indicating that separate regression equations for each lysine level were necessary to describe the data. Allometric equations ($Y = aX^b$) were used to develop coefficients for carcass protein and lipid (Y = carcass protein or lipid; a = intercept; X = BW; b = relative growth coefficient). A linear log to log transformation determined tissue accretion as a function of total weight gain via the following equation: carcass protein or lipid = $10^{b_1} \times BW^{b_2}$ (b_1 and b_2 = parameter estimates in table). Protein or lipid accretion rates were estimated as the product of the derivatives for the growth function and the allometric functions. With this model, dietary lysine needed to maximize protein accretion changed over the duration of the experiment. Maximal protein accretion was obtained for gilts fed 1.04, .94 and .84% digestible lysine from 34 to 44, from 44 to 54, and from 54 to 72.5 kg, respectively. Although lipid accretion was minimized for gilts fed 1.04% digestible lysine for the entire experiment, protein accretion was decreased from 44 to 72.5 kg for gilts fed 1.04% digestible lysine. By using ANOVA analysis and resulting means, protein accretion was optimized by feeding gilts .94 and .84% digestible lysine from 34 to 55 and 55 to 72.5 kg, respectively. These means failed to accurately describe the changing protein accretion response to increased digestible lysine over the duration of the experiment. If feeding graded levels of digestible lysine resulted in parallel lines for protein accretion during the entire feeding period, mean values would result in accurate data evaluation. However, responses to digestible lysine changed over the feeding period. Therefore, the use of BW and compositional growth curves offers an innovative approach to accurately characterize the growing pig's response to increased digestible lysine.

Digestible lysine, %	Protein accretion			Lipid accretion		
	b_1	b_2	R^2	b_1	b_2	R^2
.54	-1.39±.08	1.05±.04	.98	-2.91±.37	1.74±.18	.87
.64	-1.46±.08	1.09±.04	.98	-2.51±.32	1.53±.16	.87
.74	-1.68±.12	1.21±.06	.96	-2.21±.27	1.36±.13	.87
.84	-1.63±.09	1.18±.04	.98	-1.97±.32	1.24±.15	.79
.94	-1.62±.10	1.18±.05	.97	-2.01±.28	1.26±.14	.83
1.04	-1.59±.12	1.16±.06	.96	-1.99±.29	1.24±.14	.82

KEY WORDS: Pigs, Growth Modeling, Lysine