104 Growth performance of finishing pigs fed two diets with different protein levels. J. N. Tembei*, G. W. Libal, and C. R. Hamilton, South Dakota State University, Brookings.

Seventy-two finishing pigs were fed to an average pen weight of 115 to 118 kg to evaluate the effects of protein level and sex on growth, efficiency of growth, and backfat thickness. Pigs were divided into three initial weight blocks (pen average of 76.6, 69.8 and 62.0 kg), sorted into pens of four pigs (all barrows, all gilts, and mixed barrows and gilts), and assigned corn-soybean meal diets providing either 12 or 14% protein. Pig and feed weights were recorded weekly. Each pen of pigs was removed from the experiment and tenth rib backfat determined by ultrasound when the pen averaged 115 kg on the weekly weigh day. The experiment was a randomized block design in a 3 x 2 factorial arrangement. Barrows had greater (P < .05) average daily gain (.90 vs .79 and .85 kg, SEM = .02) and greater (P < .01) backfat thickness (2.7 vs 2.3 and 2.5 cm, SEM = .08) than gilts or mixed barrows and gilts, respectively. Feed intake and feed efficiency did not differ (P > .10). Average daily gain, feed intake, feed efficiency, and backfat thickness did not differ (P > .10) due to protein level of the diet nor was there a protein by sex interaction. A 12% protein diet proved to be adequate for barrows, gilts, and mixed barrows and gilts fed between the weights of 62 and 118 kg.

Key Words: Finishing pigs, Sex, Protein level

105 Determination of lysine requirement of growing pigs using plasma urea nitrogen in short-term trials. J. Coma* and D. R. Zimmerman, Iowa State University, Ames, Iowa.

Experiment 1 was conducted to determine the rapidity with which plasma urea nitrogen (PUN) responds to a change in dietary lysine. Twelve pigs averaging 17 kg were individually penned. After a 6-d adaptation period, during which pigs were self-fed a .75% lysine diet, two treatments (.60% and .90% lysine) were randomly assigned to pens. After a 10-d treatment period, all pigs were again fed the .75% lysine diet for 5 d. Initial PUN was used as a covariate. PUN responded (P<.01) in 24 h and stabilized after 3 d to a change in dietary lysine. Using the results of Exp. 1, Exp. 2 and 3 were conducted to assess the lysine requirement of crossbred pigs of a medium-lean genotype at two body weights. Thirty crossbred pigs (15 barrows and 15 gilts), initially averaging 25 kg in Exp. 2 and 36 kg in Exp. 3, were individually penned. After an 8-d adaptation period, five dietary treatments (.60, .70, .80, .90, 1.00 % lysine) were assigned to pens in a randomized block design and were fed for 5 d. In all experiments, a corn-soybean meal diet containing .60% lysine was supplemented with crystalline lysine to obtain the diet treatments. Methionine, threonine and tryptophan were added to diets to meet their needs relative to .90% lysine in Exp. 1 and to 1.00% lysine in Exp. 2 and 3. Diets were balanced for (Na + K-Cl) in Exp. 3. For the treatment period, initial and final weights were 32 kg and 36 kg in Exp. 2 and 44 kg and 49 kg in Exp. 3. In both experiments, PUN changed quadratically (P<.05) with increasing dietary lysine. A two-slope, broken-line regression model estimated an inflection point at .85 % lysine in Exp. 2 and at .76 % lysine in Exp. 3. Sex did not have an effect (P.>05) on PUN. These results indicate that the lysine requirement of the 32- to 36-kg pigs was .85 % of the diet and of the 44- to 49-kg pigs was .76 % of the diet.

	Lysine, %					
Item	.60	.70	.80	.90	1.00	CV,%
PUN, mg/dl:						
Exp. 2*	8.50	7.21	5.11	4.23	3.99	13.63
Exp. 3*	7.98	6.37	5.28	5.96	5.75	13.41

*Quadratic effect (P<.05)

Key Words: Growing Pigs, Lysine, Plasma Urea Nitrogen

106 Increased dietary lysine influences growth performance, carcass characteristics, and serum urea N in high-lean growth gilts fed from 34 to 55 kg. E. G. Friesen*, J. L. Nelssen, R. D. Goodband, M. D. Tokach, J. A. Unruh, L. J. Kats, and J. A. Hansen, Kansas State University, Manhattan.

One hundred and eight high-lean gilts (initially 34.3 kg BW) were used to determine the dietary lysine requirement to optimize growth performance and carcass characteristics from 34 to 55 kg. The experiment was designed as a randomized complete block (three pigs/pen, six pens/treatment) with six dietary treatments varying from .54 to 1.04% digestible lysine (total dietary lysine listed in table). Diets were formulated on an ideal amino acid ratio (NRC, 1988) using calculated amino acid digestibility coefficients. Dietary lysine was increased by adjusting the corn-soybean meal ratio, while L-lysine HCl inclusion was maintained at .05% of the complete diet. Pig weights and feed disappearance were recorded weekly to determine ADG, ADFI, and feed efficiency (G/F). Plasma samples were collected on d 21 and 35 to determine plasma urea N (PUN) concentrations. Average daily gain and G/F increased linearly (P < .05) as dietary lysine increased from .65 to 1.15%. Increases in ADG corresponded to a linear increase (P < .05) in lysine intake (LI). Average daily feed intake was not influenced (P > .10) by dietary lysine. Longissimus muscle area (LMA) increased (P < .05) and backfat (BF) numerically decreased as lysine intake increased, suggesting that the composition of gain was shifted to greater protein accretion. Plasma urea N increased linearly and quadratically (P < .01) on d 21 and 35 of the experiment as dietary lysine increased. Results indicate that 34 to 55 kg gilts selected for increased lean growth potential require greater amounts of dietary lysine than proposed by the NRC (.75% or 14.3 g/d). Although ADG and G/F increased linearly as dietary lysine increased, it appears that they plateau between 18.0 to 18.9 g/d lysine intake. These data suggest that high-lean growth gilts require at least 18 to 19 g/d of dietary lysine, a 4 to 5 g/d increase above NRC (1988) recommendations, in order to optimize growth performance and carcass characteristics from 34 to 55 kg.

	Total dietary lysine, %						
Item	.65	.75	.85	.95	1.05	1.15	CV
ADG, kg[a]	.64	.71	.71	.78	.84	.81	8.8
ADFI, kg	1.75	1.72	1.69	1.69	1.71	1.64	10.6
G/F[a]	.37	.41	.43	.46	.49	.50	8.7
LI, g[a]	11.4	12.9	14.4	16.0	18.0	18.9	10.3
PUN, mg/dL							
d 21[ab]	12.8	12.2	12.0	11.6	13.7	15.8	15.5
d 35[ab]	12.0	11.8	11.9	12.4	15.5	16.2	12.9
LMA, cm^2[c]	21.95	23.85	21.63	22.94	25.81	26.09	9.3
BF, cm	1.48	1.37	.99	1.32	1.21	1.27	19.5

[a]Linear effect of lysine (P < .01). [b]Quadratic effect of lysine (P < .05).
[c]Linear effect of lysine (P < .05).
Key Words: Pigs, Lysine, Growth

107 Interactive effects of porcine somatotropin and salbutamol on the lysine requirement of finishing pigs. J. A. Hansen*, J. L. Nelssen, R. D. Goodband, and J. L. Laurin. Kansas State University, Manhattan.

Two N balance studies (16 pigs/trial) were conducted to evaluate the interactive effects of porcine somatotropin (pST) and the β-agonist salbutamol (Salb) on the lysine requirement of finishing pigs (63 kg BW initially). A split-plot design evaluated the combined use of 0 or 4 mg of pST/d and 0 or 2.75 ppm of salbutamol in the whole-plots and dietary lysine (.8, 1.2, 1.6, and 2%) in the sub-plots. Dietary lysine was administered according to a 4 x 4 Latin square over four 7-d periods with feces and urine collected the last 3 d. Pigs were allowed ad libitum access to feed and water. Plasma was obtained 4 h postinjection (3 h fast) on d 7 of each period for urea N analysis. Interactions between pST and lysine were observed for parameters listed in the table below. For pigs receiving 0 mg of pST/d, ADG decreased with increasing lysine level and for pigs administered 4 mg of pST/d ADG was quadratic with a maximum occurring at 1.2% lysine. Gain/feed was not affected by lysine level in the absence of pST and increased to a plateau at 1.2% lysine for the 4 mg of pST/d group. Urea N was increased linearly by lysine to a greater degree for 0 mg of pST/d than 4 mg of pST/d. No differences in N or DM digestibility were found for pST treatment up to 1.6% lysine, but both were higher with 4 mg of pST/d at 2% lysine. Salbutamol improved ADG, gain/feed, and N or DM digestibility independently of lysine level or pST treatment.

	0 mg pST/d				4 mg pST/d				Salb, ppm	
Item, Lysine	.8	1.2	1.6	2.0	.8	1.2	1.6	2.0	0	2.75
ADG, g[2b]	1227	1138	1063	998	1015	1267	1145	1077	1044	1188
Gain/feed, g/kg[2b]	384	362	357	364	429	523	524	517	405	460
N digestibility, %[2b]	84.0	85.2	86.0	85.0	84.3	86.0	86.2	88.3	84.8	86.4
DM digestibility, %[2b]	86.2	86.1	85.2	83.5	86.8	86.2	85.1	86.2	85.1	86.2
Urea N, mg/dl[a]	13.9	19.6	25.5	30.0	6.1	8.4	12.3	15.8	16.3	16.6

[a]Lysine x pST interaction (P < .06). [b]Main effect of salbutamol (Salb; P < .05).

Efficiency of lysine utilization (g gain/g lysine intake) decreased quadratically (P < .01) with increasing lysine level (.8%, 50.4; 1.2%, 36.9; 1.6%, 27.5; 2%, 22.0), but was increased (P < .01) by both pST (0 mg, 29.5; 4 mg, 38.9) and Salb (0 ppm, 32.3; 2.75 ppm, 36.1) administration. Daily N retention (g) was increased linearly (P < .001) by dietary lysine level (.8%, 27.6 ; 1.2%, 32.8 ; 1.6%, 34.3; 2%, 37.6) and with Salb (0 ppm, 28.5, 2.75 ppm, 37.7). Both pST and Salb increased (P < .001) retained N as a percentage of N intake (0 mg, 33.1; 4 mg, 47.7; 0 ppm, 35.4; 2.75 ppm, 45.4) and digestible N (pST: 0 mg, 39.9; 4 mg, 55.4; Salb: 0 ppm, 41.7; 2.75 ppm, 52.6). Dietary lysine linearly decreased (P < .001) retained N as a percentage of N intake (.8%, 45.6 ; 1.2%, 43.2 ; 1.6%, 37.3; 2%, 35.6) and digestible N (.8%, 54.1 ; 1.2%, 50.3 ; 1.6%, 43.3; 2%, 40.8). These data indicate that salbutamol does not affect the lysine requirement of the finishing pig, but somatotropin appears to increase it to approximately 1.2% of the diet or about 26 to 29 g/d.

Key Words: Amino Acids, Pigs, Growth Regulators