310 The influence of dietary lysine on growth performance, carcass characteristics, and tissue accretion rates in high-lean growth gilts from 55 to 72.5 kg. K.G. Friesen[1], J.L. Nelssen[1], R.D. Goodband[1], M.D. Tokach[1], J.A. Unruh[1], L.J. Kats[1], and B.J. Kerr[2]. [1]Kansas State University, Manhattan and [2]Nutri-Quest Inc., Chesterfield, MO.

Seventy-two high-lean growth gilts (initially 55.3 kg BW) were used to determine the dietary lysine requirement to optimize growth performance, carcass characteristics, and protein accretion from 55 to 72.5 kg. The experiment was designed as a randomized complete block (two pigs/pen, six pens/treatment) with six dietary treatments ranging from .54 to 1.04% digestible lysine (.68 to 1.25% total lysine). Diets were formulated on an ideal amino acid ratio using calculated amino acid digestibility coefficients. Dietary lysine was increased by adjusting the corn-soybean meal ratio, while L-Lysine HCl 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). When the mean weight for pigs in a pen reached 72.5 kg, one pig/pen was slaughtered to determine longissimus muscle area (LMA), average backfat thickness (BF), protein accretion (PA), and lipid accretion (LA). Average daily gain (quadratic, $P < .10$) and G/F (linear, $P < .01$; quadratic, $P < .01$) were greater as digestible lysine increased. However, ADFI was not influenced ($P > .10$) by dietary treatment. Digestible lysine did not influence LMA; however, BF was decreased (linear, $P < .01$) as digestible lysine increased. Protein accretion increased (linear, $P < .05$; quadratic, $P < .10$) and lipid accretion decreased numerically with greater digestible lysine. The quadratic effect of dietary lysine suggests that high-lean growth gilts require at least 21 to 22 g/d total dietary lysine (LI) for optimal ADG, G/F, and PA. Lipid accretion was numerically lowest for pigs fed .84% digestible lysine. These data represent a 16% (21.8 vs 18.7 g/d) increase in total dietary lysine requirement above NRC (1988) recommendations to optimize growth performance and protein accretion rate.

	Digestible/total lysine, %						
Item	.54/.68	.64/.79	.74/.91	.84/1.02	.94/1.14	1.04/1.25	CV
ADG, kg[a]	.77	.80	.87	.86	.83	.83	8.8
ADFI, kg	2.37	2.33	2.22	2.09	2.27	2.18	10.8
G/F[bc]	.33	.34	.39	.41	.37	.38	10.4
LI, g/d[b]	18.06	18.65	21.78	22.17	26.76	28.64	11.3
LMA, cm^2	31.10	32.32	33.61	34.06	33.81	33.48	7.8
BF, cm[b]	1.75	1.80	1.50	1.35	1.30	1.27	10.0
PA, g/d[ad]	84.8	90.9	130.7	113.0	137.6	111.3	27.4
LA, g/d	123.1	127.0	103.2	72.7	94.4	127.3	53.9

[a]Quadratic effect of lysine ($P < .10$).
[b]Linear effect of lysine ($P < .01$).
[c]Quadratic effect of lysine ($P < .01$).
[d]Linear effect of lysine ($P < .05$).

Key Words: Lysine, Gilts, Growth performance

311 Lysine requirement of finishing pigs determined by using plasma urea nitrogen in short-term trials. J. Coma* and D. R. Zimmerman, Iowa State University, Ames, Iowa.

Plasma urea nitrogen (PUN) was used in a short-term trial to assess the lysine requirement of finishing pigs of a medium-lean strain at a specific body weight. Sixty crossbred pigs, initially averaging 67 kg, were randomly allotted to 15 pens which each contained two barrows and two gilts. After a 4-d adaptation period, five dietary treatments (.50, .60, .70, .80, .90 % lysine) were randomly assigned to pens within blocks and fed for 4 d. A corn-soybean meal diet containing .50 % lysine was supplemented with crystalline lysine to obtain the diet treatments. Methionine, threonine, tryptophan and isoleucine were added to diets to meet their needs relative to .90 % lysine. Diets were balanced for (Na+K-Cl). For the treatment period, initial and final weights averaged 70 kg and 74 kg, respectively. Correlation between initial (adaptation period) and final (treatment period) PUN was .61. Initial PUN was used as a covariate ($P < .002$). Increasing dietary lysine caused PUN to decrease quadratically ($P < .0007$). PUN response to lysine levels was different ($P < .05$) between sexes. Two linear (one-slope and two-slope broken line) and two nonlinear (quadratic and quadratic with plateau) regression models were used to estimate the lysine requirement from the PUN data. The one-slope broken line did not fit the response because the slopes of both lines were different ($P < .05$) than zero. The two-slope broken line regression model estimated an inflection point at .69 % lysine for barrows and at .75 % lysine for gilts. The quadratic model estimated similar requirements (concentration at which the response reached 90 % of the minimum response): .68 % lysine for barrows and .74 % lysine for gilts. The lysine requirement for barrows could not be estimated by the quadratic model with plateau. For gilts, an inflection point at .745 % lysine was obtained. It is concluded that, when the different models fit the PUN data adequately, the estimated lysine requirement of 70- to 74-kg medium-lean pigs are nearly the same: .69 % of the diet for barrows and .75 % of the diet for gilts.

		Dietary lysine, %					
Item	Sex	.50	.60	.70	.80	.90	CV,%
PUN[ab], mg/dl:	Barrow	9.91	8.54	7.12	7.87	8.21	9.38
	Gilt	11.58	8.73	7.34	6.75	8.11	

[a]Quadratic effect of lysine ($P < .0007$).
[b]Sex x lysine effect ($P < .05$).

Key Words: Finishing Pigs, Lysine, Plasma Urea Nitrogen

312 Relationship of plasma urea nitrogen to carcass measurements and estimates of rate of lean growth in pigs of four strains. Gene Gourley* and Dean Zimmerman, Iowa State University, Ames, Iowa.

Plasma Urea Nitrogen (PUN), Bioelectrical Impedance Analyzer (BIA) and Ultrasound Backfat (USB) were used to estimate lean of 144 barrows of four strains from 45 to 120 kg. Thirty-six pigs from each strain were assigned by weight to three pens (heavy, medium, and light-weight). Each strain was randomly assigned a pen within weight group blocks. All pigs were fed a corn-soybean meal-lysine•HCL diet with .90% lysine from 45 to 90 kg BW and .70% lysine from 90 to 120 kg BW. Pigs were weighed every 14 d, blood was drawn, and BIA and USB measures were taken at a pen average of 68 kg BW and again at 114 kg BW. Four randomly selected pigs from each pen had blood drawn, BIA and USB measures every 14-d weigh period after 68 kg BW. Pigs were weighed and slaughtered at 120 kg BW. Hot carcass weight, carcass length, backfat at fifth, last rib and last lumbar, 10th rib loin muscle area, backfat 3/4 off midline at the 10th rib, and BIA readings were determined. Because of illness, some pigs from each treatment were removed during the experiment. BIA estimates of carcass fat-free-mass did not reveal any strain differences. PUN did not differ (p>.10) among strains at 68 or 114 kg BW. Lean estimations of carcass and growth were determined for pigs of all strains using NPPC (1991) formulas. Percentage lean of pigs of strain 3 was less (p<.01) than those of strains 1 and 2 and less (p<.05) than that of pigs of strain 4. Pigs of strain 4 had slightly less lean than pigs of strain 1 (p<.01) and 2 (p<.05). Strain 2 pigs had less (p<.05) lean than pigs of strain 1. Pigs of strain 3 deposited lean at a slower (p<.01) rate than other strains. Pigs of strain 4 (p<.01) and strain 2 (p<.05) deposited lean slower than pigs of strain 1. Lean growth rate did not differ (p>.10) between strains 2 and 4. Correlations of average PUN of the subset of 12 pigs per strain that were repeatedly sampled during the growing-finishing period and NPPC (1991) percent lean were -.86,-.80, -.24, and -.17 for strains 1, 2, 3 and 4, respectively. Correlations of average PUN and lean estimates made at 68 kg BW (USB and BIA) were lower than estimates made at 114 kg or at slaughter. Correlations of PUN and USB at 114 kg BW were .90, .81, .68, and .12 for strains 1, 2, 3 and 4, respectively. Correlations of PUN and BIA fat-free-mass of 114 kg BW were -.88, -.74, -.58, and -.35 for strains 1, 2, 3 and 4, respectively. Why PUN and lean estimates were highly correlated for strains 1 and 2 but not strains 3 and 4 is not known. However, the diet may have supplied an excess of protein and amino acids for strains 3 and 4. This excess may have made PUN less responsive as an estimator of lean among pigs of strains 3 and 4 than of strains 1 and 2.

Key Words: Pigs, Plasma Urea Nitrogen, Strain

313 Interactive effects of genotype and dietary protein level on growt and body composition in mice. M.J. Bertram, W.D. Schoenherr, E.J. Eisen, M.T. Coffey. North Carolina State University, Raleigh

A 3 x 4 factorial experiment was conducted to examine the effects c dietary protein level and genotype on performance and body composition of mice Forty, 3 week old mice were allotted from each of three lines that had bee selected as follows: High (HF) or low (LF) epididymal fat pad weight and randomly mated control. Each of 4 littermate male mice were allotted to diet formulated to contain 12, 16, 20 or 24% crude protein (CP) and remained on te until 9 wk of age. Diets were a corn-soybean meal mix fortified with vitamins ar minerals to meet NRC (1972) requirements for laboratory mice and dietary C levels were obtained by changing the ratio of corn and soybean meal. Feed ar water were available ad libitum. No genotype by dietary protein level interactic was detected in this study; thus, data were pooled across genotype to examir the effects of dietary treatment. From 3 to 5 wk of age, ADG ($P < .06$) ar gain:feed ratio (GF) ($P < .005$) changed quadradically as dietary CP level increase with 20% CP producing maximal ADG and GF. Over the entire study, ADG w not affected and GF changed quadradically ($P < .02$) with increasing dietary (level, with 16% CP producing maximal GF. Protein gain (PG) from 3 to 9 wk age exhibited a quadratic response ($P < .02$) and fat gain (FG) decreased lineai ($P < .001$) as dietary protein level increased. In conclusion, in the first two wee of the experiment maximal ADG and GF was seen in mice consuming 20% C However, over the entire study, a 16% diet produced maximal protein gain, a feeding CP levels above this resulted in decreased growth and carcass fatne possibly due to the energetic cost of de-aminating excess amino acids.

	DIETARY PROTEIN PERCENT				P<		
TRAIT	12	16	20	24	L	Q	C
ADG, g/d							
3 to 5 wk	.958	1.051	1.089	1.047	.05	.07	.88
3 to 9 wk	.613	.626	.601	.584	.18	.44	.60
GF							
3 to 5 wk	.197	.231	.242	.240	.001	.005	.66
3 to 9 wk	.111	.119	.117	.115	.42	.02	.23
PG, g	3.93	4.32	4.19	3.95	.91	.02	.48
FG, g	6.32	5.65	5.04	4.32	.001	.96	.94

Key Words: Mice, Protein, Growth, Body Composition