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EFFECTS OF INCREASING STANDARDIZED ILEAL DIGESTIBLE LYSINE:CALORIE RATIO FOR 120- TO 180-lb GILTS GROWN IN A COMMERCIAL FINISHING ENVIRONMENT[1,2]

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Summary

A 28-d growth trial was conducted to estimate the lysine requirement for 120- to 180-lb gilts. A total of 1,092 gilts (initially 121.7 lb, PIC 337 × 1050) were allotted to treatment diets with standardized ileal digestible (SID) lysine/ME ratios of 1.89, 2.12, 2.35, 2.58, 2.81, and 3.04 g/Mcal. All diets contained 0.15% L-lysine HCl and 3% choice white grease and were formulated to meet or exceed all other requirements. Seven replicate pens per treatment were used; there were approximately 26 pigs per pen. Gilts were vaccinated with 2 doses of commercial porcine circo virus type 2 (PCV2) vaccine while in the nursery. As the SID lysine content of the diet increased, both ADG and F/G improved (linear, $P < 0.001$) with the greatest values at the SID lysine/ME ratio of 2.58 g/Mcal. Daily SID lysine intake and SID lysine intake per pound of gain increased (linear, $P < 0.001$) as lysine density of the diet increased. Diet did not influence ($P > 0.25$) feed cost per pound of gain; however, there was a tendency for improved (linear, $P < 0.06$) income over marginal feed cost (IOMFC) as SID lysine level increased in the diet. The SID lysine/ME ratio that yielded the greatest IOMFC value, 2.58 g/Mcal, corresponded to the treatment with the greatest growth response. On the basis of this trial, 2.58 g SID lysine/Mcal ME appears to provide the greatest biological and economical response for 120- to 180-lb gilts.

Key words: gilt, lysine, requirement

Introduction

As feed prices continue to increase, producers must optimize feed efficiencies to minimize feed costs. Because lysine is the first limiting amino acid in corn-soybean meal-based swine diets, it is essential for nutritionists and producers to utilize the most effective lysine level to maximize efficiency without incurring extra costs. Lysine requirements are often expressed in terms of standardized ileal digestible (SID) lysine or as a ratio of SID lysine to the ME level in a diet. This ratio allows dietary lysine levels to be altered for a variety of feeding situations in which different feed ingredients are used. Lysine requirements need to be routinely reevaluated as genotype and heath status change within the production system. Currently, porcine circovirus type 2 (PCV2) vaccine is used to protect against the performance and economic effects related to porcine circovirus disease. The vaccine also has been shown to increase growth rates.

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[2] Appreciation is expressed to New Horizon Farms for the use of its pigs and facilities and Richard Brobjorg and Marty Heintz for technical assistance.
[3] Food Animal Health and Management Center, College of Veterinary Medicine, Kansas State University.

Therefore, the objective of this experiment was to estimate the lysine requirement of 120- to 180-lb gilts vaccinated with PCV2 vaccine.

Procedures

Procedures in this experiment were approved by the Kansas State University Institutional Animal Care and Use Committee. A total of 1,092 gilts (initially 121.7 lb, PIC 337 × 1050) were used in a 28-d growth trial to estimate the lysine requirement for 120 to 180 lb gilts. Gilts were vaccinated with 2 doses of commercial PCV2 vaccine while in the nursery and housed in a curtain-sided commercial finishing barn located in southwest Minnesota. There were 26 pigs per pen.

All diets were corn-soybean meal based with 0.15% added L–lysine HCl. Soybean and corn levels were altered to achieve the desired lysine concentration in the diet. All diets contained 3% added fat in the form of choice white grease. Diets were formulated to meet all other requirements recommended by NRC (1998). The SID lysine/ME ratios for the experimental diets were 1.89, 2.12, 2.35, 2.58, 2.81, and 3.04 g/Mcal (Table 1). During the trial, diet samples were collected and analyzed to validate the calculated amino acid values.

Pens of pigs were allotted to 1 of 6 dietary treatments in a completely randomized design with 7 replicate pens per treatment. Pig weights (by pen) and feed disappearance were measured throughout the trial at 14-d intervals to determine ADG, ADFI, F/G, daily SID lysine intake, SID lysine intake per pound of gain, feed cost per pound of gain, and income over marginal feed costs (IOMFC). Income over marginal feed costs was calculated by assessing a value to the weight gain per pig ($60/cwt) during the trial and subtracting the feed costs incurred per pig. The data were analyzed for linear and quadratic effects of increasing SID lysine:calorie ratios by using the PROC MIXED procedure in SAS with pen as the experimental unit.

Results and Discussion

Daily gain and F/G improved (linear, $P < 0.001$, Table 2) as SID lysine:calorie ratios increased in the diet. The greatest numeric increases in ADG and F/G were observed up to 2.58 g SID lysine/Mcal ME. No statistical trends were detected ($P > 0.70$) for ADFI. Therefore, daily SID lysine intake increased (linear, $P < 0.001$) as dietary SID lysine levels increased. SID lysine intake per pound of gain also increased (linear, $P < 0.001$) as lysine density of the diets increased. On the basis of the performance results, it appears that approximately 9 g SID lysine were required for each pound of gain. No differences were observed ($P > 0.25$) for feed cost per pound of gain; however, IOMFC tended ($P < 0.06$) to increase linearly as SID lysine:calorie ratio increased. The greatest economical response was at 2.58 g SID lysine/Mcal ME, which corresponds to the growth response. These data illustrate that 2.58 g SID lysine/Mcal ME provides the most efficient growth and economic responses for 120- to 180-lb gilts.

Figures 1 and 2 show results from our trial compared with those from a similar trial conducted by Main et al. (2002) in the same southwest Minnesota research facility with the same genetic line of pigs (PIC 337 × 1050). Growth plateaus were reached at slightly higher SID lysine:ME ratios in our trial than in the earlier trial.

This higher lysine requirement was not surprising as we continue to reap the benefits of growth due to genetic advancement as well as improved overall health with PCV2 vaccination. Kansas State University previously recommended using approximately 2.35 g SID lysine/Mcal ME for 120- to 180-lb gilts. The data from this trial show that utilizing a slightly higher value of approximately 2.58 g SID lysine/Mcal ME will help maximize biological and economic responses in healthy pigs with good feed intakes and growth rates.

Table 1. Composition of diets

	SID[1] lysine:calorie ratio (g/Mcal)					
	1.89	2.12	2.35	2.58	2.81	3.04
	SID lysine, %					
Item	0.66	0.74	0.82	0.90	0.98	1.06
Corn	81.00	77.85	74.65	71.50	68.30	65.15
Soybean meal (46.5% CP)	13.90	17.10	20.25	23.45	26.60	29.80
Choice white grease	3.00	3.00	3.00	3.00	3.00	3.00
Monocalcium P (21% P)	0.63	0.61	0.59	0.58	0.56	0.54
Limestone	0.85	0.85	0.85	0.85	0.85	0.85
Salt	0.35	0.35	0.35	0.35	0.35	0.35
Vitamin premix	0.05	0.05	0.05	0.05	0.05	0.05
Trace mineral premix	0.05	0.05	0.05	0.05	0.05	0.05
Lysine HCl	0.15	0.15	0.15	0.15	0.15	0.15
DL-Methionine	---	---	---	0.005	0.015	0.035
L-Threonine	---	---	0.005	0.010	0.015	0.025
Optiphos 2000	0.025	0.025	0.025	0.025	0.025	0.025
Total	100.0	100.0	100.0	100.0	100.0	100.0
Calculated analysis						
Lysine:ME ratio, g/mcal	2.15	2.40	2.65	2.90	3.16	3.41
SID amino acids, %						
Lysine	0.66	0.74	0.82	0.90	0.98	1.06
Isoleucine:lysine	70	70	70	69	69	69
Leucine:lysine	180	171	163	157	152	148
Methionine:lysine	32	30	29	29	29	30
Met & Cys:lysine	65	62	60	58	58	58
Threonine:lysine	63	62	62	62	62	62
Tryptophan:lysine	19	19	19	19	19	20
Valine:lysine	84	82	80	79	78	77
ME, kcal/lb	1,581	1,581	1,580	1,580	1,580	1,580
Total lysine, %	0.75	0.84	0.92	1.01	1.10	1.19
CP, %	13.5	14.7	15.9	17.1	18.3	19.6
Ca, %	0.51	0.52	0.52	0.53	0.54	0.54
P, %	0.46	0.46	0.47	0.48	0.49	0.50
Available P, %[2]	0.29	0.29	0.29	0.29	0.29	0.29
Avail P:calorie, g/Mcal	0.82	0.82	0.82	0.82	0.82	0.82
Diet cost, $/ton[3]	232.62	237.94	243.38	248.96	254.62	260.62

[1] SID = standardized ileal digestible.
[2] Phytase provided 0.1% available P to the diet.
[3] Diet costs were based on corn at $5.00/bu and 46.5% soybean meal at $350/ton.

Table 2. Effects of standardized ileal digestible (SID) lysine:calorie ratio on performance of 120- to 180-lb gilts[1]

	SID lysine:calorie ratio (g /Mcal)								
	1.89	2.12	2.35	2.58	2.81	3.04			
	SID lysine, %							Probability, *P* <	
	0.66	0.74	0.82	0.90	0.98	1.06	SE	Linear	Quadratic
Initial weight, lb	121.7	121.7	121.7	121.7	121.7	121.7	2.22	0.99	0.98
ADG, lb	1.99	1.96	2.10	2.15	2.15	2.13	0.03	0.001	0.12
ADFI, lb	4.72	4.63	4.77	4.66	4.82	4.64	0.10	0.95	0.71
F/G	2.37	2.36	2.27	2.17	2.24	2.18	0.04	0.001	0.35
Final weight, lb	177.5	176.9	180.3	181.8	182.5	182.2	2.41	0.05	0.68
Daily lysine intake, g	14.2	15.6	17.8	19.0	21.5	22.4	0.365	0.001	0.63
Lysine intake/lb gain, g	7.10	7.94	8.47	8.89	9.96	10.51	0.160	0.001	0.61
Feed cost/lb gain, $[2]	0.276	0.281	0.277	0.271	0.285	0.285	0.005	0.26	0.35
IOMFC, $/pig[3]	18.12	17.51	19.01	19.81	18.99	18.76	0.499	0.06	0.12

[1] A total of 1,092 gilts (PIC 337 × 1050) were housed at approximately 26 pigs per pen and 7 replications per treatment in a 28-d trial.
[2] Feed costs were based on corn at $5.00/bu and 46.5% soybean meal at $350/ton.
[3] IOMFC = Income over marginal feed costs (weight gain × $0.60/lb - feed cost).

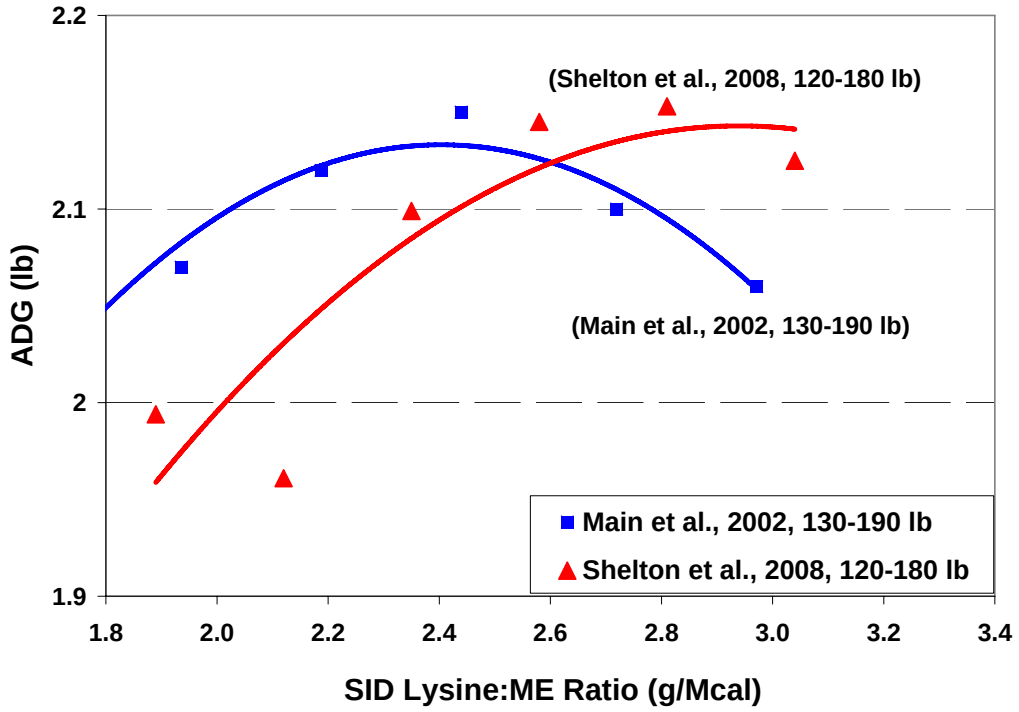

Figure 1. Comparison of ADG response to standardized ileal digestible (SID) lysine:calorie ratio for two gilt studies.

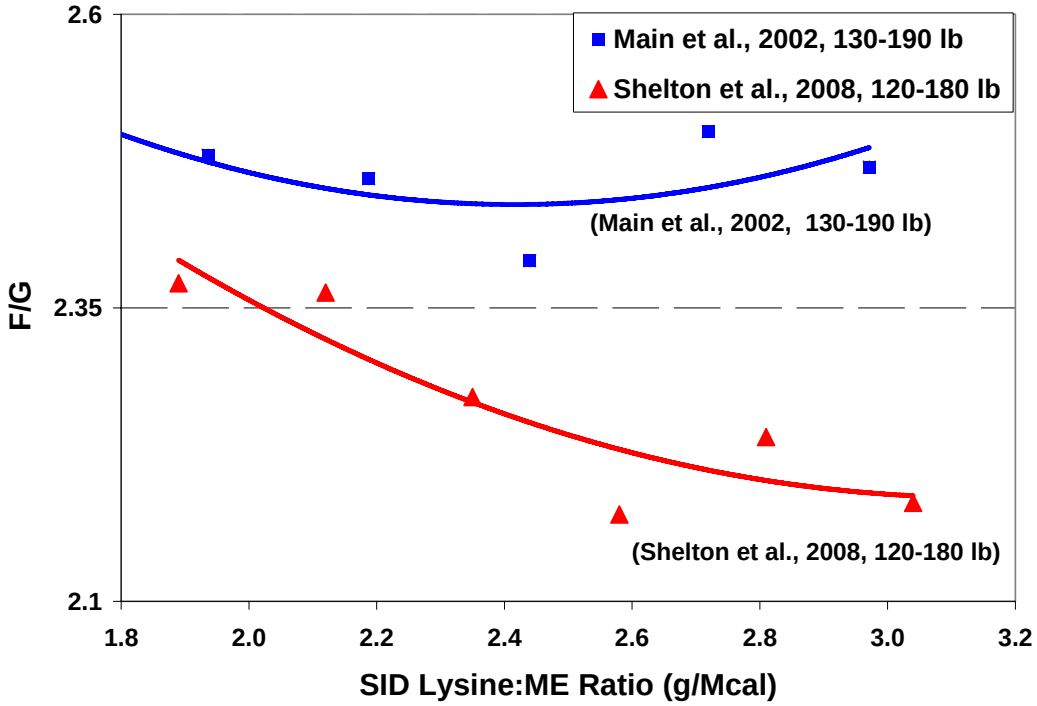

Figure 2. Comparison of F/G response to standardized ileal digestible (SID) lysine:calorie ratio for two gilt studies.