Animal Reproduction Science 184 (2017) 1–10

Contents lists available at ScienceDirect

Animal Reproduction Science

journal homepage: www.elsevier.com/locate/anireprosci

Effect of feeding three lysine to energy diets on growth, body composition and age at puberty in replacement gilts☆,☆☆

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ARTICLE INFO

Keywords:
Age at puberty
Feed intake
Growth rate
Lysine
Replacement gilts

ABSTRACT

This study evaluated the effect of diets differing in standard ileal digestible (SID) lysine on lysine intake, growth rate, body composition and age at puberty on maternal line gilts. Crossbred Large White × Landrace gilts (n = 641) were fed corn-soybean diets differing in SID lysine concentration (%, g SID lysine:Mcal ME); diets were not isocaloric. Gilts received three grower, finisher diet combinations: low (0.68% lysine grower, 0.52% lysine finisher), medium (0.79% lysine grower, 0.60% lysine finisher) or high (0.90% lysine grower, 0.68% lysine finisher). Grower diets were fed from 100 until 142 days of age, and finisher diets were fed until they reached 220 days of age. Body weight (BW), backfat thickness (BF), and loin depth (LD) were recorded every 28 days. From 160–220 days of age, gilts were exposed daily to vasectomized boars and observed for behavioral estrus. Gilts fed the low lysine diet had lower average daily gain and BW ($P < 0.05$), but not fat depth:LD ratio. The percentage of gilts that displayed natural estrus by 220 days of age was low but not different among dietary treatments (low 27.7%, medium 31.0% and high 37.7%, respectively; $P = 0.1201$). Gilts fed the high and medium diets reached puberty 10 and 6 days earlier, however, than gilts fed the low lysine diet ($P < 0.05$). The rate of puberty attainment may have been less because all gilts contracted porcine epidemic diarrhea (PEDv) just as boar exposure was to begin for the first group of gilts. Results from the

☆ This research was funded by the National Pork Checkoff under the Sow Lifetime Productivity Project #12-209. The authors would like to thank Murphy Brown LLC for their collaboration during this project.

☆☆ Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture.

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http://dx.doi.org/10.1016/j.anireprosci.2017.06.007
Received 21 December 2016; Received in revised form 5 June 2017; Accepted 20 June 2017
Available online 23 June 2017
0378-4320/ Published by Elsevier B.V.

present study indicate that growth rate and age at puberty can be altered by *ad libitum* fed diets that differ in SID lysine concentration.

1. Introduction

Proper gilt development is of vital importance to maximize sow reproductive performance and sow longevity. The Animal Science Committee of the National Pork Board commissioned studies to develop *ad libitum* fed gilt development diets that result in reduced

Table 1
Experimental grower and finisher diets composition used to feed to maternal line[a] gilts to evaluate three lysine concentrations and determine the effects on growth, body composition and age at puberty, as-fed basis.

Item	Grower diets			Finisher diets		
	Low lysine	Medium lysine	High lysine	Low lysine	Medium lysine	High lysine
Corn	48	58	73	49	66	80
De-oiled corn germ	16	8.0	0.0	20	7.5	0.0
Soy bean meal (47.25% CP)	14	14	17	7.5	7.5	10
Wheat middlings	18	15	5.0	18	15	5.0
Yellow grease	1.0	1.0	1.0	2.9	1.0	1.0
Limestone	0.98	0.92	0.76	0.93	0.90	0.77
Dicalcium phosphate (21%)	1.2	1.3	1.6	0.98	1.1	1.4
Liquid L-lysine (50%)	0.0	0.33	0.60	0.0	0.29	0.45
Salt	0.40	0.40	0.40	0.40	0.40	0.40
Black iron oxide dye	0.0	0.0	0.25	0.0	0.0	0.25
Blue dye	0.01	0.0	0.0	0.01	0.0	0.0
Methionine hydroxy analogue 88% liquid	0.0	0.0	0.11	0.0	0.0	0.03
L-Threonine	0.0	0.04	0.14	0.0	0.02	0.09
Sow trace mineral premix[b]	0.18	0.18	0.18	0.18	0.18	0.18
Sow vitamin premix[c]	0.05	0.05	0.05	0.05	0.05	0.05
Biotin, 200 mg/l	0.03	0.03	0.03	0.03	0.03	0.03
L-tryptophan	0.0	0.0	0.03	0.0	0.0	0.02
Calculated values[d], %						
ME, Mcal/kg	2.95	3.07	3.21	3.08	3.13	3.27
NE, Mcal/kg	2.36	2.44	2.56	2.46[f]	2.49	2.59
Crude protein	16.94	15.66	14.89	14.70	12.83	12.10
Total lLysine	0.81	0.90	0.99	0.65	0.70	0.76
SID[e] lysine	0.64	0.77	0.91	0.49	0.58	0.67
SID lysine:ME ratio, g/Mcal	2.3	2.6	2.8	1.7	1.9	2.1
Diet free lysine equivalent[g]	0	0.16	0.30	0	0.14	0.22
SID threonine	0.48	0.49	0.59	0.39	0.39	0.45
SID isoleucine	0.27	0.27	0.33	0.14	0.14	0.20
SID lysine	0.64	0.77	0.91	0.49	0.58	0.67
SID methionine	0.25	0.24	0.32	0.22	0.20	0.22
SID threonine	0.48	0.49	0.59	0.39	0.39	0.45
SID tryptophan	0.16	0.15	0.16	0.13	0.11	0.12
ME, Mcal/kg	2.95	3.07	3.21	3.08	3.13	3.27
SID lysine:ME ratio, g/Mcal	2.29	2.57	2.79	1.69	1.94	2.08
Linoleic acid	1.30	1.48	1.68	1.50	1.57	1.76
Chemically determined values, %						
Crude protein	16	13	13	16	14	12
Total Lysine	0.86	1.04	0.99	0.69	0.67	0.74
Free Lysine	0.02	0.14	0.20	0.03	0.13	0.20
Methionine	0.24	0.20	0.19	0.25	0.20	0.20
Threonine	0.75	0.48	0.49	0.77	0.59	0.50
Tryptophan	0.18	0.16	0.18	0.20	0.18	0.17

[a] Maternal line = Large White × Landrace.
[b] Premix provided the following minerals per kg: Mn, 19 mg; Zn, 77 mg; Fe, 77 mg, Cu, 12 mg; Se, 171 ppm; I, 400 ppm; Cr, 114 ppm.
[c] Premix provided the following vitamins per kg: vitamin A, 20,566,783 IU; vitamin D3, 2,932,099 IU; vitamin E, 117,504 IU; vitamin B12, 73 mg; Biotin, 589 mg; Menadione, 9700 mg; Riboflavin, 14,698 mg; d-Pantothenic acid, 58,790 mg; niacin, 88,183 mg; folic acid, 4409 mg.
[d] Calculated using ME values for the ingredients obtained from the NRC (2012).
[e] Standard Ileal Digestible; calculated using SID coefficients for the various ingredients obtained from the NRC (2012).
[f] Energy value of this diet elevated because more fat was required to provide a minimum of 1.50% linoleic acid; one of two parent essential fatty acids.
[g] Free lysine is computed from the ingredient liquid L-lysine which is 50% lysine by multiplying the diet percent x 0.50; This can be compared to the analyzed free lysine in the diet; The latter accounts only for added synthetic lysine, not which is ingredient bound as protein.