

The Effects of Dietary Fat and Lysine on Pig Growth, Pork Quality and Carcass Composition

J.M. Eggert, E.J. Farrand, A.P. Schinckel, and S.E. Mills
Department of Animal Sciences

Today's swine producers continue to use genetics which produce lean pork as efficiently as possible. Unfortunately, swine genotypes which provide a high percentage of carcass lean also tend to be very low in their amount of intramuscular fat, or marbling. One lean genotype was tested on diets which differed in levels of lysine and supplemental dietary fat. Diets which contained less than ideal amounts of lysine were utilized to inhibit lean growth in an effort to allow for more intramuscular fat to be deposited prior to slaughter.

Materials and Methods

Twenty-four gilts were produced by mating Dekalb Pietrain sires to Dekalb (Large White-Landrace) dams. The gilts were reared using segregated early weaning procedures. From 60 to 198 lbs. liveweight, the pigs were fed a conventional diet which contained .90% lysine and one percent added fat (Basal Diet). At 198 lbs. liveweight, pigs were randomly assigned to one of three diets with the same formulation as the Basal Diet except that they contained .85% lysine (Diet 1), .56% lysine (Diet 2), or .64% lysine with 10% added beef tallow (Diet 3). Diets 2 and 3 were formulated to have equivalent lysine:calorie ratios (Table 1) and all diets were offered on an ad-libitum basis. Pigs were slaughtered at 264 lbs. liveweight.

Results and Discussion

Growth Performance. Pigs fed Diet 2 had lower on-test average daily gains, more days on test, and higher slaughter ages than did pigs fed Diets 1 or 3 (Table 2). Average daily feed intakes and gain:feed ratios were not significantly different. The lysine limits imposed in Diet 2 did slow the growth to slaughter weight; however, the addition of dietary fat to a lysine-limited diet (Diet 3) allowed pigs to reach slaughter weight equally as fast as those fed the high lysine diet (Diet 1) while consuming less feed (Table 2).

Pork Quality and Carcass Composition. Pigs fed Diet 3 (.64% LYS + 10% added fat) had significantly more first rib backfat, last rib backfat and 10th rib fat depth, while pigs fed Diet 2 (56% LYS) had significantly less (Table 3). The added fat treatment also resulted in thicker outer and middle 10th rib backfat layers while no differences were found for the innermost layer (Table 3). No differences in carcass length, loin eye area, dressing percentage or kidney fat were found between the dietary treatments. The dietary treatments did not affect color, firmness or marbling evaluations of the loin (Table 4). Thus, limiting lysine in a diet supplemented with 10% beef tallow caused more backfat to be deposited, but did not affect the intramuscular fat.

Summary

Manipulating levels of dietary fat and lysine can affect the amount of fat deposition without adversely affecting growth performance. However, in this trial, the amount of intramuscular fat was not affected. Because this line of pigs is only depositing backfat and is not actively depositing much visible marbling by 264 lbs. liveweight, the treatments only have an effect on the backfat. Additional trials need to be performed with lines that vary in their ability to deposit intramuscular fat while on test in order to better determine whether diets which differ in supplemental fat and lysine levels can affect pork quality.

Table 1. Composition of dietary treatments.

<u>Ingredient (lbs./ton)</u>	<u>Basal Diet^a</u>	<u>Diet 1</u>	<u>Diet 2</u>	<u>Diet 3</u>
		<u>.85% LYS</u>	<u>.56% LYS</u>	<u>.64%+fat</u>
Corn	1543.7	1586.0	1791.1	1515.2
48% Soybean Meal	384.0	354.5	144.8	220.9
Lysine HCl	3.3	3.0	3.0	3.0
Dicalcium Phosphate	22.0	29.2	33.6	35.1
Limestone	15.0	14.8	15.0	13.3
Salt	5.0	7.0	7.0	7.0
Vitamin Premix	2.5	3.0	1.0	3.0
Trace Mineral Premix	1.0	1.5	1.5	1.5
Selenium Premix	1.0	1.0	1.0	1.0
Beef Tallow	---	---	---	200.0
Yellow Swine Grease	20.0	---	---	---
Tylosin Phosphate (40g/lb.)	2.5	---	---	---
Total	2000.0	2000.0	2000.0	2000.0
<u>Calculated Percentages</u>				
Crude Protein	15.65	15.14	11.16	11.73
Mcal ME/lb	1529.29	1502.00	1500.18	1721.00
Lysine	.90	.85	.56	.64
Ca	.64	.70	.70	.70
P	.54	.60	.60	.60
Lysine/Mcal	2.67	2.57	1.69	1.69

^a This ration had 100g/ton of Tylan.

Table 2. Least squares means of growth traits for three dietary treatments.

	Diet 1 <u>.85% LYS</u>	Diet 2 <u>.56% LYS</u>	Diet 3 <u>.64%+fat</u>	<u>SE</u>	<u>Significance^a</u>
<u>On Test (198-264 lbs.)</u>					
ADFI (lbs.)	6.34	4.92	5.33	0.35	not significant
Feed/Gain	3.25	3.55	2.96	0.40	not significant
Gain/Feed	0.31	0.29	0.34	0.04	not significant
ADG (lbs.)	1.88	1.44	1.82	0.70	***
Days on Test	36.50	44.50	36.50	1.21	***
Age at Slaughter	178.50	189.00	178.50	1.87	***
Slaughter Weight	265.79	263.53	264.25	3.67	not significant

^a *, **, *** = P<.05, P<.01, P<.001 respectively.

Table 3. Least squares means of carcass composition traits for three dietary treatments.

	Diet 1 <u>.85% LYS</u>	Diet 2 <u>.56% LYS</u>	Diet 3 <u>.64%+fat</u>	<u>SE</u>	<u>Significance^a</u>
<u>Backfat Depths</u>					
First Rib (in.)	1.40	1.29	1.69	0.08	**
Last Rib (in.)	0.85	0.68	0.86	0.06	not significant
Last Lumbar (in.)	0.67	0.57	0.74	0.04	*
10 th Rib Fat Depth (in.)	0.63	0.56	0.77	0.05	*
10 th Rib Outer Layer (in.)	0.25	0.25	0.30	0.02	*
10 th Rib Middle Layer (in.)	0.25	0.21	0.31	0.02	*
10 th Rib Inner Layer (in.)	0.14	0.10	0.16	0.02	not significant
<u>Carcass Composition</u>					
Carcass Length (in.)	33.22	33.09	33.13	0.24	not significant
Loin Eye Area (sq.in.)	7.53	7.96	7.44	0.33	not significant
Dressing Percentage	76.46	75.04	76.11	1.63	not significant
Kidney Fat (lbs.)	2.81	3.25	3.61	0.29	not significant

^a *, **, *** = P<.05, P<.01, P<.001 respectively.

Table 4. Least squares means of pork quality traits for three dietary treatments.

	Diet 1	Diet 2	Diet 3	SE	Significance ^a
	<u>.85% LYS</u>	<u>.56% LYS</u>	<u>.64%+fat</u>		
<u>Carcass Quality^b</u>					
Color	2.88	2.88	2.88	0.18	not significant
Firmness	2.94	3.19	2.88	0.20	not significant
Marbling	1.42	1.51	1.57	0.16	not significant

^a *, **, *** = P<.05, P<.01, P<.001 respectively.

^b 1-5 NPPC scoring system, evaluated on the loin at the 10th rib.