THE INFLUENCE OF GENOTYPE, SEX, AND DIETARY LYSINE ON SUBPRIMAL CUT DISTRIBUTION OF 230 AND 280 LB. FINISHING PIGS[1]

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Summary

One hundred sixteen pigs were used to determine effects of the interrelationship among genotype, sex, and dietary lysine on subprimal cut distribution of pigs fed to 230 and 280 lb. In a 2 × 2 × 2 factorial arrangement, barrows and gilts, previously characterized as having either high or medium lean-gain potential, were fed one of two dietary lysine regimens. One pig per pen was slaughtered when the mean weight of pigs in a pen reached 230 lb and the remaining two pigs were fed until the mean weight reached 280 lb. When fed to either 230 or 280 lb, carcasses from high-lean genotype pigs or gilts had higher percentages of combined closely trimmed boneless ham, loin, and shoulder than medium-lean genotype or barrow carcasses, respectively. Dietary lysine level had minimal influences on subprimal cut distribution. The highest percentages of major lean subprimal cuts for pigs fed either to 230 or 280 lb were in high-lean genotype gilts.

(Key words: Pork, Lysine, Sex, Genotypes, Meat Yield.)

Introduction

Because of consumer demand, a major priority over the past 5 years in the swine industry has been the production of lean pork. Packers are driving the industry towards leaner, more efficient pigs with market premiums and giving discounts for fat, less efficient hogs. Research has indicated that lean gain can be influenced by genotype, gender, and dietary lysine. Improved genetic evaluation and selection have resulted in pigs with increased lean gain potential and feed efficiency but decreased backfat measurements.

By selecting for increased lean gain and using split sex feeding methods, the potential exists for increased dietary lysine to optimize lean growth and subprimal cutout. Thus, the objective of this experiment was to determine the interrelationship between genotype, sex, and dietary lysine and how these factors influence the distribution of subprimal cuts.

Procedures

Diets, growth performance, and carcass characteristics for the pigs used in this study are described in previous papers in this Report of Progress. One hundred sixteen pigs were used in a 2 × 2 × 2 factorial arrangement. Genetic comparisons were made between pigs previously characterized as having either high or medium lean-gain potential. Within genotype, barrows and gilts were fed separately two dietary lysine regimens in pens of three. Pigs were fed either a diet containing .90 or .70% dietary lysine until a mean weight of pigs in a pen equaled or exceeded 230 lb. One pig from each pen was then selected randomly and slaughtered. The remaining two pigs were

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fed diets that were decreased from .90 and .70% to .75 and .55% dietary lysine, respectively, and slaughtered when their mean weight reached 280 lb.

Twenty-four hours postmortem, carcass data were collected. Then carcasses were fabricated into closely trimmed, bone-in and boneless, subprimal cuts according to Institutional Meat Purchase Specifications (IMPS). All boneless cuts were trimmed to less than .25 in. of fat.

Results and Discussion

USDA grade, percent muscle, and subprimal cut yield percentages for pigs fed to 230 lb are given in Table 1. High-lean genotype pigs had ($P<.05$) carcasses with more desirable USDA grades; heavier chilled side wt; a higher percent of 402C boneless ham, whole loin, 410 loin, 413 boneless loin, 415 tenderloin, and combined boneless ham, loin, and shoulder; and a lower percent of 420 front foot than medium-lean genotypes. Gilts had more desirable USDA grades ($P<.05$); higher percent muscle; and a higher percent of whole ham, 402 ham, 402C boneless ham, 410 loin, 413 boneless loin, 415 tenderloin, and combined boneless ham, loin, and shoulder than barrows. Dietary lysine did not influence ($P<.05$) USDA grade, percent muscle, or subprimal cut percentages.

For pigs fed to 280 lb (Table 2), high-lean gain pigs produced carcasses ($P<.05$) with more desirable USDA grades; heavier chilled side weights; a higher percent of whole shoulder, 404 shoulder, 405A boneless picnic shoulder, 406 Boston butt, 406A Boston butt, whole loin, 410 loin, 413 boneless loin, 415 tenderloin, and combined boneless ham, loin, and shoulder; and a lower percent of whole belly, hind foot, and 420 front foot than medium-lean genotype pigs. High-lean genotype carcasses also tended to have a higher percent of 402C boneless ham ($P=.06$) and a lower percent of 416 spareribs ($P=.08$) and 408 belly ($P=.09$). Gilts at 280 lb produced carcasses with more desirable USDA grades; higher percent muscle; and a higher percent of whole ham, 402 ham, 402C boneless ham, 405 picnic shoulder, 410 loin, 415 tenderloin, and combined boneless ham, loin, and shoulder than carcasses from barrows. Gilt carcasses tended also to have a higher percent of 405A boneless picnic shoulder ($P=.06$) and 413 boneless loin ($P=.09$).

Lower dietary lysine carcasses had ($P<.05$) a higher percent 405A boneless picnic shoulder than higher dietary lysine carcasses. Sex × dietary lysine interactions ($P<.05$) occurred for last rib backfat and percent 404 shoulder, 406 Boston butt, 406A boneless Boston butt, and 416 spareribs. The higher lysine barrow carcasses had more backfat ($P<.05$) than lower lysine barrow, higher lysine gilt, or lower lysine gilt carcasses. Higher lysine gilt carcasses had ($P<.05$) a higher percent of 404 shoulder and 406A boneless Boston butt than higher lysine barrow carcasses and a higher percent of 406 Boston butt than lower lysine gilt carcasses and higher lysine barrow carcasses.

Even though last rib backfat, 10th rib fat depth, and calculated percent muscle were similar for high lean-gain and medium lean-gain carcasses from pigs fed to 230 and 280 lb, high lean-gain carcasses had 3.0 and 2.7% higher yields of boneless, closely-trimmed ham, loin, and shoulder than medium lean-gain carcasses, respectively.

Compared with barrows, gilt carcasses had less carcass fat measured as last rib backfat and 10th rib fat depth and larger loin eye areas, resulting in more desirable USDA grades and 3.4 and 2.4% higher calculated percent muscle for pigs fed to 230 and 280 lb, respectively. Furthermore, gilt carcasses had 2.4 and 2.1% more combined boneless ham, loin, and shoulder for pigs fed to 230 and 280 lb, respectively, than barrow carcasses. Dietary lysine levels had minimal effects on subprimal cut distribution. The highest yields of major lean subprimal cuts for pigs fed to 230 or 280 lb were in high-lean genotype gilts. Therefore, the packer's desire for heavier weight, high cutability hogs can be achieved by feeding high-lean genotype gilts to 280 lb.

Table 1. The Effects of Genotype, Sex, and Dietary Lysine on Subprimal Cut Distribution for Pigs Fed to 230 lb[a]

	Genotype		Sex		Dietary lysine, %		
Carcass traits	High (H)	Medium (M)	Barrow (B)	Gilt (G)	.90	.70	CV
Last rib backfat, in	.90	.94	1.00[f]	.84[g]	.94	.89	15.2
Muscle score[b]	2.3[h]	2.1[i]	2.2	2.2	2.2	2.1	17.7
USDA grade[c]	1.3[h]	1.7[i]	1.8[f]	1.2[g]	1.5	1.5	44.6
10th rib fat depth, in	1.10	1.08	1.24[f]	.94[g]	1.11	1.07	19.4
Loin eye area, in^2	5.2	4.9	4.7[f]	5.4[g]	5.1	5.0	10.7
Percent muscle[d]	52.6	52.5	50.9[f]	54.3[g]	52.5	52.7	4.4
Chilled side wt, lb	85.8[f]	82.7[g]	84.1	84.4	85.2	83.3	4.0
Ham (whole), %	23.7	23.7	23.4[h]	24.1[i]	23.9	23.6	4.4
402 Ham, %	22.0	21.8	21.4[h]	22.4[i]	22.1	21.7	5.4
402C Ham, boneless, %	17.6[h]	16.4[j]	16.4[f]	17.6[g]	17.2	16.9	8.4
Shoulder (whole), %	21.0	21.5	21.2	21.3	21.0	21.5	5.7
421 Neck bone, %	1.6[j]	1.5[j]	1.5[j]	1.6[j]	1.6	1.6	17.3
404 Shoulder, %	17.6	17.8	17.5	17.8	17.5	17.8	5.2
405 Picnic shoulder, %	9.2	9.5	9.4	9.3	9.3	9.4	6.6
405A Picnic shoulder, boneless, %	6.9	6.8	6.8	6.8	6.8	6.9	8.5
406 Boston butt, %	8.4	8.0	8.2	8.2	8.1	8.3	10.7
406A Boston butt, boneless, %	7.7	7.4	7.4	7.7	7.5	7.6	10.0
Loin (whole), %	29.2[f]	27.8[g]	28.6	28.4	28.5	28.5	4.6
410 Loin, %	22.1[f]	20.2[g]	20.3[f]	22.0[g]	21.1	21.2	4.6
413 Loin, boneless, %	13.9[f]	12.6[g]	12.9[h]	13.6[i]	13.3	13.2	7.4
415 Tenderloin, %	1.3[f]	1.1[g]	1.1[f]	1.2[g]	1.2	1.1	13.0
416 Spareribs, %	3.7	3.6	3.6	3.7	3.6	3.8	9.2
Belly (whole), %	15.6	16.0	16.0	15.6	15.8	15.8	8.0
408 Belly, %	13.4	13.8	13.6	13.6	13.6	13.6	7.6
Jowl, %	3.0	3.0	3.2	2.8	3.0	3.0	20.5
Hind foot, %	1.8[k]	2.0[k]	1.9[k]	1.9[k]	1.9	1.9	11.6
420 Front foot, %	1.2[h]	1.3[i]	1.2	1.2	1.2	1.3	9.4
Boneless ham, loin and shoulder, %[e]	47.3[f]	44.3[g]	44.6[h]	47.0[i]	45.9	45.7	6.6

[a]Percentage of chilled side wt.
[b]Muscle score: 1=thin, 2=average, and 3=thick.
[c]USDA grade=(4 × last rib backfat, in) - (1 × muscle score).
[d]Percent muscle=100 × [10.5 + (0.5 × hot carcass weight, lb) + (2.0 × loin eye area, in^2) - (14.9 × 10th rib fat depth, in)]/ hot carcass weight, lb
[e]100 × (402C ham + 405A picnic shoulder + 406A Boston butt + 413 Loin + Tenderloin)/chilled side wt.
[fg]Means within genotype, sex, or dietary lysine level differ ($P < .01$).
[hi]Means within genotype, sex, or dietary lysine level differ ($P < .05$).
[j]Genotype × sex interaction ($P < .05$) for 421 neck bones, % - MG (1.7) > MB (1.4), $P < .05$; HB (1.6) and HG (1.5) intermediate.
[k]Genotype × sex interaction ($P < .05$) for hind foot, % - MG (2.1) > HB (1.9) and HG (1.7), $P < .05$; MB (1.9) intermediate.

Table 2. The Effects of Genotype, Sex, and Dietary Lysine on Subprimal Cut Distribution for Pigs Fed to 280 lb[a]

	Genotype		Sex		Dietary lysine, %		
Carcass traits	High (H)	Medium (M)	Barrow (B)	Gilt (G)	.90/75	.70/.55	CV
Last rib backfat, in	1.06	1.13	1.16[j]	1.03[j]	1.12[j]	1.07[j]	11.5
Muscle score	2.3[f]	2.0[g]	2.1	2.3	2.2	2.2	13.9
USDA	2.0[h]	2.5[i]	2.5[f]	1.9[g]	2.3	2.1	24.2
10th rib fat depth, in	1.32	1.34	1.46[f]	1.20[g]	1.37	1.29	16.5
Loin eye area, in^2	6.1[f]	5.5[g]	5.5[f]	6.1[g]	5.8	5.8	8.1
Percent muscle	51.4	50.8	49.9[f]	52.3[g]	50.7	51.4	3.7
Chilled side wt, lb	106.3[h]	103.8[i]	105.2	104.9	105.7	104.4	2.6
Ham (whole), %	23.5	23.6	23.3[h]	23.8[i]	23.4	23.6	3.0
402 Ham, %	21.7	21.6	21.2[f]	22.1[g]	21.4	21.9	3.9
402C Ham, boneless, %	16.7	16.0	15.9[f]	16.8[g]	16.2	16.5	5.7
Shoulder (whole), %	21.6[h]	21.0[i]	21.2	21.4	21.3	21.3	3.2
421 Neck bone, %	1.5	1.5	1.5	1.5	1.5	1.5	.7
404 Shoulder, %	18.1[h]	17.5[i]	17.6[k]	18.0[k]	17.7[k]	17.8[k]	3.9
405 Picnic shoulder, %	9.5	9.3	9.3[h]	9.6[i]	9.3	9.5	4.1
405A Picnic shoulder, boneless, %	7.1[h]	6.8[i]	6.8	7.1	6.8[h]	7.1[i]	5.3
406 Boston butt, %	7.9[f]	7.5[g]	7.6[l]	7.8[l]	7.7[l]	7.8[l]	5.3
406A Boston butt, boneless, %	7.5[f]	7.1[g]	7.2[m]	7.3[m]	7.2[m]	7.3[m]	5.5
Loin (whole), %	28.8[h]	28.0[i]	28.7	28.1	28.5	28.3	4.2
410 Loin, %	20.7[f]	19.4[g]	19.5[h]	20.6[i]	19.9	20.2	6.4
413 Loin, boneless, %	12.7[f]	11.5[g]	11.8	12.4	12.0	12.2	7.6
415 Tenderloin, %	1.1[f]	1.0[g]	1.0[f]	1.1[g]	1.1	1.1	8.3
416 Spareribs, %	3.7	3.9	3.8[n]	3.8[n]	3.7[n]	3.9[n]	7.4
Belly (whole), %	16.3[h]	17.0[i]	16.7	16.6	16.6	16.7	6.1
408 Belly, %	14.2	14.7	14.6	14.4	14.4	14.5	5.3
Jowl, %	2.7	2.7	2.6	2.7	2.7	2.7	14.8
Hind foot, %	1.7[g]	1.9[h]	1.8	1.8	1.8	1.8	7.2
420 Front foot, %	1.1[g]	1.2[h]	1.2	1.1	1.2	1.2	5.9
Boneless ham, loin and shoulder, %[e]	45.1[g]	42.4[h]	42.7[g]	44.8[h]	43.3	44.2	5.0

[abcde]See Table 1 for explanation of superscripts.
[fg]Means within genotype, sex, or dietary lysine level differ ($P<.01$).
[hi]Means within genotype, sex, or dietary lysine level differ ($P<.05$).
[j]Sex × dietary lysine interaction ($P<.05$) for last rib backfat, in - B.90 (1.2) > B.70 (1.1), G.90 (1.0) and G.70 (1.1), $P<.05$.
[k]Sex × dietary lysine interaction ($P<.05$) for 404 shoulder, % - G.90 (18.2) > B.90 (17.3), $P<.05$; B.70 (17.9) and G.70 (17.8) intermediate.
[l]Sex × dietary lysine interaction ($P<.05$) for 406 Boston butt, % - G.90 (8.5) > G.7 (8.0) and B.90 (7.8), $P<.05$; B.70 (8.2) intermediate.
[m]Sex × dietary lysine interaction ($P<.05$) for 406A boneless Boston butt, % - G.90 (7.9) > B.90 (7.4), $P<.05$; B.70 (7.7) and G.70 (7.5) intermediate.
[n]Sex × dietary lysine interaction ($P<.05$) for 416 spareribs - B.70 (3.9) > B.90 (3.6), $P<.05$; G.90 (3.9) and G.70 (3.8) intermediate.