

EFFECT OF PORCINE SOMATOTROPIN AND SEX-CLASS ON PORK CARCASS GRADE TRAITS AND COOKING CHARACTERISTICS

T.L. Gardner¹, H.G. Dolezal², C.P. Foutz¹, B.D. Behrens³ and F.K. Ray²

Story in Brief

Thirty hogs (15 gilts and 15 barrows) were allocated to one of five treatments with Treatment 1 serving as a control and Treatments 2 through 5 receiving .71, 1.43, 2.86, or 4.29 mg/day of porcine somatotropin, respectively. Hogs were finished on a commercial diet and slaughtered upon attaining an individual live weight of 230 lb. No significant differences were observed among treatment groups or sex classes for slaughter traits. Carcasses from hogs treated with 1.43 mg or more of somatotropin per day had less fat at the tenth rib and lower loin eye marbling scores than carcasses from control hogs. Gilt carcasses were longer, trimmer, more desirable in USDA cutability grade and higher in estimated percentage muscle than barrow carcasses. Sex classes responded similarly to somatotropin (no significant treatment x sex class interactions) for all traits examined. Cooking properties and shear force values were similar for all treatment groups and sex classes. Somatotropin treatments of 1.43 mg/day produced trimmer carcasses with less marbling, and no adverse effects on cooking properties and tenderness. Increasing the level of somatotropin beyond 1.43 mg/day provided little additional enhancement for the traits examined.

(Key Words: Porcine Somatotropin, Sex Class, Carcass Traits, Shear Force.)

Introduction

Today's health oriented consumers are concerned with the amount of fat in their diets. Accordingly, methods of producing carcasses with less fat and more muscle should be investigated. Porcine somatotropin has been shown to reduce fat deposits when injected in finishing swine (Ivy et al., 1986). Apparently, porcine growth hormone dramatically alters nutrient partitioning to decrease lipid and increase protein synthesis.

¹Graduate Student ²Associate Professor ³Research Technician

Somatotropin treatment has been shown to have minimal effect on the quality of pork. Kanis et al. (1988) reported that cooking loss, drip loss, and tenderness were similar for somatotropin treated and control hogs.

To date, the dosage required for optimal efficiency has not been determined. Experiments thus far have focused primarily on somatotropin administered as mass per unit of body weight. This approach is not very feasible for future commercial application. Therefore, the objective of this study was to examine the effects of daily somatotropin dosage (mg/day) in barrows and gilts on subsequent slaughter, carcass, and cooking traits.

Materials and Methods

Fifteen gilts and 15 barrows were allocated across 5 treatment groups and administered porcine somatotropin (mg/day) as follows: group 1 = none (control), group 2 = .71, group 3 = 1.43, group 4 = 2.86, and group 5 = 4.29. Hogs were finished on a commercial diet and slaughtered upon attaining an individual live weight of 230 lb.

Upon delivery to the Oklahoma State University Meat Laboratory, the hogs were individually weighed, slaughtered to collect liver weight, intestinal weight (gastro-intestinal tract and contents) and hot carcass weight and chilled at 32°F. Upon 24 hours postmortem, two trained University personnel weighed each side for chilled weight and obtained all measurements and scores necessary for USDA quality and cutability grade determinations. The left side of each carcass was ribbed between the 10th and 11th ribs to obtain loin eye area, fat depth, marbling score (5=abundant, 4=moderate, 3=small, 2=slight, 1=traces), muscle color (5=dark red, 4=red-pink, 3=light pink, 2=gray, 1=white/pale) and muscle firmness (3=firm, 2=intermediate, 1=soft and watery) according to NPPC (1985) guidelines.

USDA cutability grade was calculated as follows: $\text{Grade} = (4 \times \text{last rib backfat, in}) - (\text{muscling score})$ with muscling score coded as 3 (thick), 2 (intermediate) or 1 (thin). Percent muscle was estimated as: $(10.5 + (.505 \times \text{hot carcass weight, lb}) + (2.0 \times \text{loin eye area, sq in}) - (14.9 \times \text{tenth rib fat depth, in}) / \text{hot carcass weight, lb}) \times 100$ (NPPC, 1985).

At 72 hours postmortem, two loin chops (1 inch thick) were removed from the tenth rib region of each carcass, vacuum packaged and stored at -22°F. Chops were thawed (35°F) for 24 hours and broiled on Farberware Open-Hearth broilers to an internal temperature of 167°F. Data were collected to assess cooking time (minutes to a medium degree of doneness) and cooking shrinkage (% weight loss). All chops were cooled to 77°F and cored (.5 inch in diameter) to determine the average (6 cores) pounds of force required for Instron shearing (tenderness).

Data were analyzed using the model of treatment, sex class and the treatment x sex interaction. Duncan's multiple range test was used for mean separation when F-tests were significant ($P < .05$).

Results and Discussion

Means for slaughter traits stratified by somatotropin treatment level and sex class are reported in Tables 1 and 2, respectively. No significant differences were noted between treatment groups or sex for slaughter weight, hot carcass weight, dressing percentage, intestinal weight and liver weight.

Although carcass fat thickness tended to decrease with increased dosage of somatotropin, the only significant difference apparent in this study involved tenth rib fat depth (Table 3). Carcasses from hogs treated with 1.43

Table 1. Slaughter traits for hogs treated with porcine somatotropin.

Item	Porcine somatotropin treatment ^a				
	1	2	3	4	5
Slaughter weight, lb.	231.8	234.7	232.3	228.2	231.0
Hot carcass weight, lb.	175.3	177.8	174.8	172.8	173.1
Dressing percentage	75.6	75.7	75.2	75.7	74.9
Intestinal weight, lb. ^b	16.3	16.7	18.1	16.9	17.6
Liver weight, lb.	3.40	3.45	3.85	3.72	4.05

^aPorcine somatotropin administered (mg/day/hog) to 6 hogs per treatment: 1 = none (control), 2 = 0.71, 3 = 1.43, 4 = 2.86, 5 = 4.29.

^bIntestinal weight includes the weight of the gastro-intestinal tract and contents.

Table 2. Slaughter traits by sex-class for hogs treated with porcine somatotropin.

Item	Sex-class	
	Gilt	Barrow
Slaughter weight, lb.	232.4	230.8
Hot carcass weight, lb.	175.7	173.8
Dressing percentage	75.6	75.3
Intestinal weight, lb. ^a	17.7	16.5
Liver weight, lb.	3.79	3.60

^aIntestinal weight includes the weight of the gastro-intestinal tract and contents.

Table 3. Carcass grade traits for hogs treated with porcine somatotropin.

Item	Porcine somatotropin treatment ^a				
	1	2	3	4	5
Carcass length, in	31.9	31.6	32.0	32.4	32.4
Backfat thickness, in					
First rib	1.99	1.85	1.66	1.66	1.69
Last rib	1.22	1.05	1.03	0.91	0.96
Last lumbar vertebra	1.46	1.26	1.22	1.02	1.17
Average	1.56	1.39	1.31	1.20	1.27
Tenth rib fat depth, in	1.50 ^g	1.28 ^{fg}	1.13 ^f	0.96 ^f	1.01 ^f
Muscling score ^b	1.67	2.33	1.83	2.17	2.00
Loin eye area, sq.in.	5.07	4.96	4.99	5.32	5.11
USDA cutability grade ^c	3.21	1.87	2.27	1.49	1.83
Estimated percent muscle ^d	49.49	51.23	52.60	54.45	53.80
Loin eye scores ^e					
Color	2.67	2.67	2.83	2.83	2.50
Marbling	2.67 ^f	2.00 ^{fg}	1.67 ^g	1.50 ^g	1.83 ^g
Firmness	2.50	2.33	2.00	2.17	2.00

^aPorcine somatotropin administered (mg/day/hog) to 6 hogs per treatment: 1 = none (control), 2 = 0.71, 3 = 1.43, 4 = 2.86, 5 = 4.29.

^bMuscle score: 1 = thin; 2 = intermediate.

^cUSDA, 1985.

^dNPPC, 1985.

^eLoin eye scores: Color: 2 = gray; Marbling: 1 = traces, 2 = slight; Firmness: 2 = intermediate.

^fValues in the same row with a common superscript letter are not statistically ($P > .05$) different.

mg or more of somatotropin per day (Treatments 3, 4 and 5) were significantly trimmer than carcasses from control hogs. This finding is in agreement with previous work where somatotropin treatments produced trimmer carcasses than controls. Among somatotropin-treated hogs, increasing the dosage level from .71 to 4.29 mg/day did not ($P > .05$) substantially decrease the depth of fat at the tenth rib. No differences ($P > .05$) were observed in this study for measures of carcass muscularity regardless of treatment group. Despite large ranges in USDA cutability grade (over 2 full grades) and estimated percentage muscle (5%) between treatment groups, differences were not consistent enough for statistical significance. Furthermore, the small sample size ($n=3$ per treatment x sex class group) used in this study posed additional difficulties in proving significance. Treatment groups were similar ($P > .05$) for loin eye color and firmness scores; however, loin eyes from control hogs were scored higher ($P < .05$) for marbling amount than those produced with 1.43 mg or more of somatotropin per day (Treatments 3, 4 and 5).

Gilt carcasses were significantly longer, trimmer at the last and tenth ribs, more desirable in USDA cutability grade and higher in estimated percent muscle than barrow carcasses (Table 4). Although muscularity differences were numerically consistent with the latter, no ($P>.05$) differences were observed. Loin eye quality scores were similar between sexes.

Means for cooking properties and shear force by treatment group and sex class are presented in Tables 5 and 6, respectively. No ($P>.05$) differences were noted between treatment groups or sex classes for cooking time to 167°F, cooking shrinkage or shear force (an objective measurement for tenderness).

Table 4. Carcass grade traits by sex-class for hogs treated with porcine somatotropin.

Item	Sex-class	
	Gilt	Barrow
Carcass length, in	32.6 ^a	31.5 ^f
Backfat thickness, in		
First rib	1.72	1.82
Last rib	0.95 ^a	1.12 ^f
Last lumbar vertebra	1.14	1.31
Average	1.27	1.42
Tenth rib fat depth, in	1.04 ^a	1.32 ^f
Muscling score ^a	2.13	1.87
Loin eye area, sq.in.	5.24	4.94
USDA cutability grade ^b	1.65 ^a	2.62 ^f
Estimated percent muscle ^c	53.65 ^a	50.98 ^f
Loin eye scores ^d		
Color	2.53	2.87
Marbling	1.73	2.13
Firmness	2.07	2.33

^aMuscle score: 1 = thin; 2 = intermediate.

^bUSDA, 1985.

^cNPPC, 1985.

^dLoin eye scores: Color: 2 = gray; Marbling: 1 = traces, 2 = slight; Firmness: 2 = intermediate.

^eValues in the same row with a common superscript letter are not statistically ($P>.05$) different.

Table 5. Cooking properties and shear force values for loin chops from hogs treated with porcine somatotropin

Item	Porcine somatotropin treatment ^a				
	1	2	3	4	5
Cooking time, min. ^b	27.9	28.1	29.0	30.6	33.7
Cooking shrinkage, %	31.2	31.2	33.6	31.1	35.8
Instron shear force, lb	10.6	9.9	11.9	10.6	11.3

^aPorcine somatotropin administered (mg/day/hog) to 6 hogs per treatment: 1 = none (control), 2 = 0.71, 3 = 1.43, 4 = 2.86, 5 = 4.29.

^bTime in minutes required to reach a broiled internal temperature of 167°F.

Table 6. Cooking properties and shear force values by sex-class for loin chops from hogs treated with porcine somatotropin.

Item	Sex-class	
	Gilt	Barrow
Cooking time, min. ^a	31.0	28.7
Cooking shrinkage, %	33.2	32.8
Instron shear force, lb	10.6	11.1

^aTime in minutes required to reach a broiled internal temperature of 167°F.

Literature Cited

- Ivy, R.E. et al. 1986. Effects of various levels of recombinant porcine growth hormone (rpGH) injected intramuscularly in barrows. *J. Anim. Sci.* 63(Suppl.1):218.
- Kanis, E. et al. 1988. Effects of recombinant porcine somatotropin (rPST) on meat quality of pigs. *J. Anim. Sci.* 66(Suppl.1):280.
- National Pork Producers Council (NPPC). 1985. *Procedures to Evaluate Market Hog Performance*. 2nd Edition, Des Moines, IA.
- USDA. 1985. *Official United States standards for grades of pork carcasses*. AMS-USDA, Washington, DC.