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Abstract

The types and diameters of muscle fibers from 30 barrows that had received daily injections of porcine somatotropin (pST) or a placebo and were fed dietary lysine at .6, .8, 1.0 or 1.2% were determined. Fiber data indicated that pST slightly increases the anaerobic metabolic potential of longissimus muscle. The higher levels of lysine caused enlargement of muscle cells. Earlier research has shown that this type of muscle biochemistry contributes to development of PSE muscle. Thus, use of pST in certain strains of pigs may lead to reductions in muscle quality.; Swine Day, Manhattan, KS, November 16, 1989

Keywords

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WILL PORCINE SOMATOTROPIN (pST) LOWER PORK QUALITY?

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Summary

The types and diameters of muscle fibers from 30 barrows that had received daily injections of porcine somatotropin (pST) or a placebo and were fed dietary lysine at .6, .8, 1.0 or 1.2% were determined. Fiber data indicated that pST slightly increases the anaerobic metabolic potential of longissimus muscle. The higher levels of lysine caused enlargement of muscle cells. Earlier research has shown that this type of muscle biochemistry contributes to development of PSE muscle. Thus, use of pST in certain strains of pigs may lead to reductions in muscle quality.

(Key Words: Porcine Somatotropin, Lysine, Pork Quality.)

Introduction

Earlier efforts by the pork industry to select and breed leaner, heavier muscled, more efficient hogs led to increased problems with porcine stress syndrome and low quality muscle, such as PSE (pale, soft, and exudative) and DFD (dark, firm, and dry) pork. Some problems also were encountered with reduced tenderness, juiciness, and flavor.

Research by KSU swine nutritionists clearly shows that combinations of porcine somatotropin (pST) and supplemental lysine improve production efficiencies and reduces carcass fatness. A major questions remains — will the use of pST cause packers problems with abnormal lean color, water-holding capacity, and protein functionality?

Experiments were conducted to determine the biochemical properties of muscle from pigs injected with pST and fed diets of different lysine content.

Experimental Procedures

Twenty-four barrows (128 lb avg initial wt) were injected daily with 4 mg pST and fed one of four levels (.6, .8, 1.0, or 1.2%) of dietary lysine. Six barrows were used as controls, and received daily injections of saline and were fed diets containing .6% lysine. All diets contained 17.7% crude protein and 200% of NRC requirements for minerals, vitamins, and other amino acids.

[1]Pitman-Moore, Inc., Terre Haute, IN 47808.

Samples from major muscles in the loin (longissimus) and ham (semimembranosus) were evaluated histochemically for fiber types and fiber dimensions.

Results and Discussion

Data in Table 1 show that pST alone had an effect on muscle fiber types in the longissimus, but not in the semimembranosus. In the longissimus muscle, percentage αRed fibers decreased, and the percentage of αWhite fibers increased (P<.10). Porcine somatotropin did not affect fiber diameters in either muscle.

Table 1. Porcine Somatotropin (pST) and Dietary Lysine Effects on Muscle Fiber Type and Diameter

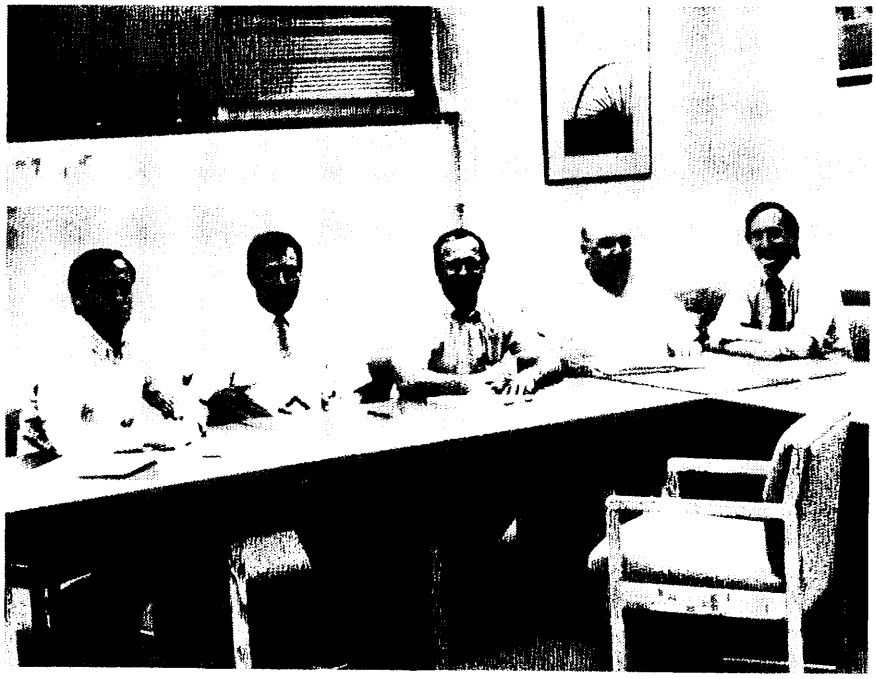
Muscle/trait	Fiber type, %			W/R fiber ratio	Mean fiber diameter, um
	βR	αR	αW		
Longissimus					
Control-.6% lysine	13.7	22.9[b]	63.5[a]	1.7[a]	55.9
pST-.6% lysine	11.9	18.1[a]	70.1[b]	2.3[b]	58.6
Semimembranosus					
Control-.6% lysine	14.2	28.8	57.0	1.3	60.3
pST-.6% lysine	12.9	28.9	58.2	1.4	58.6
Longissimus					
Lysine-.6%	11.9	18.1	70.1	2.3	58.6
Lysine-.8%	14.1	16.2	69.7	2.3	60.7
Lysine-1.0%	10.3	16.7	73.0	2.7	65.9
Lysine-1.2%	13.2	19.0	67.8	2.1	63.9
Semimembranosus					
Lysine-.6%	12.9	28.9	58.2	1.4	58.6[a]
Lysine-.8%	17.1	30.8	52.1	1.1	65.8[c]
Lysine-1.0%	14.0	31.2	54.8	1.2	60.2[ab]
Lysine-1.2%	15.7	25.7	58.6	1.4	63.9[bc]

[abc]Means within a muscle trait column with different superscripts differ (P<.10).

Increasing the amount of lysine in the diet did not significantly affect longissimus fiber traits, although diameters were numerically larger in groups receiving higher levels of lysine. Increasing dietary lysine enlarged fibers in the semimembranosus muscle (P<.10). Lysine additions to the diet did not alter longissimus or semimembranosus fiber types.

Overall, these data suggest that pST and dietary lysine affect muscles differently. The increased whiteness of the longissimus of pST-treated pigs could make this muscle more susceptible to PSE. Interestingly, though, the muscles from pST-treated pigs in this study had normal lean qualities. Researchers at Cornell and Iowa State have shown pST-treated pigs to have more PSE muscle than controls, but they started treatment at an earlier age and possibly used larger hormone dosages.

Although these data are not conclusive, they do suggest that pST increases the potential for abnormal pork quality. This would be especially true if the pigs had tendencies for stress-susceptibility.



KSU swine staff (left to right), Drs. Jim Nelssen, Joe Hancock, Dave Nichols, Bob Hines, Bob Goodband (Duane Davis, missing).