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THE EFFECT OF PORCINE SOMATOTROPIN ON PIG BEHAVIOUR

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INTRODUCTION

Swine carcasses currently marketed in Canada contain approximately 34% fat compared to beef at 25% (Jones, 1986). Clearly, the desire to produce leaner pork is consistent with present consumer demands (Wood, 1987). Unfortunately, conventional genetic selection methods are capable of removing only about 0.5mm of backfat per animal generation which is deemed as too slow by the pork industry. Therefore, as discussed by Topel (1987), the swine industry has actively been seeking methods and technologies capable of producing leaner pork.

Numerous studies in recent years have clearly demonstrated that porcine somatotropin can significantly and rapidly improve lean carcass content and reduce carcass fat in finishing pigs (Evock *et al.*, 1988; Etherton, 1988; Betchel *et al.*, 1988; Campbell *et al.*, 1990; Boyd and Bauman, 1989; Evans *et al.*, 1991; McNamara *et al.*, 1991).

Porcine somatotropin (pST) is recognized as a naturally occurring metabolic regulator (Hanrahan, 1990). However, the effect of exogenous administration of somatotropin on animal behaviour has been essentially unexplored. Given the importance of behaviour studies in assessing the overall well being of an animal, it is logical to suggest that the ultimate use of somatotropin in the swine industry will likely depend not only on its efficacy as a repartitioning agent, but also on the effects on animal behaviour. The present study was therefore undertaken to investigate the effects of porcine somatotropin on basic animal behaviour in market weight pigs.

MATERIALS AND METHODS

One hundred and twenty Yorkshire pigs equally represented by barrows and gilts were used in the present study and assigned to one of three treatments. The treatments consisted of:

(1) control (sham implant);
(2) prolonged release of pST at 2mg per pig per day (Monsanto product #CP115409-F); or
(3) a daily subcutaneous injection of pST at 2mg per pig per day (Monsanto product #CP115409).

Each treatment group consisted of 10 pens of four pigs of equal sex. The pigs were fed *ad libitum* a 17% protein barley-wheat diet. The animals had free access to water. The animals weighed on average 70±5kg when commencing their treatment and remained on test until 96±5kg. The minimum and maximum times on test were 28 and 49 days respectively.

Approximately one week before slaughter, animal behaviour was monitored on 92 of the pigs (36 pST prolong release, 40 daily injected pST and 16 control animals). A time lapse recorder and monitor were used to capture behaviour data four frames per second. Behaviour frequencies were collected every five minutes on all pigs for four hours, for a total of 48 observations per pig. The ethograms used in the present study were based on those described by Schaefer *et al.* (1990) and included the following 10 behaviours: (1) feeding, (2) drinking, (3) investigating (walking or standing in pen with no other obvious behaviour intended), (4) resting or sleeping individually, (5) resting or sleeping in a group, (6) nose to nose contact, (7) nose to body contact, (8) sexual behaviour, (9) agonistic or aggressive behaviour, and (10) stereotypic behaviour.

Statistical analysis of the sum of frequency count (treatment main effects and interactions) was done using a general linear models procedure of the Statistical Analysis of System Institute (1985).

RESULTS AND DISCUSSION

The pigs placed on pST regimes in the present study were seen to display classical repartitioning effects. For the daily injected pigs, backfat depth (10^{th} rib) was reduced by 10% (P=0.01) over controls. Lean yields were also significantly increased in this group. The prolonged release of pST product was seen to bring about repartitioning effects that were intermediate to, but not significantly different from, control or the daily injected treatment animals.

In terms of behavioral observations, neither of the pST treatments were seen to significantly change animal behaviour (Table 1). The only statistically significant change in behaviour appeared to be that of pen investigation with the daily injected animals showing a reduced frequency. The reason(s) for an observed change in investigative behaviour remain speculative. Some published data suggest that pST-treated pigs can display a reduced compressive joint strength (He *et al.*, 1992) which arguably could lead to a reduced frequency of walking. It is noteworthy, however, that in the present study, no lameness was observed in the pST-treated pigs on the basis of weekly inspections by a veterinarian and also, no gross morphological joint problems were observed on post-mortem inspection.

Of interest in the present study was the observation that the daily injected pST pigs in particular tended to display a higher frequency of sleeping in groups and a lower frequency of sleeping individually. This observation is consistent with the comments of Curtis (1987) suggesting that pST-treated pigs, because of less fat insulation, may have a higher thermoneutral zone.

Important from an animal welfare perspective was the observation that while growth traits were normal or above normal, no deviant behaviours were seen in the pST-treated pigs. The current study would therefore suggest that within the limits of the analysis procedures used, that market weight pigs treated with pST do not appear to display abnormal, aggressive or sterotypic behaviours.

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REFERENCES

BECHTEL, P.J., EASTER, R.A., McKEITH, F.K., NOVAKOFSKI, J., McLAREN, D.G., and BEMNER, G.L. 1988. Growth, carcass and sensory characteristics of pigs injected daily with natural porcine somatotropin. *Proc. ICMST.* pp.603-604.

BOYD, R.D., and BAUMAN, D.E. 1989. Mechanisms of action for somatotropin in growth. In: CAMPION, D.R., HAUSMAN, G.J., and MARTIN, R.J. (eds). *Current Concepts of Animal Growth Regulation.* pp.257-293.

CAMPBELL, R.G., JOHNSON, R.J., KING, R.H., and TRAVERNER, M.R. 1990. Effects of gender and genotype on the response of growing pigs to exogenous administration of porcine growth hormone. *J. Anim. Sci.* 68:2674-2681.

CURTIS, S.E. 1987. Management and environmental considerations for successful use of repartitioning agents. In: *Pork Industry Conference.* University of Illinois. Urbana-Champaign. pp.64-68.

ETHERTON, T.D. 1988. Anabolic effects of porcine somatotropin on pig growth. In: *Designing Foods.* National Research Council. Washington, D.C.

EVANS, F.D., USBORNE, V.R., EVANS, N.M., MORRIS, J.R., and HACKER, R.R. 1991. Effect of different patterns of administration of recombinant porcine somatotropin on growth performance and economic returns of pigs in the starter grower vs finisher phases of production. *Can. J. Anim. Sci.* 71:355-361.

EVOCK, C.M., ETHERTON, T.D., CHUNG, C.S., and IVY, R.E. 1988. Pituitary growth hormone (PGH) and recombinant PGH analogue stimulate pig growth performance in a similar manner. *J. Anim. Sci.* 66:1928-1941.

HANRAHAN, T.J. 1990. Use of somatotropin in livestock production. Growth in pigs. In: SEJRSEN, K., VESTERGAARD, M., and NELMANN SORENSON, A. (eds). *Use of Somatotropin on Livestock Production.* Elsevier. London. pp.157-177.

HE, P., SCHAEFER, A.L., AHERNE, F.X., and THONPSON, J.R. 1992. Determination of joint soundness in pigs treated with rpST by daily injection or slow release implant. *Can. J. Anim. Sci.* 72:1013-1014.

JONES, S.D.M. 1986. Changes in animal product composition and implications for animal production systems. *Can. J. Anim. Sci.* 66:23-30.

McNAMARA, J.P., BREKKE, C.J., JONES, R.W., and DALRYMPLE, R. 1991. Recombinant porcine somatotropin alters performance and carcass characteristics of heavy weight swine and swine fed alternative feed stuffs. *J. Anim. Sci.* 2273-2281.

SCHAEFER, A.L., SALOMONS, M.O., TONG, A.K.W., SATHER, A.P., and LEPAGE, P. 1990. The effects of environment enrichment on aggression on newly weaned pigs. *Appl. Anim. Behav. Sci.* 27:41-52.

STATISTICAL ANALYSIS SYSTEM INSTITUTE (SAS), INC. 1985. *Users Guide.*

TOPEL, D.G. 1987. Development and status of repartitioning agents for use in the swine industry. In: *Pork Industry Conference.* University of Illinois. Urbana-Champaign. pp.1-11.

WOOD, J.D. 1987. Carcass leanness and its effects on meat quality. In: *Work Planning Meeting on Meat Quality.* Winnipeg, Man. Agr. Can. Res. Br. Supply and Services Canada. Ottawa pp.89-100.

Table 1. Behaviour frequency of market weight pigs treated with daily or prolonged porcine somatotropin (% daily activity).

Behaviour	Treatment			
	Control	Daily	Prolonged	P
Drinking	3.4±1.0	2.0±0.6	2.4±0.6	>0.05
Feeding	7.7±1.3	7.4±0.7	7.9±0.8	>0.05
Sleeping individually[2]	20.4±7.2	18.5±4.0	19.7±4.5	>0.05
Sleeping in a group	54.5±7.7	64.4±4.3	59.4±4.8	>0.05
Investigating	13.6±2.7[b]	7.3±1.5[a]	10.1±1.7[b]	<0.05
Aggression[3]	0.52±0.59	0.41±0.32	0.53±0.35	>0.05

[2] Sleeping can imply sleeping or resting (laying down).
[3] Aggressin includes parallel and inverse parallel pressing, head to head and head to body knocks, levering, replacing another pig at the feeder or water nipple, or biting.