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Summary and Implications

The objectives of this study were to determine the effect of selection for reduced residual feed intake (RFI) on behavior and activity in gilts in their home pen. A total of 192 gilts were used, 96 were from a line that had been selected for low residual feed intake over 5 generations (LRFI) and 96 from a randomly bred control line (CRFI). Gilts were housed in 12 pens, containing 8 gilts from each line in a conventional grow-finish unit. Twelve hours of video footage was collected on the day of placement and then every 4 wk for 3 more observational periods. Video was scored using a 10-min instantaneous scan sampling technique. Four postures (standing, lying, sitting and locomotion) and one behavior (at drinker) were collected. Categories of active (standing, locomotion and at drinker) and inactive (sitting and lying) were also created. Analyses were done using Proc Mixed of SAS. There were no differences ($P > 0.05$) between genetic lines for all postures and the behavior at drinker on the day of placement. However, over subsequent rounds it was observed that LRFI gilts spent less ($P = 0.03$) time standing, more time sitting ($P = 0.05$) and were less active ($P = 0.03$) overall. In conclusion, on the day of placement there were no behavioral differences between genetic lines. Behavioral differences were observed between genetic lines over subsequent rounds, with LRFI gilts becoming less active. Therefore, overall behavioral repertoire of the gilt in their home pen may be beneficial for future RFI selection programs and may contribute to variation in efficiency of the grow-finish gilt.

Introduction

Fast-growing lean pigs require less feed to reach market weight. However approximately 34% of differences in feed intake between pigs are not related to growth and backfat. Although past selection for lean growth has substantially increased feed efficiency in pigs, further increases are limited by differences in feed intake that are unrelated to growth and backfat. These differences in feed intake independent of growth and backfat have been called residual feed intake (RFI). Factors that can contribute to RFI include activity, digestion, metabolism (anabolism and catabolism) and thermoregulation. One factor that may affect differences in RFI is behavior of the individual animal. The objectives of this study were to determine the effect of selection for reduced residual feed intake (RFI) on behavior and activity in gilts in their home pen.

Materials and Methods

Experimental design: The protocol for this experiment was approved by the Iowa State University Institutional Animal Care and Use Committee. The experiment was conducted from April 15 to August 14, 2008. A total of 192 gilts were used. Half of the gilts were from a line that had been selectively bred for low residual feed intake over 5 generations (LRFI) and the other half from a randomly bred control line (CRFI). Development of these lines has been described in Cai et al. (2008). Gilts on average started the trial weighing 40 kg. At the end of the trial average gilt weight was 74 kg. The experimental design for this study was a randomized complete block design, with pen as block and individual pig as the experimental unit.

Housing and feeding: All gilts were housed in a conventional confinement unit located at the Lauren Christian Swine Research Center at the Iowa State University Bilsland Memorial Farm, near Madrid, Iowa. Gilts were housed in 1 room that contained 12 pens, 16 gilts/pen, and providing 0.82m^2/gilt. Each pen measured 5.6 m length x 2.3 m width. Each pen contained a 2 nipple-type waterer (Edstrom, Waterford, WI) providing ad libitum access. A Feed Intake Recording Equipment feeder (FIRE®, Osborne Industries, Inc., Osborne, KS) provided ad libitum access to a standard finishing diet that was formulated to meet or exceed the requirements for growing pigs (NRC, 1998). Gilts were checked twice daily at 0800 and 1700 h for health and general maintenance of the facility.

Video collection: Video was collected on the day of placement and then every 4 wk until the end of the trial, for a total of 4 recordings. On the day of gilt placement, video was collected for 12 h after the last gilt was placed into that respective pen (~1100 h and ~1000 h for groups 1 and 2). On the subsequent recording rounds (rounds 1, 2 and 3), video was collected from 0800 h to 2000 h (12 h). Twelve color cameras (Panasonic, Model WV-CP484, Matsushita Co. Ltd., Kadoma, Japan) were placed over the 6 pens on the south side of the barn. Gilts were individually marked with an animal safe paint stick (Prima Tech Retractable Marking Sticks, Prima Tech, NC, U.S.) on their back the day before recording, allowing the behavior of the

individual gilt to be collected. Video was collected onto a DVR (RECO, Darim Vision, Pleasanton, CA) at 10 frames per second.

General Behavioral Activity: General behavioral activity within the home pen was collected by two experienced observers using the Observer software (The Observer, Ver. 5.0.31 Noldus Information Technology, Wageningen, The Netherlands). A 10 min instantaneous scan sampling technique was utilized. Individual gilts were classified into 1 of 6 mutually exclusive categories. Four postures (standing, lying, sitting and locomotion) and one behavior (at drinker) were collected. Categories of active (standing, locomotion and at drinker) inactive (sitting and lying) and a default category of unknown was created.

Statistical Analysis: Analyses were done using Proc Mixed of SAS. The data were analyzed separately for the day of placement and the subsequent for three rounds. General activity was summarized on a percentage basis by each posture and behavior and subjected to an arcsine square root transformation to help normalize data and stabilize variance. Analysis was performed on each behavior and posture.

Results and Discussion

There were no differences ($P > 0.05$) between genetic lines for all postures and the behavior at drinker on the day of placement (Table 1).

Table 1. Least square means ± SE for grow-finish gilt postures and behavior at drinker in their home pen.

	Genetic Line				
	LRFI		CRFI		
Parameter	**Estimate**	**SE**	**Estimate**	**SE**	***P-value***
Posture					
Locomotion	4.25	1.59	4.00	1.59	0.728
Standing	10.30	2.94	11.90	2.94	0.113
Sitting	2.25	0.37	1.98	0.37	0.503
Lying	82.70	5.02	81.60	5.02	0.342
Active	15.09	5.09	16.38	5.09	0.285
Inactive	84.88	5.02	83.54	5.03	0.270
Behavior					
At drinker	0.46	0.13	0.50	0.13	0.778

However, over subsequent rounds it was observed that LRFI gilts spent less ($P = 0.027$) time standing, more time sitting ($P= 0.051$) and were less active ($P = 0.028$) overall (Table 2).

Table 2. Least square means ± SE for grow-finish gilt postures and behavior at drinker in their home pen.

	Genetic Line				
	LRFI		CRFI		
Parameter	**Estimate**	**SE**	**Estimate**	**SE**	***P-value***
Posture					
Locomotion	2.26	0.17	2.37	0.17	0.577
Standing	13.72	0.88	15.21	0.88	0.027
Sitting	2.50	0.28	2.12	0.28	0.051
Lying	80.23	0.92	79.16	0.92	0.179
Active	16.88	0.82	18.50	0.82	0.028
Inactive	82.70	0.87	81.33	0.87	0.063
Behavior					
At drinker	0.88	0.09	0.93	0.09	0.523

In conclusion, on the day of placement there were no behavioral differences between genetic lines. Behavioral differences were observed between genetic lines over subsequent rounds, with LRFI gilts becoming less active. Therefore, overall behavioral repertoire of the gilt in their home pen may be beneficial for future RFI selection programs and could be added to the list of previously identified factors that may contribute to variation in efficiency of the grow-finish gilt.

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