The Effect of Selection for Residual Feed Intake on Scale Activity in Yorkshire Gilts

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Summary and Implications

The objective of this study was to determine the effect of selection for reduced feed intake (RFI) on scale activity for Yorkshire gilts. A total of 192 Yorkshire 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 (16 gilts/pen; 0.82 m^2/gilt) containing 8 gilts from each line in a conventional grow-finish unit. Gilts were weighed every 2-wks for a maximum of eight scores per gilt. Gilts were scored while on the weigh scale for activity using a whole number scale of one to five (1 = calm, minimal movement; 5 = continuous rapid movement and an escape attempt). Analyses were done using Proc Mixed of SAS. The LRFI line began with a lower scale activity score, but did not experience as great of a drop in their score as the CRFI gilts. The CRFI gilts scored lower by the end of the rounds compared to the LRFI gilts. In conclusion, selection for lower residual feed intake in purebred Yorkshires has a related effect on scale activity score but this relationship is complicated and thus warrants further research. Therefore, scale activity may not be an easy measure to be added to the list of already described traits in pigs as a factor which relates to selection for lower RFI.

Introduction

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. Another factor that may affect differences in RFI may be the behavior of the individual animal. Therefore, the objective of this study was to determine the effect of selection for reduced feed intake (RFI) on scale activity for Yorkshire gilts.

Materials and Methods

Experimental design

The protocol for this experiment was approved by the Iowa State University Institutional Animal Care and Use Committee (12-07-6482-S). The experiment was conducted from April 15 to August 14, 2008. The experimental design for this study was a randomized complete block design, with pen as the block and individual pig as the experimental unit.

Animals

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 was described in Cai et al. (2008). On the day of placement, gilts were sorted from their home pen by four trained caretakers using sort boards. Gilts were moved to the grow-finish building, and received an ear tag transponder in the right ear. Gilts on average started the trial weighing 40 kg and averaged 104 kg at the end of the trial.

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.

Data collection

One week after placement, gilts were moved from their home pen to a central location to be weighed and scored for scale activity. Scale activity scoring was conducted every 2-wks until the first gilts completed the trial. Scale activity scores were collected over nine sessions. Once in the holding area, gilts were individually moved onto the weigh scale (Electronic Weighing Systems, Rite Weigh, Robert E Spencer Enterprises, Ackley, IA). The scale was a freestanding self-sustained flow through unit. The weigh scale was of steel construction with waved fiberglass sides and metal woven flooring with rebar spaced 0.3 m for added protection against slipping. The gates, located on both the entrance and exit of the scale, were 1.9 cm angle iron spaced 10.2 cm on center. The inside dimensions of the weigh scale were 0.41 m wide by 1.2 m long by 0.8 m tall. Individual gilt scale activity was determined and recorded while she was on the weigh scale.

Scoring system

Activity scores while in the scale were based on a subjective scale of one to five (Table 1). The individual gilt was identified by her ear tag number and therefore observers were blind to genetic line of the gilt.

Table 1. Gilt scale activity, adapted from Rempel, *et al*. (2009).

Score	Description
1	Calm gilt, little or no movement
2	Calm movement, including the gilt Walking forward and backward at a slow pace
3	Continuous fast movement, including quickly walking forward and backward
4	Continuous rapid movement and vocalizing
5	Continuous rapid movement and an escape attempt

Statistical Analysis

All analyses were done using Proc Mixed of SAS (SAS Inst. Inc., Cary, NC). In all cases, the Kenward-Rodger method was used to compute the denominator degrees of freedom. For analysis purposes, gilts were scored on seven or eight rounds (group one and two respectively), where round is number of times a gilt was exposed to the process. Round is in contrast to session and is defined as the number of days the technicians collected data. Therefore during the first session only group one gilts were scored. In the second session group one gilts were scored for their second round, while group two gilts were scored for their first round.

Results and Discussion

There were no ($P = 0.14$) differences between LRFI and CRFI gilts for scale activity (1.89 ± 0.11 vs. 1.81 ± 0.11 scale activity). However, differences were observed when comparing the lines in individual rounds. During round one, the LRFI line had a lower mean temperament score then the CRFI line (2.31 vs. 2.65; $P = 0.001$). For all other rounds, if a Bonferroni adjustment is applied, there were no significant line effects ($P > 0.05$). However, if left unadjusted statistical differences between lines were found in all rounds, except two, four and five ($P < 0.05$) (Table 2). For both genetic lines, temperament scores decreased from round one to round eight, but the LRFI line did not experience as large a drop in mean score as the CRFI line (Table 2). Thus, the LRFI line scored lower than the CRFI line in the first round, but by the last round, this relationship had switched. Throughout the trial, gilts from both lines were considered calm; by round four, both lines had a mean score below two, with a score of one and two indicating a calm pig. In conclusion, selection for lower residual feed intake in purebred Yorkshires has a related effect on scale activity score but this relationship is complicated and thus warrants further research. Therefore, scale activity, may not be an easy measure to be added to the list of already described traits in pigs as a factor which relates to selection for lower RFI.

Table 2 Least square means and SE of scale activity score by line and time of score.

Round	Treatment		*P-value*	Adjusted *P-value*[1]
	LRFI[4, 6]	CRFI[5, 6]		
1[2]	2.31	2.65	<0.001	0.001
2	2.33	2.44	0.196	1.000
3	2.21	2.01	0.031	0.244
4	1.73	1.65	0.403	1.000
5	1.58	1.44	0.119	0.955
6	1.65	1.47	0.040	0.321
7[3]	1.60	1.41	0.046	0.370
8[3]	1.69	1.44	0.013	0.108

[1]Bonferroni adjustment of P-value
[2]Analysis only includes data from Group 1 pigs
[3]Analysis only included data from Group 2 pigs
[4]Low residual feed intake line (n = 96)
[5]Control residual feed intake line (n = 96)
[6]SE between lines equal ± 0.13