Effect on Gilt Behavior and Postures when Selected for Residual Feed Intake Selection in Response to a Lipopolysaccharide Challenge

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Summary and Implications

The objective of this study was to determine low and high-RFI gilt sickness behavior when challenged with lipopolysaccharide (LPS). This work was conducted with seven low residual feed intake gilts (RFI) and eight high RFI gilts (63±4 kg BW) from the 8th generation of the ISU Yorkshire RFI selection lines. Gilts were challenged intramuscularly with 30 µg/kg BW *Escherichia coli* O5:B55 LPS at 1000±1 hour. Gilts were video recorded one day before the LPS challenge (*baseline*) and on the treatment day (*LPS challenge*). Video was analyzed for lying, sitting, standing, eating and drinking using a 1-minute scan sample at two time points on the baseline and treatment days; 1) 1000 to 1200 hour and 2) 1700 to 1800 hour. There were no line by treatment interactions for behaviors and postures in response to the LPS challenge (P ≥ 0.32). There were no RFI selection line differences in behavioral and postural responses to the LPS challenge (P ≥ 0.45). Regardless of the RFI selection line, after the LPS challenge gilts laid more (P < 0.0001) and stood less (P < 0.0001). However, there were no differences observed in the percent of time engaged in sitting, eating and drinking (P ≥ 0.16). Regardless of the RFI selection line, gilts laid more (P = 0.0004) and stood and ate less (P < 0.0001) during the first (AM) compared to the second time point (PM). In conclusion, gilts from both RFI selection lines similarly expressed classical sickness behaviors and postures when challenged with LPS.

Introduction

Feed has been estimated to cost 50 to 85% of operating costs. Additionally, competition between animal agriculture, human food, and biofuel industries has resulted in an increased demand for grain. Consequently, grain prices and swine production cost have increased. By decreasing the amount of feed needed per pig for the same rate of growth, we can ultimately lower swine production costs. Residual feed intake (RFI) is a feed efficiency measure. Low-RFI (more feed efficient) pigs consume less feed for equal weight gain compared to less efficient, high-RFI counterparts. However, it is unknown if selection for improved feed efficiency impacts the expression of sickness behavior. Therefore, the objective of this study was to determine low and high-RFI gilt sickness behavior when challenged with lipopolysaccharide (LPS).

Materials and Methods

Experimental design: The protocol for this experiment was approved by the Iowa State University Institutional Animal Care and Use Committee. A total of 15 Yorkshire gilts (63 ± 4 kg initial BW) selected for low-RFI (LRFI; n = 7) and high-RFI (HRFI; n = 8) were randomly selected from the 8th generation of the Iowa State University RFI herd.

Housing: The study was conducted at the Iowa State University (ISU) Nutrition Farm. All gilts were individually housed in metabolism stalls. Gilts were fed 1.5 kg/d corn (Zea mays) soybean (Glycine max)based diet containing 15.9 MJ/kg DE and 5.2 g/kg standardized ileal digestible Lysine twice daily.

LPS challenge: Gilts in each line were injected intramuscularly with *Escherichia coli* O5:B55 lipopolysaccharide (30 µg/kg BW) at 1000±1 hour.

Measures: Three color cameras (Panasonic, Model WV-CP-484, Matsushita Co. LTD., Kadoma, Japan) were placed above the metabolic stalls for video collection. Video was collected onto a computer using Handy AVI (HandyAVI version 4.3 D, Anderson's AZcendant Software, Tempe, AZ, USA) at 10 frames/second. Gilts were video recorded one day before the LPS challenge (*baseline*) and on the treatment day (*LPS challenge*). Video was analyzed for lying, sitting, standing, eating and drinking using a 1-minute scan sample at two time points on baseline and treatment day; 1) 1000 to 1200 hour and 2) 1700 to 1800 hour.

Statistical analyses: The percentage of time gilts were performing behaviors and postures were analyzed using the GLIMMIX procedure of SAS. The model included the main effects of RFI selection line, LPS treatment, two time points and the LPS treatment by RFI selection line interaction. A random effect of pig nested within replicate was used and *P*<0.05 was considered significant.

Results and Discussion

Treatment by RFI selection line interaction: There were no line by treatment interactions for behaviors and postures in response to the LPS challenge ($P \geq 0.32$; data not presented).
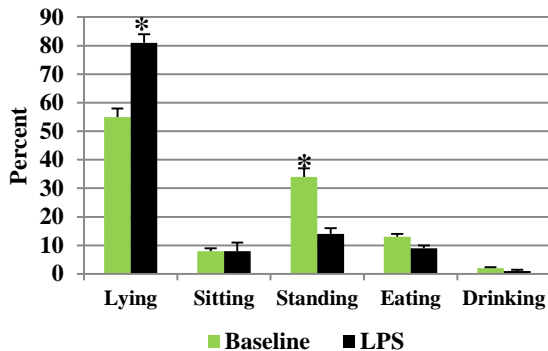
RFI selection line: There were no RFI selection line differences in behavioral and postural responses to the LPS challenge ($P \geq 0.45$; Figure 1).

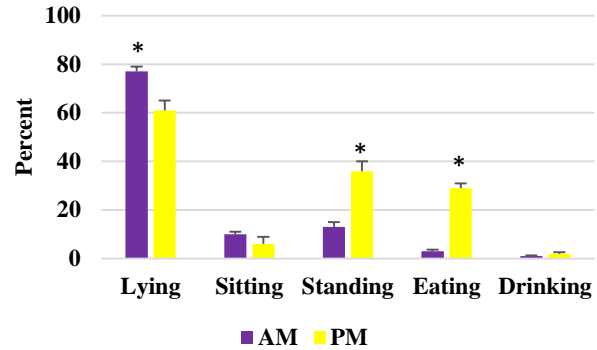**Figure 1. Gilt behaviors and postures when selected for HRFI and LRFI.**
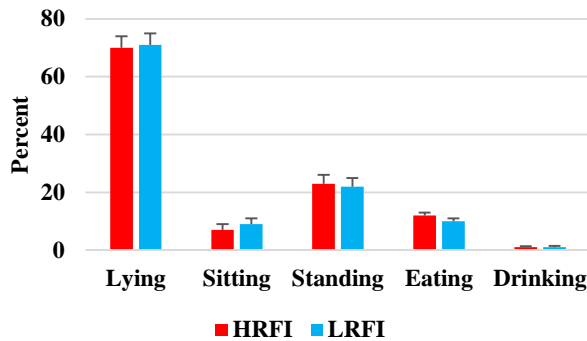
LPS treatment: Regardless of the RFI selection line, after the LPS challenge gilts laid more ($P < 0.0001$) and stood less ($P < 0.0001$). However, there were no differences observed in the percent of time engaged in sitting, eating and drinking ($P \geq 0.16$; Figure 2).

Figure 2. Gilt behaviors and postures before (baseline) and after (LPS challenge) an LPS challenge.

Time: Regardless of the RFI selection line, gilts laid more ($P = 0.0004$) and stood and ate less ($P < 0.0001$) during the first (AM) compared to the second time point (PM; Figure 3).

Figure 3. Gilt behaviors and postures for two time points. Time point 1 (AM) and time point 2 (PM).

In conclusion, gilts from both RFI selection lines similarly expressed classical sickness behaviors and postures when challenged with LPS.