Identification of the Range of Hock Angles in Lame and Non-lame Replacement Gilt

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Summary and Implications

Hock angle ranges were measured in Yorkshire gilts from the 10th generation of gilts divergently selected for residual feed intake (RFI) at Iowa State University. Fifty-five gilts (low RFI n= 26 and high RFI n= 29) were included in the study. Digital profile images were taken from each gilt and hock angles were measured while the gilt's leg was positioned forward, standing squarely, and backwards. Angles were calculated by tracing the front and back of the joint between the fibula/tibia and tarsals, with the anterior and posterior positions acting as the anchor. Additionally, gilts were classified as lame or non-lame according to their gait. Differences for hock angulation were found between RFI lines. Gilts in the low RFI line had wider hock angles while their leg was in the rear position than the high RFI but there was no difference in the front or standing positon. There was no difference in hock angles between lame and non- lame sows. However, when hock angles from lame and non-lame legs within each gilt were compared, lame legs had wider hock angles while standing and while flexing legs backwards when compared with the sound leg. Results indicate that there is a measureable difference in hock angulation between RFI lines and between lame and non-lame legs. Biological importance of such differences requires further research. These data indicate that there are differences in the angle to the hock, and lameness does play a part in those differences. This could indicate that the hock needs to be included as a tool for selection of animals with regards to longevity.

Introduction

Objective joint angle measurement is becoming increasingly important for gilt selection because of its relationship with sow productive lifetime. It has been reported that hock angle is related to sow longevity, but the range of acceptable hock angles in gilts is unknown. Furthermore, to our knowledge, there is no information in the scientific literature regarding possible differences in hock angles between lame and non-lame sows. The objective of this study was to identify the range for hock angle measurements, and possible differences in hock angulation between gilts that have been divergently selected for residual feed intake (RFI), as well as differences between lame and non-lame gilts.

Materials and Methods

Yorkshire gilts from the 10th generation of the Iowa State University RFI lines (low RFI n= 26 and high RFI n= 29) were moved to a pen where digital images (i.e. still pictures) of the gilts' profile (both left or right) were captured while walking to measure hock angles while the leg moved forward and backward. Angles were also measured while the gilt was standing squarely. On average, 9 images were used per gilt. Hock angles were measured by tracing the front and back of the joint between the fibula/tibia and tarsals, with the anterior and posterior positions acting as the anchor. Flank-to-flank measurement was recorded to estimate body weight. Gilts were classified as lame and non-lame. If lame, affected limb(s) were recorded and images for only the sound leg were used. Two separate analyses were conducted. First, in order to identify the range for hock angle measurements, and possible differences in hock angulation between RFI lines, hock measurements were taken only on the non-lame legs of the gilts. This was done to ensure that the hock angle measurements obtained were representative of hock angles in sound animals. The model to analyze hock angles was controlled for the gilt's lameness score. Second, as 16 gilts were classified as lame on the right leg, (Low RFI = 3 High RFI = 13), it was of interest to investigate possible hock angles changes between lame and sound legs.
Data were analyzed using mixed model methods (SAS v9.4 PROC MIXED; SAS Inst. Inc., Cary, NC).

Results and Discussion

Hock angles: There were no differences between hock angles on left or right legs or between overall lameness classifications. Body weight was not a significant source of variation. Hock angles differed between all three leg positions (forward, standing, and backward). Average hock angles were 141.7 ± 1.2, 133.4 ± 1.2 and 147.0 ± 1.16 degrees when the leg was positioned forward, standing and backward, respectively. Gilts from the low RFI line had wider hock angles when their leg was positioned backward than gilts from the high RFI line (151.3 ± 1.7 vs. 142.71 ± 1.5 degrees). There was no difference between RFI lines when the leg was positioned forward or standing. There is a measureable difference in hock angulation while the leg is in different positions. While hock angles differed between leg position and between the RFI lines, it's unclear if these differences are biologically important.

Angle differences between lame and sound legs: For the 13 gilts that were lame on the right leg, the analysis showed hock angle varied between the sound and lame leg. Affected legs had wider hock angles when compared with the sound leg (141.1 ± 1.9 vs 136.9 ± 1.9 degrees, respectively). Hock angles did not differ between lame and sound legs when the leg was positioned forward. However, while standing and while flexing legs backwards, hock angles were greater on the lame leg when compared with the sound leg (136.7 ± 2.1 vs. 132.7 ± 2.1 degrees and 145.4 ± 2.1 vs. 136.1 ± 2.1, respectively). Body weight was not a significant source of variation for any traits evaluated. Straighter hock angles on the lame leg could indicate an effort of the gilt to balance her body while moving due to the discomfort she might be experiencing in the lame leg.

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