

ANIMAL WELFARE

Title: Dynamic space requirements for non-lame and lame sows determined by lying-standing sequence profile – NPB# 15 -004

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Scientific Abstract:

The primary objective of this project was to determine the dynamic space requirements during a lying-standing postural sequence for lame and non-lame sows. A secondary objective was to characterize the postures and movements for the lying down sequence in multiparous sows and to identify possible lying sequence differences between lame and sound sows. A third objective was to identify other leg risk factors for lameness in multiparous sows. A total of 85 multiparous sows were used. Each sow was evaluated for walking lameness between their gestation stall to a pen using a 3-point scale (1 = normal to 3 = severely lame). Also, limb lesions such as callus, swellings and wounds were scored in the front and rear legs according to severity. Individual sows were moved to a pen on 30, 60 and 90 days of gestation and a ceiling mounted camera was installed above the pen to record one lying down-standing up event per sow. Observations ceased when the sow laid-down and stood-up or if 2.5 hours elapsed from recording commencement. Still frames of lying-down and standing-up sequences were combined into a single image and measured in Adobe Photoshop Elements by either counting pixels by contouring the sows' body or by overlaying a grid on the sow image. A second video of the sows' profile while standing in a gestation stall was collected on the same gestation days. From this video, postures and movements that occurred during the lying-standing sequence were identified. Time (seconds) from kneeling to shoulder rotation (KSR), shoulder rotation to lying (SRHQ) and total time to lie down (TLIE) were determined. In addition, latency to lie down (LATENCY; minutes) and number of attempts (ATTEMPTS) to successfully lie down were recorded. Time (seconds) to stand up was defined as the first leg fold to sit (TLS), time from sit to rise (TSR), and total time to rise (TRISE) were recorded from the standing up sequence. Furthermore, joint angulation at the knee, hock, front and rear pasterns were measured using digital images extracted from this secondary video only on first parity sows. Data was analyzed using mixed model equations. Lameness was re-classified as non-lame (score 1) and lame (scores ≥ 2) and parity was re-classified as 0, 1 and 2+. Data were analyzed using

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mixed model equations methods. On average, sows used $1.2 \pm 0.4 \text{ m}^2$ to lie down and to stand up and there was no difference in the space required between the two measuring methods used ($P > 0.05$). Space required to lie-down and stand-up increased as gestation progressed ($P < 0.05$). Lameness was not a significant source of variation for any of the traits evaluated in this study ($P > 0.05$). On average, sows took 13.9 seconds for KSR, 7.7 seconds for SRHQ, 20.5 seconds for TLIE and 66.1 minutes for LATENCY. Furthermore, sows took 8.0 seconds for TLS, 6.9 sec for TSR, and 9.8 seconds for TRISE. Lameness tended to take longer during KSR ($15.5 \text{ vs. } 11.9 \pm 1.59$ seconds for lame and sound sows, respectively; $P = 0.08$), and to spend less time standing ($54.1 \text{ vs. } 69.8 \pm 6.20$ minutes for lame and sound sows, respectively; $P = 0.06$) compared with sound sows. Additionally, lame sows tended to be more likely to sit while transitioning from lying to standing compared with sound sows ($P = 0.07$). Gestation day and parity were not associated with the time taken for the different movements in the lying down sequence ($P > 0.05$). There were no significant associations between gestation day, lameness status or parity and attempts to lie down. Sows parity 1 had greater TLS compared with gilts ($20.9 \text{ vs. } 4.7 \pm 3.01$ seconds; $P < 0.05$) and sows parity 2+ ($20.9 \text{ vs. } 5.5 \pm 3.62$ seconds; $P < 0.05$). Parity 1 sows tended ($P = 0.09$) to take 8.1- and 6.7 seconds more for TRISE than gilts and 2+ sows; respectively ($16.0 \text{ vs. } 7.9 \pm 1.9$ and 9.3 ± 3.3 seconds; $P < 0.10$). There was no significant association between lameness and any of the limb lesions studies ($P > 0.05$). Lameness had wider joint angles for the knee, front and rear pasterns compared with non-lame sows ($P < 0.05$). Under the conditions of this study, lameness did not influence dynamic space requirements or the time taken for the different movement of the lying down-standing up sequence. However, lameness recorded was mild and thus, it might not be severe enough to affect the studied traits. However, results from this study could be important in the decision making process for housing specifications regarding sow gestation housing space needs for gestation sow housing in the USA.