

## ANIMAL WELFARE

**Title:** Optimized Minimal Floor-space for Group-Pen System Using Feeding Stalls and Diet Strategy to Improve Well Being, **NPB #12-200**

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**Scientific Abstract:** One of the main concerns with housing gestating sows in group pens is the increased aggression at mixing and around limited resources which often results in variable body conditions scores and higher lesion and injuries. Grouped-housed sows establish a social hierarchy upon mixing which often reduces aggressive encounters later-on, however pregnant sows still engage in aggressive encounters at feeding time due to feed restriction, thus affecting sow well-being. At gestational d 37, groups of 9 multiparous sows/pen ( $n=144$ , 36/block) that were randomly assigned by BW and parity to a 2 x 2 factorial arrangement, with dietary treatments of either (a) soy hulls-wheat middlings (**Midds-Hulls**) or (b) DDGS-corn germ meal diet (**DDGS-GM**) modified gestation diets, and feeding stall length of either (c) 2 ft. (**SHORT**) or (d) 6 ft. (**LONG**). Social rank ( $n = 64$  sows) was determined using a feed competition test to assign dominance value (**DV**) of either dominant (**DOM**) or submissive (**SUB**). Within each treatment pen a DV was calculated based on aggressive encounters during the feeding test. Sow performance, productivity, behavior, immune and endocrine status were assessed throughout gestation to determine sow well-being. Lesion scores and blood glucose along with behavior at collection were recorded every 3 d for 2-wks post mixing (Phase 1), and then again on a bi-weekly basis until gestational d 104 (Phase 2). Data were analyzed using PROC MIXED with repeated measures and PROC GLIMMIX for ordinal data (SAS). No effects of diet x feeding partition length occurred for sow- or litter-related traits. Sows fed DDGS-GM loss less BW ( $P < 0.01$ ) from gestational d 90 through end of lactation and had greater BF depth ( $P = 0.05$ ) at end of lactation compared with sows fed Midds-Hulls diet. Those same sows also weaned heavier piglets than did sows fed Midds-Hulls diet ( $P = 0.02$ ). There was no diet x feeding partition length effect on total lesion severity during phase 1 ( $P > 0.05$ ), but there was an effect on lesion severity scores during phase 2. Sows housed in pens with SHORT feeding partitions and fed either Midds-Hulls or DDGS-GM diet had least severe total lesion scores ( $P = 0.04$ ). Sows fed Midds-Hulls diet had lower ( $P = 0.03$ ) total lesion severity score during phase 2. Regardless of diet, sows housed in pens with SHORT feeding partitions had less severe lesion scores during both phases ( $P < 0.01$ ). Interactions of feeding partitions and dietary fiber with social rank affected sow performance, behavior, productivity, and immune status. Socially, SUB sows were heaviest when housed in pens with LONG feeding stalls than with SHORT (social status x stall length;  $P < 0.02$ ), and SUB sows were also heaviest when fed Midds-Hulls diet and performed equally when compared with DOM sows (social status x diet;  $P < 0.01$ ). Total aggressive encounters (AE;  $P < 0.02$ ) and no. of AE towards SUB sows were lowest ( $P < 0.004$ ) when housed in pens with LONG feeding stalls and fed DDGS-GM diet (diet x stall length). Percentage of standing and sitting was greatest ( $P < 0.02$ ) for SUB sows

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fed DDGS-GM, but highest ( $P < 0.004$ ) percentage of eating was observed when sows were fed Midds-Hulls diet. Heaviest ( $P < 0.01$ ) adjusted litter and piglet wean BW ( $P < 0.005$ ) was found among piglets weaned from SUB sows in pens with LONG feeding stalls and fed DDGS-GM diet (social status  $\times$  diet  $\times$  stall length). Based on these results, it seems plausible to increase average piglet weaning weight by feeding sows a DDGS-GM diet from gestational d 35 to 104. However, the feeding partition lengths did not affect performance and productivity of sows housed in small groups, with exception of lesion severity scores which may be reflective of either inadequate length and/or floor-space allowance. Results from this research show that socially dominant and submissive sows both perceive and cope with social stress by evoking different biological responses and a combination of housing and dietary strategies can improve submissive sows well-being, therefore social status should be considered when implementing group housing for gestating sows. These results imply that if group-pens are not properly designed in terms of adequate floor-space and length of feeding stall partition there are minimal effects on the overall well-being of gestating sows in terms of performance and productivity. Moreover, these data imply that well-being of socially submissive sows may be improved by housing them in pens with longer feeding stalls and feeding them a high-fiber diet. Taken together, these results imply that sow social status is an important factor that should be considered when implementing group pen systems and that housing environment and dietary strategies may be a management tool that can be used to improve at least submissive sow well-being.