

## ANIMAL WELFARE

**Title:** Designer Diets Decrease Aggression and Increase Welfare - NPB #12-196

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### Scientific Abstract:

#### Experiment 1:

Aggression during mixing of pregnant sows impacts sow welfare and productivity. The aim of this study was to increase satiety and reduce aggression by including dietary fiber and fermentable carbohydrate. Sows were housed in individual stalls 7 to 14 d post-breeding and were fed (at 0700 h) with either a CONTROL (regular feed with no extra fiber), RSTARCH (10.8% resistant starch), BEETPULP (27.2 % sugar beet pulp), SOYHULLS (19.1% soybean hulls) or INCISOY (14.05% soybean hulls) for 21 d (5 sows/diet × 5 diets × 8 replications = 200 sows). The CONTROL diet was targeted to contain 185 g/d/sow NDF and other diets were targeted to contain 350 g/d/sow NDF. The INCISOY diet was fed at 2.2 kg/d/sow and other diets were fed at 2 kg/d/sow. On d 22, sows were mixed in groups of five (at 1200 h). Behaviors in stalls (on d 1, 7, 14 and 21) and after mixing (d 22 and 23), heart rate (on d 1, 7, 14 and 21), blood metabolites (on d 2, 8, 15, 22 and 25), and the effects of diets on production were collected and analyzed. Sows stood more ( $P < 0.01$ ) and rested less ( $P < 0.001$ ) over time irrespective of the diet. Sows on BEETPULP stood more ( $P < 0.01$ ) and sows on SOYHULLS rested more ( $P < 0.01$ ). Sham chewing increased over days irrespective of the diet. Chewing behavior (bar and feeder) increased with days on diet ( $P < 0.001$ ) and was lowest in sows on SOYHULLS diet ( $P = 0.045$ ). When mixed, biting frequency in the first hour was highest for sows on the CONTROL diet ( $236.5 \pm 62.6$ ) and lowest for sows on the RSTARCH diet ( $90.5 \pm 30.5$ ). Skin lesions increased ( $P < 0.001$ ) 24 h after mixing sows irrespective of diet. Blood urea nitrogen (BUN) concentration was lowest in BEETPULP and SOYHULLS ( $P < 0.001$ ). Serum glucose concentration was highest in RSTARCH and BEETPULP ( $P = 0.04$ ), but there was no day effect ( $P = 0.62$ ) or diet by day interaction ( $P = 0.60$ ). The NEFA was greatest in RSTARCH, BEETPULP and SOYHULLS ( $P < 0.001$ ). Lactate ( $P < 0.001$ ) and BUN concentrations were greatest on d 2 but dropped and remained constant after d 8. Average heart rate was lowest for sows on SOYHULLS and INCISOY compared to other diets ( $P = 0.03$ ). Number of piglets born and average weaning weight were not affected by diets ( $P > 0.05$ ). Average birth weight was lowest in INCISOY diet ( $P = 0.02$ ). This study demonstrates that RSTARCH and SOYHULLS can improve the welfare of sows by reducing aggression and increasing satiety in limit fed pregnant sows without affecting production.

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### Experiment 2:

The aim of this study was to increase satiety and reduce aggression by modifying the diets in Experiment 1 to include combinations of them or to increase their effectiveness. Sows were housed in individual stalls 7 to 14 d post-breeding and were fed (at 0700 h) with either a Control (regular feed with no extra fiber), Ad Libitum (as a control for satiated sows), resistant starch (16.2% inclusion rate), and resistant starch/soyhulls (8.1% resistant starch/8.05% soybean hulls). Unlike Experiment 1, in this study we found few to no differences in behavior, physiology, or productivity. It was observed that control sows in this experiment showed low levels of aggression as compared to sows in Experiment 1, likely causing any treatment differences to be non-existent. It is concluded that the resistant starch diet and the soyhull diet as fed in Experiment 1 are the best candidates to decrease aggression and abnormal behavior through dietary means.