

## Public Abstract

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Title:Effects of heat stress on reproduction and productivity of primiparous sows and their piglets' performance

Heat stress (HS) produces seasonal infertility in sows and decreases reproductive efficiency. The objective of this study was to examine productivity in sows exposed to HS during a production cycle (gestation, lactation, and breeding). First parity Landrace or Landrace/Large White F1 sows were rotated through environmental chambers in the Brody Environmental Center (BEC) for 55 d beginning in late gestation, continuing through farrowing/lactation and culminating in breeding. The ambient temperature sequences included either thermoneutral (TN; 18 to 20 degrees C) or HS (24 to 30 degrees C) for each production phase with the following treatment groups: TN-TN-TN (n = 15), TN-HS-TN (n = 14), HS-TN-HS (n = 14) or HS-HS-HS (n = 15) for gestation-farrowing-breeding (20, 24, and 11 d, respectively). Rectal temperature, respiration rate, shoulder skin temperature, body weight (BW), backfat (BF), loin eye area (LEA), feed intake (FI), metabolite concentrations, energy balance, piglet weights, follicular growth and breeding performance were measured. Rectal temperature differed across phases and conditions (38.33 and 38.22, 39.47 and 39.22, 38.79 and 38.74 degrees C (SEM < 0.05) for HS and TN during gestation, lactation, and breeding, respectively; P < 0.001). Sows had similar FI (kg/d) when limit fed during gestation (2.28) and breeding (1.71), but during lactation (ad libitum) TN sows had greater FI than HS sows (3.75 vs. 3.12; P < 0.001). There was no effect of treatment on BW, BF, or LEA before farrowing, after parturition and on the day of weaning. Sows in HS had less body weight gain during gestation than TN sows (11.7 vs. 14.2 kg, respectively; P < 0.022). There was an effect of treatment on the change in LEA during gestation (-2.03, -2.57, -2.68, and 1.43 cm<sup>2</sup> for TN-TN-TN, TN-HS-TN, HS-TN-HS, and HS-HS-HS, respectively; P < 0.050). Sows in HS-TN-HS (-22.2 kg) lost less weight during lactation (-30.4, -32.6, and -30.7 kg for TN-TN-TN, TN-HS-TN and HS-HS-HS, respectively; P < 0.084). There was also an effect of treatment for the change in body weight and backfat depth during breeding (-11.3 and -0.24, -10.0 and -0.27, -10.5 and -0.05, and -7.7 kg and -0.07 cm for TN-TN-TN, TN-HS-TN, HS-TN-HS and HS-HS-HS, respectively; P < 0.059). Follicular growth was affected by treatment on the day of weaning, and sows in HS-TN-HS had a greater largest follicle (P < 0.047). Total born (11.7 pigs), piglet birth weight (1.46 kg) and total weaned (10.3 pigs) were similar, but piglet weaning weight was greater at the end of lactation for TN compared with HS sows (6.21 vs. 5.76 kg; P < 0.053). Blood IGF-I was different within d 43 only (103.41, 84.83, 116.11 and 89.52 ng/mL for TN-TN-TN, TN-HS-TN, HS-TN-HS and HS-HS-HS, respectively; P < 0.003), and HS-TN-HS sows had the greatest concentrations the day before weaning. Blood NEFA concentrations were not different (153.85, 204.28, 137.02 and 138.51 ng/mL for TN-TN-TN, TN-HS-TN, HS-TN-HS and HS-HS-HS, respectively). Weaning to estrus interval (4.70 d), percentage inseminated sows after weaning (85.7%), subsequent farrowing rate (82.6%) and subsequent total born (10.8 pigs per litter) were not different by treatment. In summary, HS decreased FI during lactation. This depression in feed intake was associated with a decrease in milk production and reduced piglet growth. There was no effect of heat stress among treatments for BW, BF, and LEA when averaged across gestation, farrowing and breeding. Heat stress, however, did impact the change in BW, BF, and LEA during the trial. Heat stress did not affect metabolite concentrations except on the day of weaning for IFG-I. Sows with greater feed intake had greater IFG-I concentrations. These sows had larger follicles at weaning, but the difference in size was not sustained. Rebreeding and second farrowing performance was not compromised by HS. To conclude, although HS increased body temperature and decreased feed intake, milk production and piglet growth, it did not detrimentally impact reproductive performance.