RESEARCH ABSTRACT

ANIMAL SCIENCE

Title: Trans-generational effects of *in utero* heat stress on reproduction in the gilt and sow, **NPB15-043**

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Date Submitted: October 30, 2017

Revised 2

Scientific Abstract:

Gestational heat stress may lead to transgenerational changes in the reproductive capacity of boars and gilts. The objective of this project was to assess fetal and placental development and the development of gonads in conceptuses whose mother was subjected to either gestational heat stress (GHS; 28 to 38° C; 65 to 88% relative humidity; n=12) or gestational thermoneutral (GTN; 17 to 22°C; 56 to 65% relative humidity; n=11) conditions during pregnancy or *in utero* as a developing fetus. Gilts were housed in the Brody Environmental Chambers from week (wk) 4 to 8 of pregnancy, then sacrificed during wk 8 of gestation for collection of reproductive tracts and fetal tissues, and a subset of gilts (GHS n=23; GTN n=25) were moved to the University of Missouri Swine Teaching Farm and allowed to farrow. During pregnancy, GHS gilts had greater rectal temperature (38.5±.04 vs. 38.0±.04 °C; P<.001), skin temperature (35.5±.2 vs. 28.7±.2 °C; P<.001), and respiration rate (44.3±2.6 vs. 19.5±2.7 breaths per min; P<.001) than GTN. Sow was the experimental unit for analyses of fetal development. Weight of the pregnant tract (12.0±1.2 vs. 12.5±1.3 kg), number of viable conceptuses (13.8±.8 vs. 15.3±.9), number of non-viable conceptuses (.3±.2 vs. .1±.2), number of mummies (.2±.1 vs. .3±.1), and the %survival (number of viable conceptuses/number corpora lutea; 89±4 vs. 90±5%) did not differ (P>.10) for GHS vs. GTN, respectively. Upon dissection, the weight of the fetus (82.3±3.6 vs. 84.9±3.8 g), placenta (155.5±14.7 vs. 170.1±15.6 g), fetal fluid (80.4±10.0 vs. 90.4±10.6 g), and placental efficiency (fetal weight/placental weight; 0.60±.04 vs. 0.55±.05) did not differ (P>.10) for GHS vs. GTN, respectively. The ratio of male to female fetuses was similar (P>.10) for GHS (1.3±.3) and GTN (1.6±.3). Weight of male fetuses (86.2±3.8 vs. 86.4±4.0 g), combined testis weight (34.2±1.4 vs. 32.8±1.5 mg), and combined testis weight as a % of fetal weight (.040±.001 vs. .038 ±.001) did not differ (P>.10) for GHS vs. GTN, respectively. Weight of female fetuses (81.2±3.6 vs. 83.5±3.8 g), combined ovarian weight (25.2±1.0 vs. 26.1±1.1 mg), and combined ovarian weight as a % of fetal weight (.031±.001 vs. .031 ±.001) did not differ (P>.10) for GHS vs. GTN, respectively. After treated females farrowed, it was determined that litter size (13.6±0.7 vs. 13.6±0.6), piglet birth weight (1.26±0.03 vs. 1.28±0.03 kg), and weaning weight (3.61±0.10 vs. 3.71±0.10 kg) did not differ (P>0.10) between GHS and GTN females, respectively. Female progeny (generation 1; G1) from both GTN and GHS mothers remained on farm and were AI at second estrus. During the 8th wk of gestation, gilts that came from the GTN (GTN-G1; n=55) and GHS (GHS-G1; n=50) were sacrificed for the collection of the reproductive tracts and fetal tissues (grandprogeny). Sow was the experimental unit for analyses of fetal development. An effect of replicate between replicates 1, 2, 3, and 4 was observed for the weight of the pregnant tract (9.9±1.0 vs. 11.7±0.7 vs. 15.0±1.0 vs. 13.6±0.7 kg; P<0.003). The

weight of the pregnant tract (12.7±0.6 vs. 12.4±0.6 kg), number of viable conceptuses (12.3±0.6 vs. 12.7±0.5), and the %survival (number of viable conceptuses/number corpora lutea; 77±4 vs. 75±3%) did not differ (P>.10) for GHS-G1 and GTN-G1 (respectively). A sex-specific transgenerational effect on fetal weight was observed, because male fetuses from GHS-G1 had increased weight (129.0±4.8 vs. 119.5±4.5 g) but female fetuses were similar (117.4±4.7 vs. 115.8±4.5 g) (GHS-G1 vs. GTN-G1; Treatment by sex, P<0.012). Placental weight was lesser in females vs. male (155.5±5.7 vs. 170.1±5.7 g; P<0.001) but placental efficiency (fetal weight/placental weight) did not differ between females and males (82.9±2.3 vs. 80.5±2.3; P>.10) or GHS-G1 vs. GTN-G1 (P>.10). The conclusion was that heat stress from wk 4 to 8 of gestation in gilts did not change the growth of the fetus, placenta, ovary or testis at mid-gestation, and *in utero* heat stress from wk 4 to 8 of gestation had gender-specific transgenerational (first generation) effects.