

Title: Impact of in utero heat stress on subsequent lactational performance and performance of offspring - NPB project #14-133 Revised

Investigator: Michelle L. Rhoads

Institution: Virginia Polytechnic Institute and State University

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Scientific Abstract:

Previous research in the area of gestational heat stress (gHS) has shown that pigs exposed to gHS retain greater adiposity during adolescence and yield carcasses with greater fat:lean content at slaughter compared to pigs under thermoneutral gestational conditions (gTN). The objective of this study was to determine the effects of gHS on the lactational performance of affected gilts (F1 generation), as well as to determine if the effects of gHS are multi-generational and persist into subsequent generations (F2 generation). In the experiment, twenty-four post-pubertal gilts were bred and housed in thermoneutral or heat stressed conditions for the entirety of gestation at the University of Missouri-Columbia. Female offspring of these litters (F1 generation) were then grown to breeding age and transported to the Virginia Tech Tidewater Agricultural Research and Extension Center, where they were bred to farrow in two replicates. The first group farrowed in the spring (March and April) and the second in the summer (July and August) months ($n = 16$ gHS/SPR; 18 gHS/SUM; 19 gTN/SPR; 15 gTN/SUM). Colostrum samples were collected 15 hr post-farrowing, and milk samples were collected on d 7, 14, and 21 post-farrowing. All milk samples were analyzed for fat (FAT), protein (PRO), solids-non-fat (SNF), lactose (LAC) and somatic cell content. Milk yield was also determined at peak lactation (day 19 ± 1 of lactation). There was no effect of gestational treatment or season of farrowing, nor their interactions, on milk production. Protein content tended to be higher in milk from dams that were heat stressed in utero ($P=0.07$). Conversely, lactose content was lower in milk from dams that were heat stressed in utero ($P<0.05$). Milk fat, solids non-fat and somatic cell count did not differ based upon in utero treatment. At weaning, a subset of equal-gender offspring from these litters were retained and grown to slaughter in mixed pens under identical management conditions. The dam's gestational environment did not impact growth of these pigs to market weight. Days of age and live weight at the time of slaughter did not differ between treatment groups, indicating that the number of days needed to reach a similar market weight was not affected by treatment. Carcass analysis after 24 hrs post-mortem revealed a tendency for greater backfat ($P=0.11$) and dressing percentage ($P=0.14$) in the offspring of gestationally heat stressed dams compared to the offspring of gestationally thermoneutral dams. There were no detectable differences in loin eye area or lean percentage. The tendency for greater adiposity as indicated by the backfat thickness suggests that the effects of in utero heat stress are diluted, but still evident, across multiple generations of offspring.

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • pork.org
