IMPACTS OF *IN UTERO* HEAT STRESS ON CARCASS AND MEAT QUALITY TRAITS OF PORK LOINS

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I. OBJECTIVES

Heat stress (HS) has been demonstrated to negatively affect animal growth and performance, which leads to adverse impacts on the livestock industry. Swine are particularly prone to experiencing HS, due to their lack of functional sweat glands and large body size. Gestating sows are more susceptible to HS due to increased metabolic heat production as gestation progresses. Furthermore, *in utero* heat stress (IUHS) may cause more issues with pork production. While it is well known that IUHS has negative impacts on the offspring's growth and performance postnatally, it is largely unknown what effects IUHS has on meat quality attributes. Therefore, the objective of this study was to evaluate the impacts of IUHS on carcass and meat quality traits of market weight pigs.

II. MATERIALS AND METHODS

A total of 24 pregnant gilts were blocked by body weight and assigned to a thermoneutral (TN; $n = 12$; 17.5°C ± 2.1°C) or HS ($n = 12$; cyclic 26°C to 36°C) chamber during the first half of gestation (day 6 to 59). All pregnant gilts were exposed to TN conditions (20.9°C ± 2.3°C) from day 60 of gestation to farrowing. From all of the litters, gilts were randomly selected from the TN group (*in utero* thermoneutral [IUTN]; $n = 10$) and from the HS group (IUHS; $n = 10$), raised to market weight (117.3 ± 1.7 kg body weight), and harvested under standard conditions. Carcass and organ weights were recorded, and the rate and extent of temperature and pH declines were measured during 24 h postmortem. After the carcass quality traits were measured, the right-side *longissimus* muscles were sectioned and randomly assigned to either no aging or 7 d of aging at 2°C in vacuum packaging. Chops (2 cm thick) were used to measure Warner-Bratzler shear force (WBSF), surface meat color, water-holding capacity (WHC), and other chemical attributes, such as fatty acid profile, lipid oxidation, and protein denaturation. The data were analyzed using the PROC MIXED procedure of SAS version 9.4 (SAS Institute Inc., Cary, NC) in a randomized complete block design with IUHS treatment as main effect and dam as a random effect. Statistical significance was separated at $P < 0.05$.

III. RESULTS

Carcasses from IUHS pigs had lower head and heart weights ($P < 0.05$) compared to IUTN pigs. The IUHS treatment had a decreased loin muscle area ($P < 0.05$). No differences in other carcass quality traits, such as marbling score, fat depth, and muscle/lean firmness/lean color scores, were found ($P > 0.05$). Pork chops from IUHS carcasses had significantly higher WBSF values compared to IUTN counterparts ($P < 0.05$), regardless of aging. No impacts of IUHS on WHC were found ($P > 0.05$), but postmortem aging reduced drip, freezing/thawing, and cooking losses of loin samples ($P < 0.05$). Temperature and pH decline, surface color attributes, fatty acid profile, lipid oxidation, and protein denaturation were all unaffected by *in utero* environment ($P > 0.05$).

IV. CONCLUSION

These results suggest that IUHS negatively impacts some carcass and meat quality traits, evidenced by the decreased loin muscle area and increased WBSF values. However, there appeared to be limited impact on other traits, including pH, color attributes, WHC, and antioxidative capacity. To the best of our knowledge, this is the first study reporting the impacts of IUHS on carcass and meat quality traits of market weight pigs. These results provide practical implications for the pork industry to prioritize minimizing IUHS during the first half of gestation to improve yield and quality.

Keywords: carcass composition, gestation, *in utero* heat stress, pork quality