INFLUENCE OF CARCASS CHILLING SYSTEM ON CHUCK, LOIN, AND ROUND TEMPERATURE DECLINE

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I. OBJECTIVES

Spray chilling has been utilized to replace loss of moisture and increase yields during beef chilling. The objective of this study was to evaluate the effect of spray chilling beef carcasses on temperature decline of the chuck, loin, and round.

II. MATERIALS AND METHODS

Ten beef animals were slaughtered at the South Dakota State University Meat Laboratory across 2 slaughter days ($n = 5$/d). Hot carcass weight for each side was recorded. The left side of each carcass was chilled by air movement only (AIR), and the right side was spray chilled (SPRY). Air temperature of the cooler was 3.8°C (range 2.5°C–6.0°C), and air movement was 3,500 m^2/min. The SPRY treatment was chilled under similar conditions to the AIR treatment with addition of a timed spray of chilled water at 5.5°C with a volume of 3.78 L for 80 s repeated every 32 min for 24 h via 10 sprinkler heads. Temperature data loggers were placed in the round, loin, and chuck of each side 60 min postmortem, and temperature was recorded at multiple positions every 30 min. Loggers were placed in the center of the round in the *semimembranosus* at depths of 20.32, 15.24, 10.16, and 5.08 cm from the surface. Loggers were placed in the chuck immediately posterior to the foreleg in the pocket between the brisket and the chuck in the *serratus ventralis* at depths of 20.32, 15.24, and 10.16 cm. A data logger was placed 10.16 cm deep into the *longissimus lumborum* of the loin, at the third lumbar vertebra. Data were analyzed using the MIXED procedure of SAS (SAS Institute Inc., Cary, NC). Hot carcass weight was used as a covariate for all data. Temperature decline from the round and chuck were analyzed as repeated measures with day, time, treatment, and logger depth and their interactions as fixed variables. Temperature decline from the loin was analyzed as a repeated measure with day, time, and treatment and their interactions as fixed variables. Statistical significance was considered at an alpha of $P < 0.05$.

III. RESULTS

Sides exposed to SPRY treatment were cooler ($P < 0.001$) than AIR chilled sides in the round, loin, and chuck. No treatment by time interactions were observed for any primal ($P >$ 0.05). A treatment by depth interaction was observed in the chuck ($P = 0.001$) with SPRY sides having lower temperatures than AIR sides at the 10.16-cm depth (21.4°C vs. 22.5°C; $P < 0.0001$) and 20.32-cm depth (23.4°C vs. 24.0°C; $P = 0.0006$). A depth by time interaction was observed in the round ($P < 0.0001$). In the round at time 0, the 5.08-cm probe recorded lower (30.0°C; $P < 0.0001$) temperatures compared to the 10.16-, 15.24-, and 20.32-cm probes, which were similar (39.5°C, 40.2°C, and 39.8°C, respectively; $P > 0.05$). At 1,440 min, as depth in the round increased, temperature increased and differed at each depth (5.2°C at 5.08 cm, 10.2°C at 10.16 cm, 12.2°C at 15.24 cm, and 13.6°C at 20.32 cm; $P < 0.0001$).

IV. CONCLUSION

Spray chilling of beef carcasses resulted in lower internal temperatures in the round, loin, and chuck compared to the air chilled sides. Internal temperature decline differs between carcass locations and muscle depth. Tissue closer to the surface reached lower temperatures and chilled faster than deep tissue in both AIR and SPRY treatments. These data suggest that spray chilling helps chill carcasses more rapidly; however, additional research is needed to optimize spray chilling systems.

Keywords: beef, internal, spray chilling, temperature