



Vascular Rinsing and Chilling Carcasses: Effects on Quality Attributes and Metabolic Changes in Beef

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Objectives

Rinse & Chill® (RC) is a process applied early postmortem that provides the ability to manipulate muscle metabolism and can have a positive impact on meat quality traits. This study aimed to evaluate the effect of RC on pH decline, shear force, sarcomere length and cooking losses on different cull dairy cow carcass grades. Investigate the ability of different substrates to modulate contractile response as an indirect measure of metabolic activity on beef early postmortem.

Materials and Methods

For each carcass grade (lean, LE; light, LI), ten carcasses were conventionally chilled (CC) and twelve carcasses were chilled using RC technology (MPSC Inc.). The RC process involved infusion of a chilled isotonic solution (98.5% water; balance: glucose, phosphates, and maltose) through the vascular system, beginning in the arterial and exiting the venous side of the vasculature. Shear force and cooking losses were measured on *Longissimus dorsi* steaks aged (7 d). Sarcomere length (SL) was determined by a laser diffraction method. Animal served as the experimental unit and data were analyzed with a PROC MIXED procedure. For contraction measurements, a muscle-fiber bundle from the Sternomandibularis muscles ($n = 14$) was collected from cull dairy cows in a commercial packing plant, 15 min after bleeding. The muscle bundle was attached to a force transducer (FT-302, iWorx, Dover, NH). Stimulation electrodes were used to elicit a supramaximal electrical stimulus at a frequency of 50 V, 0.1 Hz (HCS-100 stimulator, iWorx). Muscle weight was standardized, and length was adjusted to obtain maximum twitch-tension output. After 3 min of rest in a test solution, 200 stimuli were given, and the contractile response was recorded. Four solutions were tested (A = RC, B = Fructose, C = Sodium phosphate,

D = Dipotassium phosphate; substrates added at 1% except fructose 1.5%). Descriptive means for initial peak twitch force, final peak twitch force, percentage decline and percentage half-time decline were calculated to determine the response associated with each solution.

Results

RC reduced ($P < 0.05$) shear force by 51.9% (6.79 kgf CC) and 55.8% (8.50 kgf CC) for LI and LE cows, respectively. LI cows were more tender than LE for CC (6.79 vs. 8.50 kgf; $P < 0.05$). RC compared to CC had longer SLs (LE: 1.80 vs. 1.44 μ ; $P < 0.05$) and LI (1.80 vs. 1.40 μ ; $P < 0.05$). Purge and cooking losses were not affected by chilling method. The contractile responses of the muscle after the exposure to the solutions were slightly different. The average percentage decline of peak twitch force was higher for solution B, followed by solutions A, D, C (54.8%, 53.5%, 48.0%, 43.4%, respectively). Furthermore, the same pattern was observed for the average percentage decline at half time of the test (82.5%, 80.4%, 78.1% and 74.7%, respectively).

Conclusion

Packing plants that harvest cull dairy cows have the potential to dramatically improve tenderness and thereby merchandize a greater amount of whole muscle cuts as a result of the application of the Rinse & Chill®. This improvement may be associated with accelerating postmortem glycolysis, thereby limiting cold shortening, although enhanced proteolysis may also be involved. Continuous electrical stimulation of isolated muscle-fiber bundles while being soaked in selected test solutions led to decreased and somewhat varied contractile force responses suggesting the potential to modify muscle metabolism.