Published April 25, 2019

2018 Reciprocal Meat Conference – Meat and Poultry Quality

Meat and Muscle Biology™

Vascular Rinse and Chill Effects on Meat Quality and Shelf Life of Cull Cows

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Keywords: carcass chilling method, color, dairy and beef cows, steak and ground beef, tenderness
Meat and Muscle Biology 2(2):105 **doi:10.221751/rmc2018.094**

Objectives

To determine the effect of vascular Rinse & Chill technology on meat quality and shelf life of cull cows in comparison to conventional carcass harvest.

Materials and Methods

Two treatments were randomly implemented on lean dairy cows (LC) and grain-finished beef cows (GF). Ten LC carcasses were conventionally chilled (CC, plus high voltage electrical stimulation, ES) and 12 LC were chilled using Rinse & Chill technology (RC; MPSC Inc.) without ES. Six GF were conventionally chilled (plus ES) and other 5 GF were chilled with RC (without ES). The RC process involved transfer 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. The pH and temperature of each carcass were taken at 1, 4, 8, 12, and 24 h postmortem. At 24 h postmortem (PM) carcass swabs on LC were taken for total aerobic plate count (APC). Lean ground beef (10% fat) from only LC was made from a composite of the quadriceps femoris (round tip), longissimus muscle (LM, strip loin), and triceps brachii (shoulder clod). Fat ground beef (20%) was made from GF fat trim (navel) that was blended with LC lean. Moisture and fat content were determined in ground beef samples. Shear force and cooking losses were measured on 2 steaks (aged postmortem: 14 d, LC; 10 d, GF) according to AMSA guidelines. Color (CIE L*, a*, b*) was measured (displayed 1, 4, 7 d) on LM, semimembranosus (SM), and ground beef. States of myoglobin (oxymyoglobin, deoxymyoglobin, metmyoglobin; Shimadzu Scanning Reflectance Spectrophotometer) were measured on ground beef (4 d PM, displayed 1,4,7 d) and microbial analysis was determined on 7 d (APC, enterobacteriaceae, lactic acid bacteria; log CFU). Animal served as the experimental unit and data were analyzed with PROC MIXED model (SAS Inst. Inc., Cary, NC).

Results

Beef originating from cull cows tends to have issues with lean color and tenderness. The RC is a technology that reduces carcass temperature early PM as well as facilitates greater blood removal which have the potential to improve muscle color and stability. RC process also modulates PM metabolism in a manner that can positively impact tenderness. RC resulted in greater ($P < 0.05$, 51.3 vs. 48.6%) dressing percentage for LC, but was not significant for GF cows (61.6 versus 56.2%). The RC provided lower ($P < 0.05$; 0.40 log CFU) APC on carcasses compared to the control (0.93). LC RC had a higher ($P < 0.05$) pH than C (4, 8 h PM). LC RC had a lower ($P < 0.05$) temperature (LM, SM) at 1 h PM than C. The RC did not affect moisture or fat content in LC ground beef. Shear force varied depending on cow type and PM age (LM: LC d7 not different, d14 RC less tender, 0.6 kgf difference; GF RC more tender, 1.2 kgf lower). Cooking losses on LC were not different but higher for RC on GF. LC ground beef and GF blended (20% fat) ground beef on d 7 display had higher CIE a* (RC vs. CC; 15.8 vs. 13.1; 15.9 vs. 12.8, respectively), higher DMb, and lower MMb. SM LC steaks had higher CIE b* (d 4) and CIE L* (d 7). GF LM steaks had higher CIE a* (d 1). Higher values for lactics were found for RC (P t< 0.05), but no differences were observed for APC and enterobacteriaceae in ground beef.

Conclusion

Rinse & Chill technology has potential to improve the quality and shelf life of meat from cull cows, but results may be influenced by cow type.

