Effects of Vascular Rinse and ChillTM **Technology on Beef Cholesterol, Color Stability,** Shear Force, and Palatability.



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Abstract

The objective of this research was to evaluate effects of Vascular Rinse and ChillTM (R&C) technology on beef cholesterol, color stability, shear force, and palatability in four muscles within the beef carcass: serratus ventralis (SV), triceps brachii (TB), obliquus abdominis internus (OAI), and semitendinosus (ST). The R&C process was applied to 10 of 20 carcasses as the experimental group and the remaining 10 carcasses were the control group. Temperature and pH readings were taken at 1, 7, and 24 h postmortem. The SV, TB, OAI, and ST were dissected from the left side of each carcass and cholesterol, color stability, Warner-Bratzler shear force. and sensory testing were conducted for each muscle. High and sensory testing were conducted for each muscle. High performance liquid chromatography and gas chromatography analysis were conducted on denuded, composite (day x treatment) samples. High performance liquid chromatography analysis revealed reductions in cholesterol content in the SV ($P \leq 0.05$), TB ($P \leq 0.05$), and ST. Gas chromatography results showed significant reduction in cholesterol for all muscles. Steaks from each muscle were placed in a retail display environment and colorimeter readings were taken to determine color stability. Experimental steaks from the SV, TB, and OA1 had higher a* values than control steaks throughout the test with significant differences for SV on d 1 through 6, TB on d 1 through d 12, and OA1 on d 3 through 12 (excluding d 6). Warner-Bratzler shear force evaluation was conducted on all muscles with no differences ($P \leq 0.01$) shown conducted on all muscles with no differences ($P \le 0.10$) shown between experimental and control groups in all four muscles tested. Sensory evaluation was performed by a consumer preference panel consisting of 84 panelists evaluating paired experimental and control samples from the same muscles for experimental and control samples from the same induces to liking of flavor, juiciness, toughness, liking of texture, and overall liking, Flavor liking, juiciness ($P_{\leq} < 0.05$), toughness ($P_{\leq} < 0.05$), texture liking ($P \leq 0.05$), and overall liking ($P \leq 0.05$) were improved for TB samples from the experimental group over controls. There was a trend towards less toughness for SV samples from the experimental group. Juiciness ($P_{\leq} < 0.05$) and texture liking ($P \leq 0.05$) were better for experimental samples than control samples when the average of SV, TB, and ST values were analyzed. Rinse and Chill[™] reduces cholesterol and increases palatability and color stability of beef warranting further research into this process.

Introduction

Vascular infusion has been researched using a number of solutions and procedure criteria with varying results (Koohmariae et al., 1989; Koohmariae and Shackelford, 1991; Farouk, et al., 1992; Wang et al., 1995). MPSC, Inc. (St. Paul, MN) has developed a postexsanguination vascular infusion process called Rinse and $Chill^{TM}$ (R&C), The (R&C) process has been evaluated and reported on by a number of researchers (Farouk, et al., 1992; Yancey, et al., 2001; Yancey, et al., 2002) in early stages of its development. Of this and other private research MPSC, Inc. has implemented improvements to the R&C

process currently being used. This research will examine the new technology as a method of reducing cholesterol as well as improving meat palatability and color stability in beef.

Objective

Provide sound documentation of the benefits of the Rinse and ChillTM Technology relative to:

Reduced cholesterol level •Extended shelf life

Increased tenderness of selected muscles

•Improved red meat color

Materials & Methods

- arcass Jreatment
 20 steers harvested in two groups at G & C Packing Co.
 Rinse and ChillTM technology was applied to the first 5 of 10 carcasses on d 1 and the last 5 of 10 carcasses on d 2
- Temperature and pH data were collected in the longissimus muscle at the 4th lumbar vertebrae; 1,7, and
- 24 h postmortem

Sample Collection

- Serratus ventralis (SV), triceps brachii (TB), obliquus abdominis internus (OAI), and semitendinosus (ST) were disected from the left side of the carcasses and were vacuum packaged Muscles were cut into 2.54 cm steaks and identified as
- cholesterol, shear force, fresh shelf life color evaluation, or sensory panel samples

holesterol Measurement GC – AOAC Method 994.10

 HPLC – Katsanidis and Addis, 1999 (Free Radical Biol.&Med. 27: 1137-1140)

Fresh Shelf Life Color Evaluation

- Steaks were packaged in oxygen permeable packaging and placed in a retail case environment. Minolta Colorimeter used to evaluate color changes
- <u>imer Sensory Panel Evaluatio</u>n Steaks frozen at 8 d postmortem 80 panelists

<u>Shear Force Determination</u> • Steaks aged for 9 d and fresh shear force recorded Six cores (1.27 cm) from each muscle sheared using a

Results and Discussion



Carcass data collection revealed a significant increase in rate of pH decline for R&C carcasses vs control carcasses. Temperature measurements (not shown in tabular form) were lower for R&C carcasses than control carcasses at 1h (P 0.14) and 7h (P = 0.09) postmortem.



Rinse and ChillTM SV and TB muscle samples from the chuck Rinse and Chill¹¹⁻⁸ SV and TB muscle samples from the chuck had lower (P < 0.05) cholesterol values as determined by HPLC and GC methods. The GC method also found that treated OAI and ST muscles were lower in cholesterol than control muscles. HPLC and GC method results were in agreement for SV and TB muscle cholesterol values.

Shelf Life Color Results





Minolta a* value is a measure of redness to greenness; therefore, a* is a good indicator of the amount of discoloration in meat. There were significant differences between control and treatment cuts for the SV, TB, & OAI. The SV was more and treatment cuts for the SV, TB, & OAI. The SV was more red (P < 0.05) for treated steaks vs control steaks for d 1-6 and treated SV steaks continued a trend to more red that control SV steaks through d 12. TB a^{*} values were significantly higher (more red, less discoloration) for treated steaks than control steaks for days 1 through 12. Treated OAI a^{*} values were significantly higher for treated steaks than for control steaks from d 3 through d 12 with the exception of d 6, which may have been due to a calibration problem. The a* values for ST steaks were not significantly difference between treated and control samples.

Sensory Panel Results

| Muscle | Rinse and Chill [™] increased |
|--------------------|--|
| | - Tenderness* |
| | Juiciness* |
| TB (shoulder clod) | Texture liking* |
| | → Flavor liking |
| | • Overall liking* |
| SV (chuck roll) | · Tenderness |
| TB, SV, & ST | → Texture liking* |
| Average | → Juiciness* |
| | |

*Asterisk denotes statistical difference between R&C and controls (P < 0.05)

The TB had higher juiciness (P < 0.05), texture liking (P < 0.05), flavor liking, overall liking (P < 0.05), and lower toughness scores for R&C samples than control samples. Rinse and ChillTM SV steaks were less tough than control steaks; however, this difference was not statistically significant. No differences between R&C and control samples were observed for the OAI or ST.

Warner-Bratzler shear force results showed no significant difference between R&C and control samples for TB, SV, OAI, and ST.

Conclusions

se and Chill[™] technology reduced cholesterol, improved color stability, and improved sensory attributes of treated beef. This research shows positive results to support testing of the R&C procedure to further quantify results found in the present study as well as investigate additional benefits of R&C to the beef industry.

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