



## PROJECT SUMMARY PRODUCT QUALITY

**BEEF**  
RESEARCH

# Impact of Elevated Aging Temperatures on Tenderness, Shelf Life, and Consumer Acceptability of Beef

*D. Cassens, J. Savell, K. Gehring, A. Arnold, R. Miller*

*Texas A&M University*

Study Completed

June 2016

This project was funded in part by the Beef Checkoff.



BeefResearch.org



303.694.0305

*For more information, contact:*  
Science and Product Solutions

National Cattlemen's Beef Association • Contractor to the Beef Checkoff Program  
9110 East Nichols Avenue • Centennial, CO 80112 • 303.694.0305



Funded by the Beef Checkoff.

---

# Impact of Elevated Aging Temperatures on Tenderness, Shelf Life, and Consumer Acceptability of Beef: Project Summary

## Background

In an effort to meet consumer's expectations for high quality beef products and great eating experiences, aging of beef for foodservice and retail is a common practice. The industry is always looking for new ways to decrease aging times and still see improvement in meat tenderness. There is potential to manipulate storage temperatures during the post-mortem aging period and still establish an increase in tenderness. By subjecting subprimals to elevated temperatures during aging, we can offer a new alternative to aging of subprimals that results in an increase in tenderness and beef palatability, without negatively impacting shelf-life or consumer acceptance.

## Objective

To determine if elevated aging temperatures increase the tenderness of beef steaks without negatively impacting shelf life and consumer acceptance.

## Methods

Paired subprimals (Ribeye, Strip Loin, Shortloin, and Top Sirloin) were selected from a commercial beef harvest facility. Subprimals were initially aged at conventional temperatures (0.0 to 1.1°C) for seven days. After the initial seven days of aging, each subprimal, within its pair, was subjected to one of the following treatments: (1) aging of vacuum-packed subprimals at conventional temperatures of 0.0 to 1.1°C, or (2) aging of vacuum-packaged subprimals at elevated temperatures of 3.3 to 4.4°C. Following the aging period, subprimals were assessed for purge quantification, pH and odor by trained odor panelist prior to being fabricated into steaks. Once fabricated, steaks were allowed 30-min bloom time followed by instrumental and visual trained panel color assessments. Steaks destined for retail shelf-life evaluation were overwrapped in a retail tray and placed in a "retail-like" display setting for five days. At the conclusion of the five-day retail storage period, steaks were evaluated for odor and color as previously described. Warner-Bratzler shear force as well as a consumer sensory panels were conducted to determine differences in tenderness and palatability among subprimals with different aging treatments.


## Findings

No differences were seen between treatment groups (control versus elevated) for tenderness or consumer panelist evaluations. This indicates that the elevated aging treatment did not negatively impact tenderness or consumer acceptability when compared to aging under conventional temperature parameters. After the five-day retail shelf-life study, Strip Loin Steaks showed the least surface discoloration of all steaks types. However, elevated aging temperatures did result in significant discoloration of T-bone/Porterhouse and Ribeye Steaks (Table 1). Additionally, some off-odors were more apparent for T-bone/Porterhouse Steaks aged at elevated temperatures.

## Industry Impact

Findings from this study indicate that aging subprimals at an elevated temperature does not have a negative impact on common palatability attributes (tenderness, juiciness, flavor) of beef steaks. While these data may offer added flexibility to conventional aging temperatures, special considerations should be given to the subprimal types selected for use in an elevated aging temperature environment in an effort to manage undesirable color and odor shelf-life characteristics.

---



## Graphs/Tables

**Table 1.** Least squares means of trained panelist scores for beef color uniformity/discoloration<sup>a</sup> stratified by steak type x aging treatment<sup>b</sup>.

Steak type	Color uniformity/discoloration			
	Control	SEM	Elevated	SEM
Ribeye	2.65b	0.20	3.67a	0.21
Strip Loin	1.39c	0.22	2.00c	0.23
T-bone/Porterhouse	1.86c	0.21	3.14ab	0.23
Center-cut Sirloin	3.04b	0.20	2.98b	0.20

Means within a color uniformity attribute lacking a common letter (a-c) differ ( $P < 0.05$ ).

<sup>a</sup>Panelists used the following scale: uniformity/discoloration (1 = none; 8 = extreme).

<sup>b</sup>Subprimals were assigned randomly to one of two aging treatments: (1) subprimals were aged at control temperatures (0 to 1.1 °C) (2) subprimals were aged at elevated temperatures (3.3 to 4.4 °C).

## Photos



**Figure 1.** Instrumental and visual color assessment.



Figure 2. Cooking of steaks on commercial flat top grill for consumer panel .