

Project Summary

Consumer and Shear Force Evaluation of Steaks from the *M. Serratus ventralis*

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Background

To optimize value, processors have focused on innovative fabrication of the chuck and round to isolate underutilized muscles that can be sold as steaks and roasts. With traditional cutting techniques, retail cuts are composed of several muscles varying greatly in tenderness. In innovative fabrication, these whole muscles are identified and separated based on perceived palatability attributes.

Based on Warner-Bratzler shear force values, several muscles from the chuck have proven to be sufficient in tenderness for possible use as retail cuts. One of the most underutilized muscles from the chuck is the *M. Serratus ventralis*. This muscle, which extends over the chuck, rib and plate subprimals, has been documented as the sixth most tender muscle in the beef carcass.

To counteract unpredictability in tenderness in muscles across species, the meat industry has adopted several postmortem tenderization treatments. Two of the most widely used methods of postmortem tenderization and injection with a salt and phosphate solution.

The objectives of this project were:

1. To perform Warner-Bratzler shear force evaluations of steaks cut from the *M. Serratus ventralis* subjected to different treatments.
2. To subject steaks cut from the *M. Serratus ventralis* of different treatment groups to consumer evaluation.

Methodology

USDA Select arm chucks (n = 87) were purchased from two commercial beef processing facilities and fabricated 10 to 14 days postmortem. Shoulder clods were removed, including the *M. Triceps brachii*, *M. Infraspinatus*, and the *M. Teres major*, and then the scapula was removed with the *M. Supraspinatus* (mock tender). The *M. Serratus ventralis thoracis*, or thick portion, was removed completely from the arm chuck and trimmed practically free of fat before being separated into one of three treatment groups (control, blade tenderization, and injection containing salt, phosphate, papain and water).

Temperature, pH and weights were recorded before applying tenderization treatments. Mechanically tenderized muscles were passed twice through a TEND-R-RITE blade tenderizer (TR-2, Bettcher Industries, Inc., Birmingham, OH) and then measured again for temperature, pH and weight. Enhanced muscles were injected with a water solution containing 6.5% sodium chloride, 3.5% sodium tripolyphosphate, and 0.033% liquid papain. Papain is a natural plant enzyme derived from papaya and used to increase tenderness. The solution was injected by a single pass through a commercial injector to reach a target pump of 12%.

Following tenderization treatments, muscles were cut into 2.54 cm thick steaks before they were weighed, packaged and frozen for subsequent Warner-Bratzler shear (WBS) force analysis.

Consumers solicited for in-home testing (n = 175) were provided a box of three steaks, one from each treatment (control, blade tenderized, and injected), and were asked to prepare the steaks in their home as they normally would prepare a cut of beef. Consumers were asked to identify cooking method and approximate degree of doneness, as well as overall-like, tenderness, desirability, tenderness of cut, juiciness desirability, juiciness of cut, flavor desirability, and flavor intensity.

Findings

Tenderization Treatments

In-home consumer ratings for *M. Serratus ventralis* tenderness were higher for injected steaks as compared to blade tenderized and control steaks. Consumer juiciness ratings were also higher for injected steaks compared to control steaks. Blade tenderization received the highest ratings for tenderness desirability, flavor desirability, and flavor intensity. Injected *Serratus* steaks received the highest ratings for juiciness desirability and juiciness.

Cooking Method

When consumers prepared *Serratus* steaks in the oven, injected steaks received much higher ratings than blade tenderized or control steaks. In general, injected steaks received the highest ratings for all palatability attributes except flavor intensity. When consumers prepared steaks in a skillet, injected steaks received higher ratings for tenderness and juiciness. When prepared using a moist heat method, blade tenderized steaks were given the lowest scores for overall like and tenderness desirability, and control steaks had the lowest ratings for tenderness.

Degree of Doneness

On the grill, *Serratus* steaks cooked well done received the highest consumer ratings for tenderness desirability and flavor intensity. However, medium rare and rare steaks received the highest ratings for juiciness. As expected, well done steaks were lowest for juiciness and juiciness desirability.

When steaks were prepared in the oven, those cooked to a medium degree of doneness were rated higher in tenderness desirability than those cooked to medium rare and rare. Steaks cooked to well done received the lowest ratings for overall like, tenderness desirability, and tenderness. For steaks prepared in a skillet, those cooked to a medium well degree of doneness were given the highest ratings and those cooked to medium were given the lowest.

Overall Palatability

Overall, injected and blade tenderized steaks had the highest palatability rating when cooked to a higher degree of doneness, and cooking control steaks to a lower degree of doneness increased juiciness desirability. Also, control steaks showed a decrease in flavor desirability when cooked to higher degrees of doneness, contrary to the blade tenderized and injected steaks that received higher ratings as degree of doneness increased.

Tenderness

Overall, injected steaks had the lowest WBS force values followed by blade tenderized and control, respectively.

Implications

Based on palatability traits in general, the *M. Serratus ventralis* proved to be adequate for use as a retail steak. Steaks that were enhanced with the salt, phosphate and papain solution showed significant improvement in consumer evaluated tenderness and juiciness compared to those that were blade tenderized or left untreated. When compared using an objective mechanical test (WBS), enhanced steaks also proved to be the most tender of the three treatments. In general, cooking method and degree of doneness had little influence on consumer palatability ratings. Retailers and processors could use these findings to merchandise the *M. Serratus ventralis* as a high quality, modestly priced steak from the beef chuck.

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