Project Summary

Mapping Tenderness of the Serratus Ventralis

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Background

As the industry seeks to upgrade lower-value muscles in an effort to return more value to the beef industry, care must be taken to ensure the resulting products are tender. Tenderness is regarded as one of the most important aspects of beef, so particular attention to this important meat characteristics is warranted.

One outgrowth of the muscle profiling research and value cuts program has been exploration of additional muscles with which to add value. The *serratus ventralis*, frequently called the boneless short rib or the chuck short rib, is one such muscle. This muscle is the largest in the chuck roll and is attractive to consumers. Unfortunately the muscle profiling research reveals that the *serratus ventralis* is not as tender as desired (www.bovine.unl.edu). It is important to know if particular aspects of the muscle are appropriately tender. Said another way, are there portions of the *serratus ventralis* that are steakable?

USDA quality grades have proven effective in segregating carcasses into different value classes. The extent to which quality grade accomplishes the same goal in the *serratus ventralis* is not known. A growing proportion of meat at the retail counter is enhanced. Enhancement frequently consists of salt and phosphate, in addition to other ingredients designed to enhance flavor. Accordingly, it would be important to document the extent to which the *serratus ventralis* responds to such enhancement. This research was undertaken to map the tenderness of the *serratus ventralis* from Choice and Select-grade carcasses and to assess the tenderness response to enhancement.

The objectives of this project were to:

1. Map the tenderness of the *serratus ventralis* from USDA Choice and Select carcasses.
2. Evaluate effectiveness of a pre-marination/tenderization process on the *serratus ventralis*.

Methodology

Beef chucks (n = 32), with the brisket and shoulder clod removed, were obtained from both sides of 8 USDA Choice and USDA Select-grade beef carcasses two days postmortem. At 7 days post mortem, *serratus ventralis* muscles were removed from the chucks. *Serratus ventralis* muscles from one side of the carcasses were pumped and vacuum tumbled with a 12.5% solution containing beef broth, salt, phosphate, and rosemary extract; *serratus ventralis* muscles from the opposite sides were held as controls (unpumped). The sides selected as treatments and controls were alternated to avoid biased sampling.

All *serratus ventralis* muscles were then blade tenderized once as whole muscles. All muscles were then cut into halves by a medial cut from dorsal to ventral, splitting the muscles into anterior and posterior halves. The halves were then cut into steaks from anterior to posterior, creating 4 to 8 steaks per anterior and posterior half. All enhanced steaks were blade tenderized individually. After blade tenderization, all steaks were vacuum packaged and frozen. Cooking time, beginning/end temperature, cooking loss and Warner-Bratzler shear force were recorded.

Findings

Table 1 presents the results of shear force analysis on *serratus ventralis* muscles derived from Select-grade beef. For Select, the least tender portion of the muscle was on the anterior/cranial end (toward the head). This difference was evident only along the ventral edge. There were no other differences from the anterior to the posterior end of the muscle. At the most cranial end, the ventral side was least tender. For Choice (Table 2), differences occurred from anterior to posterior, not dorsal to ventral. As a general rule, the anterior end of the muscle was less tender than the posterior end. Thus, across both grades, the least tender areas were those toward the anterior/cranial portion of the carcass.

Results indicate that it might be possible to cut steaks from the posterior portion of the s*erratus ventralis*. Shear force values were in the acceptable range. Enhancement with a salt-phosphate solution significantly reduced the shear force on average from 3.85 kg to 2.99 kg, a reduction of 22% regardless of grade.

Table 1. Mean shear force values (kg) for serratus ventralis muscles from Select-grade beef carcasses.

Location	Anterior	Medial Anterior	Medial Posterior	Posterior
Dorsal	3.55^{xy}	3.34	3.28	3.51
Intermediate	3.20^{y}	3.27	3.83	3.29
Ventral	4.35^{ax}	3.59^{b}	3.19^{b}	3.29^{b}

^{a,b}Means in the same row with differing superscripts differ.
^{x,y}Means in the same column with differing superscripts differ.

Table 2. Mean shear force values (kg) for serratus ventralis muscles from Choice-grade beef carcasses

Location	Anterior	Medial Anterior	Medial Posterior	Posterior
Anterior	3.39^{ab}	3.76^{a}	2.87^{b}	2.78^{b}
Intermediate	4.31^{a}	3.48^{b}	2.73^{c}	2.86^{bc}
Posterior	4.04^{a}	3.83^{a}	2.95^{b}	3.35^{ab}

^{a,b,c}Means in the same row with differing superscripts differ.

Implications

The *serratus ventralis* is a broadly diverse muscle with changing fiber direction from end to end and heavy sheets of connective tissue. It appears to respond to enhancement and blade tenderization, but consumer studies are needed before further recommendations can be made.

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