

Project Title:	Blade Tenderization and Vacuum-Tumbling to Improve the Characteristics of Enhanced <i>Supraspinatus</i> , <i>Triceps brachii</i> and <i>Biceps femoris</i>
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Background

Improving the quality and consistency of beef, especially cuts from the chuck and round, continues to be a high priority for the cattle industry. Enhancing product by injecting solutions that improve tenderness and juiciness is one method to accomplish this goal, and one that has been commonly used by the pork and poultry industries.

There are some challenges, however when applying this technology to muscles from the chuck and round, primarily due to the amount of connective tissue in both cuts. The connective tissue prevents injection solutions from being evenly distributed through a muscle. To offset this problem, methods such as blade tenderization are often used to disrupt the connective tissue. However, if these methods are too severe, they can alter the product too much making it visually unappetizing to consumers at the retail level.

The large amounts of connective tissue in cuts from the chuck and round also can affect color uptake of a brine. Oftentimes when a brine or solution is injected, it is not evenly distributed, or it causes the meat to be too dark. This can also decrease consumer acceptance as color plays an important role in meat buying decisions.

This project sought to address both issues by examining a method that would disrupt the connective tissue sufficiently in cuts from the chuck and round to allow even distribution of a brine, but would not be so severe as to negatively affect the appearance of the meat.

Methodology

Three subprimals (USDA Select) were obtained from a federally inspected plant and were aged for five days. After aging, the subprimals were fabricated into three muscles for processing: *supraspinatus* (NAMP 116B—chuck tender), which represented a low connective tissue cut *biceps femoris* (NAMP 171B—bottom or outside round flats), a high connective tissue round cut, and *triceps brachii* long head (NAMP –clod), a high connective tissue chuck cut.

The muscles were either injected or not injected with a brine solution; were tumbled for zero, five, 10 or 20 minutes; and were blade tenderized by either one, two or no passes. The brine solution contained 1.55 percent potassium lactate, 0.4 percent salt and 0.3 percent sodium tripolyphosphate.

The final injected percentage was 10 percent of the muscle's original weight. Muscles were weighed before and after the brine injection to calculate the uptake of solution. If the uptake was not approximately 10 percent then the solution was removed by manual pressure, or more solution was added with another injection.

After the cuts that were assigned to the blade tenderization treatment were processed, all cuts were stored overnight to allow the brine solution to equilibrate. Subsequently, each muscle was sliced into five sections to be used for the following analytical measurements:

- Warner-Bratzler shear force and purge loss
- Color and pH
- Sensory evaluation

A three-member trained color descriptive attribute panel conducted color evaluations where members examined samples for lean color, amount discoloration and two-toning. Objective color measurements were also taken.

Sensory evaluations were also conducted by a trained panel, which evaluated the cooked steaks on the following parameters:

- Juiciness (1 = extremely dry; 8 = extremely juicy)
- Muscle fiber tenderness and overall tenderness (1 = extremely tough; 8 = extremely tender)
- Connective tissue amount (1 = abundant; 8 = none)
- Flavor intensity (1 = extremely bland; 8 = extremely intense)

Findings

Injecting *biceps femoris* muscles with a brine solution decreased package purge, improved color, and altered positive flavor attributes. Tumbling and blade tenderization had minimal to no effect on the chemical, physical and sensory properties of the steaks.

The *supraspinatus* and *triceps brachii* samples had similar results. For the *supraspinatus*, blade tenderization improved tenderness, but it had too many negative effects on color, which did not justify its use in combination with injected steaks. Tumbling and blade tenderization in the *triceps brachii* also had minimal to no effects on the various attributes of the enhanced steaks.

Implications

Based on this study, quality can be improved in USDA Select *biceps femoris*, *supraspinatus* and *triceps brachii* by injecting them with a brine solution. Doing so does not require additional treatments such as blade tenderization or vacuum tumbling to increase uptake of the solution or to ensure even color distribution.