Project Title: Effect of Aging on Warner-Bratzler Shear Force Values of Selected Muscles from the Chuck and Round

Principle Investigator(s): D. Dwain Johnson, Ph.D.

Institution(s): University of Florida

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Background

Muscle profiling research conducted by University of Florida and University of Nebraska scientists characterized 39 muscles of the chuck and round for size, shape, palatability and composition. Several of those muscles when removed separately, were very acceptable in sensory panel scores and have the potential for increased value by fabricating them into steaks rather than selling them as part of a roast or grinding.

Past research has shown that consumers are willing to pay a premium for steaks that reach a certain level of tenderness. Aging meat is one of the most prevalent and non-invasive methods of postmortem tenderization. Most research evaluating the effect of aging has focused on the *longissimus dorsi* (ribeye) muscle. If individual muscles from the chuck and round are to be marketed as steaks, it is important that there is adequate information available about the effect of aging on these various muscles. The limited amount of research covering this topic has indicated that muscles from the chuck and round might have different aging patterns than the ribeye.

This project was designed to provide more information about the effectiveness of aging on the newly developed "Beef Value Cuts" from the chuck and round.

Methodology

Two-piece boneless chucks (IMPS 115) and peeled knuckles (IMPS 167A) from two quality grades (USDA Select and upper two-thirds of USDA Choice) were obtained from a federally inspected plant. The cuts were fabricated at the University of Florida Meats Laboratory into the following individual muscles:

Boneless Chuck (IMPS 115)	**Peeled Knuckle (IMPS 167A)**
Infraspinatus	*Vastus lateralis*
Triceps brachii-lateral head	*Rectus femoris*
Triceps brachii-long head	
Serratus ventralis	
Complexus	
Splenius	
Rhomboideus	

The muscles were divided into four portions and one steak was obtained from each portion. For small muscles, the entire portion may have been used to fabricate the steak. Steak samples were aged for 7, 14, 21 or 28 days in a 2°C (± 2 °C) cooler. After the muscles were aged for the appropriate period, they were frozen until Warner-Bratzler shear force analyses could be conducted.

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Eight of each of the subprimals for each grade were sampled and this procedure was replicated twice for a total of 32 subprimals, which were boned to generate 288 muscles. Four steaks per muscle produced 1,152 observations for this trial.

Samples were broiled to an internal temperature of 71°C and evaluated for shear force values.

Findings

Overall, there were no significant differences in the effect of postmortem aging between the nine muscles evaluated. The *rhomboideus, vastus lateralis* and *splenius* muscles were the least tender of the muscles and the *infraspinatus* was by far the most tender of the nine muscles. The *tricepslateral* and *triceps-long head, complexus, serratus ventralis* and *rectus femoris* were intermediate in their degree of tenderness.

In addition, variation in shear values appeared to be directly related to average shear value. For example, the *rhomboideus* had the highest standard deviation and the highest average Warner-Bratzler shear force value. In contrast, the *infraspinatus* had the lowest standard deviation and average shear force value.

The effect of aging was influenced by grade. When aged for 7 to 14 days, shear force values for USDA Select steaks were reduced by approximately 10 percent. After 14 days of aging, there was no significant reduction of shear force values. For steaks from the upper two-thirds Choice category, no significant improvement in shear force values was noted after seven days of aging.

Aging steaks for longer periods of time is sometimes not cost-effective, but if an end-user has the ability or can afford to hold steaks for 28 days postmortem, then based on this project, USDA Select steaks would be equivalent to the upper two-thirds of the Choice grade for shear force values.

Location did significantly impact Warner-Bratzler shear force values for four of the nine muscles. The *complexus* and *rhomboideus* muscles had higher shear force values from the anterior to the posterior portion. On an animal, both of these muscles lie along the top of the shoulder and neck. The *complexus* showed the most dramatic differences based on sample location, as the core taken from the section of the muscle closest to the wholesale rib was approximately 26 percent lower in shear force value than the quartile found closest to the head.

The two muscles evaluated from the knuckle were opposite in location effect. Both the *vastus lateralis* and the *rectus femoris* had increasing shear force values when going from the anterior to the posterior portion of the muscle.

Implications

Based on this study, aging recommendations for these nine muscles from the chuck and round can be identical but should be adjusted for grade, and for four of the muscles, for location. For some individual muscles, the location of the steaks should be considered when fabricating and merchandising to achieve optimum results. It would not be necessary to age muscles from the upper two-thirds of USDA Choice beyond seven days, while muscles from USDA Select carcasses should be aged a minimum of 14 days.

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