

Project Title:	Cookery Methods for Optimizing Muscles from the Chuck
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Background

Cooking retail cuts from the chuck is often a challenging experience for consumers. Traditional cuts from the chuck are considered to be tough, which can be in large part attributed to the fact that they are made of several muscles running in different directions. Maximizing palatability of these traditional cuts via cooking is difficult due to the number of muscles involved.

However, the chuck comprises 26 percent of the carcass, the largest percentage of any primal. The muscle profiling research initiated by the National Cattlemen's Beef Association, a contractor to The Beef Checkoff, and conducted by the University of Nebraska and University of Florida, sought to characterize individual muscles from the chuck and round for color, processing characteristics, composition and palatability. The goal of the original research was to identify individual muscles that might have quality and palatability attributes that would make them more appealing to consumers.

Further research is needed to determine optimum cooking methods and endpoint temperatures for these muscles in order to enhance flavor and tenderness. This study examined the effect of four different cooking methods and three different endpoint temperatures on eight individual muscles from the chuck.

Methodology

This project was conducted in two phases. During the first phase, the eight muscles listed below, were prepared with four different cooking methods (grilling, roasting, slow cooking and braising) to three different endpoint temperatures (65° C—medium rare; 70° C—medium; 75° C—medium well).

The eight chuck muscles evaluated were:

Complexus

Dorsalis oblique

Longissimus capitis atlantis

Longissimus dorsi

Serratus ventralis

Splenius

Subscapularis

Warner-Bratzler shear force measurements were used to measure the effects of the various treatments on tenderness. All measurements were done in triplicate for each cooking method/endpoint temperature combination.

The second phase of the research reduced the cooking methods to three—two that could be considered dry heat methods and one that represented a moist heat method. For the three cooking methods (roasting, grilling and braising), the endpoint temperatures were either 63°

C or 77° C. One additional cut, the chuck eye roll, was added to the second phase for descriptive analysis purposes.

Ten trained panelists took part in a descriptive analysis of the eight beef muscles, plus the chuck eye roll. During the first three days of the session, panelists developed a list of descriptors by evaluating six samples of randomly selected muscles using all of the six possible cooking combinations (cooking method x endpoint temperature). Thirteen attributes were chosen through consensus by the panel.

Panelists then rated the eight muscles, plus the chuck eye roll, for the various attributes using a 10-point scale. During the course of the eighteen sessions, each cooking method by endpoint temperature combination was evaluated in triplicate.

Findings

Phase I

There were no differences in Warner-Bratzler shear force values for the four cooking methods and three endpoint temperatures for the *complexus*, *dorsalis oblique*, *longissimus captias atlantis*, *longissimus dorsi*, *multifidus and spinals*, *serratus ventralis* and *splenius*. Warner-Bratzler shear force values for the *subscapularis* was higher for 75° C versus when it was cooked to 65° C, however none of the mean values for shear force for any of the muscles were above the 4.6 kg threshold where consumers would detect toughness.

Phase II

Doneness, beefy flavor, livery flavor, chewiness, cohesiveness and juiciness were significant sensory attributes for all the muscles. Based on the sensory panel evaluations of the eight chuck muscles and the chuck eye roll, after they were subjected to three cooking methods (grilling, roasting and braising) and cooked to two endpoint temperatures (63 and 77° C), all of these cooking methods produced tender cuts of meat.

Implications

Researchers in this study concluded that cooking these eight chuck muscles through the dry heat methods of grilling or roasting in a convection oven to a medium rare (63° C) produced the most desirable flavor. There were no differences in tenderness due to the cooking methods or endpoint temperatures used.

Table 1. Cookery method recommendations for chuck muscles based on this study.

Muscle	Endpoint Temperature	Cooking Method
<i>Complexus</i>	63° C	Gas grill or convection oven
Chuck eye roll	63° C	Gas grill, convection oven or braising
<i>Dorsalis oblique</i>	63° C	Gas grill
<i>Longissimus capitis atlantis</i>	77° C 63° C	Convection oven Gas grill or braising
<i>Longissimus dorsi</i>	63° C	Gas grill or convection oven
<i>Multifidus and Spinalis</i>	63° C	Braising or gas grill
<i>Serratus ventralis</i>	63° C	Convection oven or gas grill
<i>Splenius</i>	63° C	Gas grill or convection oven
<i>Subscapularis</i>	63° C	Convection oven or gas grill