Influence of Fiber Type on Palatability Attributes of Beef Round

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Summary and Implications

Differences in fiber diameter, method of metabolism, and glycogen content that arise between muscle fiber types can have a significant effect on a number of sensory traits that affect palatability. The vastus intermedius was the only muscle of the round with a high percentage of type I myosin heavy chain isoform. Within the muscles of the round we observed that a high percentage of type I myosin heavy chain is associated less intact troponin-t. Increased sensory juiciness was correlated with a greater proportion of type I muscle fibers. By identifying the fiber type of the muscles of the round we can better understand how fiber type influences the sensory characteristics of those muscles. With additional understanding comes the potential to predict those characteristics and produce a product that is juicier by manipulating the fiber type of those muscles.

Introduction

The muscles of the round are typically regarded as being less tender than some of the higher quality cuts in the beef carcass. Traditionally, these muscles will receive the similar treatment with regard to aging. However, there may be differences in tenderness and rate of tenderization in these muscles. Recent muscle profiling data supported by the National Cattlemen's Beef Association has documented the characteristics of many of these muscles, and the data indicate that several muscles have the potential to be marketed as individual cuts. Differences between muscle fiber types, including fiber diameter, method of metabolism, and glycogen content, can potentially affect several aspects of meat quality. One method of determining the fiber type of a muscle is to determine the percentage of the myosin heavy chain isoforms present. Therefore, the objective of this study was to determine the influence of fiber type, as defined by myosin heavy chain isoforms, on palatability attributes of underutilized muscles from the round.

Materials and Methods

Ten market weight beef cattle were harvested, and muscles were removed from both sides of the carcasses at 24 hours postmortem. Muscles removed included the longissimus dorsi (loin; reference) and the following muscles from the round: gracillus (cap), adductor (top round), semimembranosus (top round), sartorius (side muscle), vastus lateralis (knuckle), and vastus intermedius (knuckle). Steaks were aged at 4°C to 24 hours, 7 days or 14 days postmortem in vacuum packages. Instrumental texture (star probe), sensory characteristics, pH, western blotting for troponin-T degradation and SDS-PAGE to determine the percentage of type I and II MHC isoforms were collected. A sample from bovine diaphragm served as a reference for type I myosin heavy chain.

Results and Discussion

The vastus intermedius had the highest percentage ($P<0.01$) of type I fibers and the lowest percentage ($P<0.01$) of type II fibers (type I, 62.1%; type II, 37.9%) when compared to all other muscles. Across all muscles, the proportion of type I fibers was correlated to the intensity of the lower intact troponin-T band ($r = -0.27$; $P=0.02$), and the intensity of the upper intact troponin-T band ($r = -0.48$; $P<0.01$). Degradation of troponin-t gives an indication of overall degradation occurring in the muscle and has been linked to tenderness. The negative correlation between type I myosin heavy chain isoform and both the upper and lower intact forms of troponin-t indicate that a lower percentage of type I myosin heavy chain is associated with more intact troponin-t present in the muscle. Across all muscles, the proportion of type I fibers was also correlated to sensory juiciness ($r = 0.26$; $P=0.03$).