

Beef Muscle Profiling Research

D.D. Johnson, K.H. Johnson*, C.R. Calkins, B.L. Gwartney*

Situation

When beef demand declined by more than 20 percent from 1980 to 1998, a research initiative was sparked to produce leaner and more convenient beef products. As marketing experts evaluated the decline in greater detail, it was noted that the decline in demand for beef was not equally distributed across all portions of the carcass. When consumer demand (adjusted for inflation) was evaluated by wholesale cut, it was found that the rib and loin, also called the "middle meats", were up in value by 3-4 percent from 1993 to 1998. In contrast, the chuck, round and "thin cuts", which make up 73 percent of the beef carcass weight, had declined by more than 20- 25 percent in value during this same time period. Therefore, the Cattlemen's Beef Board realized that a more concentrated effort was needed to study the cause for the decreased demand in these products. Moreover, they aimed at finding out what could be done to reverse the trend and increase the demand for the chuck and round cuts.

To address this issue, hurdles were identified as a means to gain ground on demand and value of the chuck and round. The chuck and round are the locomotive portions of the animal; these areas are less tender than the muscles of support from the rib and loin. Also, they are more variable in tenderness. There are exceptions to this situation because some muscles in these carcass areas are very tender, which has been known for many years. Another identified hurdle is the internal and external connective tissues present within the muscles of locomotion. In these areas, intermuscular or seam fat can be present, which is very objectionable to the consumer. As a result of the above-listed hurdles (i.e. less tender muscles and greater amounts of connective tissue), consumers have always had to use a long-time, low-temperature cooking method, which was not convenient for today's consumer. Using this method to cook meat would take several hours rather than 30 minutes or less as most

people desire. As a means to attack the demand slide, especially in the chuck and round portion of the carcass, the National Cattlemen's Beef Association under direction from the Beef Board, called for research to address these hurdles in 1998.

Rationale

The research requested by the National Cattlemen's Beef Association was to fill the gap in knowledge about the lesser known individual muscles in the chuck and round. This request included profiling each muscle for palatability characteristics, composition analysis, yields, physical characterizations, and included how the muscle traits were affected by factors such as USDA Quality, Yield Grade and hot carcass weight. It became readily apparent that this was a massive request that would require cooperative work to accomplish in a timely manner. The research work was conducted by the Department of Animal Sciences at the University of Florida (UF) and the Animal Science Department at the University of Nebraska. The study was called "Muscle Profiling". The UF Department of Animal Sciences contributed to the study by measuring objective tenderness and by conducting sensory panel evaluations for each of the muscles. In addition, UF characterized the yields and physical characteristics of each muscle. The University of Nebraska contributed to the study by performing color analysis, muscle fiber typing, composition (moisture, fat, ash), connective tissue concentration, pH, heme iron, expressible moisture and emulsion capacity. Together, the universities evaluated more than 5,600 muscles during a two-year period. The culmination of that work was the production of a monograph by NCBA entitled "Muscle Profiling". The production of the 100-page document serves as an "encyclopedia" of information for meat packers, processors and purveyors. The monograph has been translated into five different languages and has been utilized to develop new and more convenient, leaner, yet more palatable products for consumer marketing. Also, the information gleaned from the Muscle Profiling work was combined with other data, and a Web site was created. The Web site, Bovine Myology, is currently maintained by the University of Nebraska Meat Science section within their animal science department. Bovine Myology can be found on the Internet at <http://deal.unl.edu/bovine>. This Web site serves as a tool for the industry and as an educational medium for various audiences including university meat science and muscle biology groups. The Web site is constantly updated with

*D.D. Johnson
PO Box 110910
Department of Animal Sciences
University of Florida
Gainesville, FL 32611-0910*

johnson@animal.ufl.edu

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new data, additional research as it is reported, and innovative methods of data delivery.

The Muscle Profiling work revealed gaps in knowledge that have been filled by other institutions and the Meat Science group at the University of Florida. In the University of Florida study, muscles of marginal palatability were identified and subsequently enhanced by post-harvest marination technology to determine what improvements could be produced. It was noted in that study that all muscles do not respond to post-harvest enhancement to the same degree. However, four out of eight muscles did show improvement in tenderness of more than 15 percent. Another study conducted by the Meat Science group at the University of Florida evaluated the postmortem effects of aging on the tenderness development in muscles of the chuck and round. Work has been reported on the beneficial effects of post-mortem aging on meat tenderness, but these studies have primarily concentrated on the wholesale rib and loin. The University of Florida study found that the chuck and round muscles responded in a similar way to postmortem aging effects, and it was determined that there was an effect of the intramuscular fat on tenderness development in these muscles as well. The muscles with higher intramuscular fat would need fewer days of postmortem aging than would muscles of lower intramuscular fat. Other studies have been conducted as an offshoot of the Muscle Profiling work and are being reported at this meeting as well at other research and industry meetings.

Impact

Numerous groups have used the Muscle Profiling research to find new ways to fabricate, process and prepare meat from the chuck and round. One of the most significant

efforts has been from the R & D Ranch group of the National Cattlemen's Beef Association. This group is the product development arm of the National Cattlemen's Beef Association, and it is responsible for promoting new product development within the beef industry. Instead of merchandising the chuck and round as less convenient multi-muscle cuts, the R & D Ranch group used the Muscle Profiling data (which suggested new cuts and merchandising methods) to market cuts in a singular fashion. The new cuts decreased the length in cooking time and appealed to consumers. The R & D Ranch group coined the term "Beef Value Cuts", and they have produced cutting brochures, manuals and instructional videos on removal and merchandising. A Web site offering technical support is also available at www.rdranch.com. The R & D Ranch group has followed up with regional training seminars for processors, distributors, food service groups and retailers. In addition, they match these efforts with a publicity campaign in conjunction with food-service-trade advertising. Many other groups within the beef retail business have incorporated these ideas into marketing new items from the chuck and round which have not been previously available to the consuming public. Other segments of the beef industry have developed new products based on findings from the Muscle Profiling work, and they are currently featuring these new products on the market. Moreover, the U.S. Meat Export Federation has identified several applications from the Muscle Profiling work that are being incorporated into their efforts to export more high-quality beef to markets outside the United States. Recent data from Cattle Fax, a firm that monitors market trends, indicates an increase of 10 percent in total beef demand from 1998 to the last quarter in 2002. This increase is indeed encouraging and suggests a reversal in the slide for beef demand in these lower value portions of the carcass.