

## The Beef Tenderness Challenge Continues

by Troy Smith

Why is there so much fuss about beef tenderness? Frankly, it's because too much of the beef we produce is tough. At least that's what plenty of consumers are saying.

The often quoted National Beef Quality Audit and other consumer surveys have led to some disappointing conclusions, revealing that as many as 25 percent of beef eating experiences are unsatisfactory. And while juiciness and flavor contribute to palatability, consumers consistently rank tenderness as most important to eating satisfaction.

USDA has a quality grading system that is supposed to indicate palatability (tenderness), but it doesn't always work. While consumers complain less about inconsistencies in juiciness and flavor, they report wide variation in tenderness for every quality grade. Some USDA Select beef eats as well or better than some Choice beef. This problem needs fixing, but where should we concentrate our efforts?

Fingers have been pointed at certain breeds, particularly the *Bos indicus* cattle, which seem to have a greater tenderness problem, while breeds riding a reputation for quality (like Angus) are held up as the solution. In other words, the blame for the tenderness issue is being thrown at the producer accused of raising the wrong kind of cattle.

It seems, however, there is more than enough blame to go around. Processors and retailers of beef could do plenty to reduce variation in tenderness. Unfortunately, many fail to make use of available tools.

"We are breeding some of the wrong kind of cattle, but it isn't quite that simple," says Chris Calkins, professor of animal science at the University of Nebraska, Lincoln.

Calkins says it's important to remember that tenderness is affected by both genetics and environment. He warns that producers can't be expected to do it all genetically when some of the most detrimental factors are environmental. Certainly the way cattle are handled prior to slaughter has an effect, but his greatest concern is for what happens or doesn't happen postmortem.

"Chilling carcasses too fast, brief aging periods at temperatures too cold, and failure to use available technology to enhance tenderness is a big part of the problem,"

explains Calkins. "The production side of the beef business depends on processors and retailers to do those things, and often they are performed improperly or not at all."

The beneficial effect on tenderness due to natural enzyme activity that occurs during aging is widely known. A postmortem aging period of at least 21 days is often recommended as optimum for tenderization. The tenderness enhancement technology Calkins refers to is electrical simulation of carcasses and injection with calcium chloride solution. He says both processes have been proven safe and effective.

Meat science professor Michael Dikeman of Kansas State University, Manhattan, agrees that these methods aren't always used to optimum benefit. He says consumers have been led to believe that the USDA quality grade is good indicator of palatability and, therefore, tenderness. And it might be, he says, if all beef were sufficiently aged, electrically stimulated and properly packaged and cooked.

"Processors and retailers should have unwavering standards," Dikeman adds. "Something like the wine advertisements used to be, we should sell no 'beef' before its time. But I know how some retailers feature beef. If their supplies are running low for whatever cut is on special, they might refill the case with product that's only three to seven days postmortem. Consequently, there's going to be a lot of variation in the product they're selling. It looks like a short-sighted decision to me, but the economics of supply and demand keep processors and retailers moving product out the door as fast as they can, often ignoring the problem of inconsistent quality."

**Regarding the current** quality grading system, Dikeman says categorizing on the basis of marbling and maturity leaves too much room for mistakes due to human error and variation among animals. The indicators used are indirect measurements of tenderness. He strongly believes in the need for a rapid, economical method for measuring tenderness directly

An automated system for grading beef carcasses for tenderness has been developed by a team of scientists at the U.S. Meat Animal Research Center (MARC) at Clay Center, Neb. Team member Mohammed

Koohmaraie says the system requires removal of a one-inch thick ribeye from between the 12th and 13th ribs. Fat and bone are trimmed from the steak with a water-jet trimming device and the meat is then cooked for six minutes. The cooked sample is then subjected to a shear force test to measure the force required to cut it.

Koohmaraie says the Warner-Bratzler shear force test routinely used by meat scientists to measure tenderness can be applied as an automated, on-line system in a packing plant. Each carcass could be sampled and tested during the same time period that carcasses have been traditionally quality and yield graded. Based on the test, each carcass could be classified into one of three tenderness grades.

"Guaranteed Tender" would be the grade for carcasses found to be acceptably tender prior to aging. Carcasses which were not tender before aging but that would probably be tender after aging would be tagged "Probably Tender."

The third grade, "Probably Tough" would catch carcasses tested extremely tough before aging and predicted to remain tough afterward. These would likely require additional tenderization.

After adapting the testing system to a large plant, Koohmaraie claims classification would be accomplished with 90 percent accuracy, noting that USDA's traditional grading system is only about 60 percent accurate in predicting beef tenderness.

"MARC research indicates that at least 60 percent of USDA Select carcasses produce tender steaks and should not be discounted, but all Select carcasses are sold at a discount relative to Choice," Koohmaraie says. "Moreover, 29 percent of Choice and Select carcasses exhibit superior tenderness and could be marked at a premium. So most beef carcasses are undervalued by the current system."

Koohmaraie's analysis indicates that the average carcass is undervalued by \$51.84, with regard to quality. He estimates the cost of trying to recapture that loss through his system at \$4.36 per carcass. That's 36 cents for machinery and labor, plus a \$4 ribeye sample.

Koohmaraie thinks that's a small price to pay for a way to offer consumers guaranteed product consistency. Not everyone agrees.

**Michael Dikeman fears** the industry will resist the MARC-developed system because of its invasive nature. Nebraska's Chris Calkins agrees.

"The science is sound," explains Calkins, "but conceptually, the idea of pulling a steak will be hard for a lot of people to accept. It

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means moving away from the current grading system and that will be an uphill climb. And because the industry is notoriously slow to change, adoption of this technology isn't likely to come anytime soon."

Still, Koohmaraie says direct measurement of tenderness warrants consideration because of the relatively small influence producers can have on tenderness through genetic selection for marbling. He says studies of variation in tenderness of youthful, grain-fed beef completed by MARC and other research facilities showed that marbling will account for, at most, 15 percent of the variation in aged beef tenderness.

Calkins and Dikeman agree that the correlation between marbling and tenderness is positive, but not particularly high. In top round and top sirloin cuts, the link is weak. Still, neither Calkins nor

Dikeman would suggest that marbling be completely abandoned as a selection tool for tenderness.

Colorado State University's Ronnie Green concurs, noting that while marbling is an indirect measurement for tenderness, it's still the best handle available to select for palatability. The animal scientist from Fort Collins says that on an individual animal basis, marbling doesn't fare well, but it has value for large group analysis.

"If we try to enhance marbling through genetic selection, we should be able to sort out high- versus low-tenderness sires when using large numbers of progeny. While the correlation between marbling and tenderness may not be as strong as we'd like, it is there. Through progeny testing we build carcass EPDs that do work," explains Green.

**Green would be concerned** about the long-term impact of ignoring genetic selection for tenderness, warning that the industry shouldn't rely only on manipulation of carcasses to improve tenderness. If producers don't try to fix it genetically too, the consumer sees that as a lack of concern for producing the best product possible.

"In my opinion, Angus breeders don't have much to worry about," Green says. "They're already positioned at the high end of the palatability scale — already in the top 30 or 40 percent. That can't be said of all breeds. Some have a lot of data stacked against them."

## Nebraska label interested in guaranteed tenderness

While beef processors may be reluctant to embrace the automated process for direct measurement of tenderness, Colorado State University's Ronnie Green believes commercial application of the MARC-developed technology would be helpful to individuals or groups interested in merchandising labeled products with guaranteed palatability.

That's exactly what the Nebraska Cattlemen (NC) organization wants to do. At NC's annual convention, members considered recommendations from a Labeled Product Task Force which had been studying the feasibility of a labeled beef program to be managed by the 5,000-member group. Convention delegates gave the proposal thumbs-up and NC directors offered their approval by authorizing funding and staffing for the project.

NC president-elect and task force chairman Alan Janzen, Henderson, Neb., says technical advice and producer input was gathered to forge a plan for supply development, USDA certification, registration of a trade name and program staffing. Beef

quality assurance will be the cornerstone to the program. Janzen says participating NC members, along with every ranch hand, cowboy, feed truck driver and mill operator affecting program cattle will have to be Beef Quality Assurance (BQA) program certified. Certification of cow-calf producers and employees must be completed before calves intended for the program are born. Similarly, feedlot personnel must be certified before program cattle come under their care. Janzen says a paper trail will follow every animal from birth, documenting every thing that happened to it and who performed the task.

On the basis of source verification and adherence to BQA guidelines, Nebraska Cattlemen plans to negotiate a pricing relationship with one or more packers to process and market the initial group of cattle. As the program evolves, retail contracts and marketing relationships will be established to pull the labeled product through the system, Janzen says this will result in a fed cattle pricing mechanism based on the retail value of the end product.

In addition to the all-out effort to guarantee safe, wholesome product with a "Nebraska" label, Janzen says application of guaranteed tenderness technology will be considered. MARC team's shear force evaluation test and suggested tenderness ranking system were explained during the Nebraska Cattlemen convention.

"The 90 percent accuracy of this technology means it has to be considered," Janzen says. "Its application could help us achieve a premium based on guaranteed tenderness."

The Nebraska program's live animal specifications prohibit dairy or *Bos indicus* influence and any cattle slaughtered at ages exceeding 24 months. The program will not be limited to Nebraska-born supply, but all cattle will have to be fed in Nebraska for at least 90 days on a high-concentrate ration consisting of at least 50 percent corn or corn by-products. For this branded beef program to be successful, Janzen anticipates the need for a minimum of 1,000 head per week.

