



**EXECUTIVE
SUMMARY
OF THE
1999
NATIONAL
BEEF
TENDERNESS
SURVEY**

*Meeting and
exceeding the
demands of the
marketplace
by improving
the tenderness
of beef*

*A research project
conducted for the
National Cattlemen's
Beef Association
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THE 1999 NATIONAL BEEF TENDERNESS SURVEY

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TOUGH PROBLEMS, BUT ON THE RIGHT TRACK

In the early 1990s, the beef industry first began to react to some of the product quality problems it was facing in the marketplace. The industry had already experienced nearly two decades of shrinking demand for its product because beef was too fat, too inconsistent and too tough to remain competitive in the meat case.

Needless to say, something had to be done.

So the beef industry commissioned researchers at Texas A&M University to quantify and characterize beef's tenderness problems. The checkoff-funded study they conducted, called the 1990 National Beef Tenderness Survey, hoped to develop baseline information for all segments of the industry to work together toward improving the quality of their product.

"Tenderness is an important aspect that drives consumer satisfaction with the product," says Jim Bradford, Iowa cattle producer and chairman of NCBA's science and technology committee. "When consumers have an undesirable eating experience, they become disappointed with beef and they spend their hard-earned dollars on other, competing meats and poultry."

Using Warner-Bratzler shear tests and trained sensory panels, the survey confirmed the situation was not good: In fact, it found that many of the cuts produced from the chuck and round as well as from the top sirloin were undesirably tough, negatively impacting the products' desirability and marketability.

These findings were coupled with other checkoff-funded research that revealed the industry was falling short in communicating to consumers the necessity of preparing USDA Choice and USDA Select cuts differently in order to optimize tenderness and eating satisfaction.

For instance, Select steaks, because they possess less marbling and less trimmable fat, should be cooked for shorter periods of time or prepared at lower cooking temperatures than steaks from the Choice grade. When they're overcooked, they become less tender.

In addition, consumers should prepare less tender cuts (such as cuts from the chuck) by using moist heating

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HOW THE SURVEY WAS CONDUCTED

In 1998-1999, researchers sampled beef from retail stores and foodservice establishments from eight U.S. cities, including New York, Philadelphia, Atlanta, Chicago, Houston, Denver, Los Angeles and San Francisco. Retail chains in the survey represented at least one-third of total market share in their area. Foodservice outlets were selected more randomly.

From retail outlets, researchers selected the chuck roll steaks, clod steaks, ribeye steaks, top loin steaks, T-bone/Porterhouse steaks, top sirloin steaks, bottom round steaks, top round steaks, and eye of round steaks.

In at least two of the stores in each chain, researchers evaluated cold storage units to determine how long the product had aged, quality grades, and company names of the boxed subprimals representing the retail cuts sampled in the retail case.

From foodservice establishments, researchers selected steaks that included the ribeye steak, top loin steak, and top sirloin steak.

All steaks were shipped to Texas A&M University. The majority of the retail steaks were evaluated for Warner-Bratzler shear force, which determines the amount of force in pounds necessary to slice a steak or cut.

The remaining retail steaks, about 20% of the total, were frozen and distributed to the collaborating universities for consumer evaluation panels. All steaks were prepared on open-hearth electric broilers prior to evaluation. Based on research from the Customer Satisfaction I survey, it was important to hold cookery method and endpoint cooking temperature constant since they have a significant impact on ultimate eating quality and that was critical in this study in order to have valid comparisons among different steaks, grade classifications and regions of the country.

The foodservice cuts were evaluated at Texas A&M University in the Product Sensory Laboratory. However, steaks were prepared on the flattop griddle by employing the same cooking procedures used to prepare the steaks for Warner-Bratzler shear force determination.

Before analysis, the steaks were divided into grade classifications based on marbling scores and sample size. The grade classification consisted of retail cuts grading USDA Prime, Choice and Select as well as those that were not graded, No roll.



**TABLE 1:
HOW TENDER IS IT?**

Warner-Bratzler shear values (lbs)

RETAIL STEAKS FROM THE RIB AND LOIN SUBPRIMALS

Cut	Prime	Top Choice	Choice	Select	Lean
Ribeye	6.4	6.1	6.3	6.3	6.6
Top loin	7.0	5.7	6.2	6.1	6.4
T-Bone/Porterhouse	7.2 ^b	5.4 ^a	6.1 ^b	6.1 ^b	N/A
Top Sirloin	6.3	6.3	6.6	6.7	7.1

^{ab} Within a row, means lacking a common superscript letter differ ($P < .05$)

FOODSERVICE CUTS

Cut	Prime	Top Choice	Choice	Select	No Roll
Ribeye	5.2 ^a	6.0 ^b	6.5 ^b	7.5 ^c	6.6 ^{bc}
Top Loin	5.4	5.1	5.1	5.4	5.0
Top Sirloin	6.1 ^{ab}	5.4 ^a	6.8 ^b	N/A	7.4 ^b

^{abc} Within a row, means lacking a common superscript letter differ ($P < .05$)

RETAIL STEAKS FROM THE CHUCK AND ROUND SUBPRIMALS

Cut	Choice	Select
Clod	6.9	6.5
Chuck roll	7.3	7.3
Top round	8.9	7.9
Bottom round	11.1	11.4
Eye of round	10.0	9.0

USDA Choice, branded products with marbling scores of Small50 and higher, were classified as "Top Choice."

Branded products focusing on USDA Select or lower were classified as "Lean."

Warner-Bratzler shear values and consumer panel responses were analyzed using the general linear model procedure of SAS (1990).

INITIAL FINDINGS

Here are some of the differences that researchers found between retail and foodservice beef:

Beef used for retail was aged an average of 19 days, compared to 32 days for foodservice.

The average aging period for retail beef ranged from 2 to 61 days, compared to 5 to 67 days for foodservice.

Thirty-four percent of subprimals used for retail were aged less than 14 days, compared to 19.4% of subprimals bound for food service.

For retail steaks from the rib and loin, grade and brand-identified products significantly impacted shear-force values for the T-bone/Porterhouse steaks, but not for the ribeye, top loin, and top sirloin steaks.

Among retail steaks, consumer evaluations revealed that Prime ribeye steaks received higher overall preference – or "like" – ratings compared to the other grade classifications. Grade classification, however, did not affect the values for the top sirloin, top round, and clod steaks.

For the foodservice steaks, shear-force values from the ribeye steak and top sirloin steak were impacted by grade classification; however, grade classification did not impact shear-force values for the top loin steak.

For the foodservice steaks, consumer evaluations did not find significant differences between grade classification for the ribeye, top loin, and top sirloin steaks.

"The results from this study indicate a tender population and it just goes to show that if we have good control of steaks during handling and preparation, we can positively impact the eating experience," says Dr. Reagan.

**TABLE 2:
CONSUMER LIKES AND DISLIKES**

Sensory panel ratings (10 = highest or best; 1 = lowest or worst)

RETAIL RIBEYE STEAKS

Sensory rating	Prime	Top Choice	Choice	Select	Lean
Overall like	7.5 ^b	6.1 ^c	6.0 ^c	6.4 ^c	6.0 ^c
Tenderness	6.2	6.5	6.5	6.7	6.5
Juiciness	6.7	5.6	5.5	5.8	5.4
Overall flavor	7.3 ^b	6.1 ^{cd}	5.9 ^d	6.4 ^{bc}	6.2 ^{cd}
Beef flavor	6.9	6.0	5.9	6.3	6.1

bcb Within a row, means lacking a common superscript letter differ ($P < .05$)

RETAIL TOP SIRLOIN STEAKS

Overall like	4.9	5.9	5.7	5.8	5.5
Tenderness	4.8	6.2	5.8	5.8	5.8
Juiciness	4.3	5.0	5.1	5.2	4.9
Overall flavor	5.4	6.0	5.7	5.9	5.9
Beef flavor	5.6	6.0	5.9	6.0	6.0

RETAIL TOP ROUND STEAKS

Overall like	4.5	4.4	5.3	4.4	5.3
Tenderness	3.4	4.3	5.1	3.8	5.1
Juiciness	3.4	4.3	4.8	4.2	4.6
Overall flavor	5.0	4.6	5.6	4.9	5.4
Beef flavor	6.2	4.9	5.8	5.0	5.5

FOODSERVICE TOP LOIN STEAKS

Sensory rating	Prime	Top Choice	Choice	Select	No Roll
Overall like	6.2	5.8	6.1	5.2	5.9
Tenderness	6.7	6.5	6.6	5.8	5.9
Juiciness	6.0	5.7	5.7	5.0	5.0
Overall flavor	6.1	5.7	5.9	5.2	5.9
Beef flavor	6.2	5.7	6.0	5.2	5.9

FOODSERVICE TOP SIRLOIN STEAKS

Overall like	6.4	4.9	5.7	N/A	6.5
Tenderness	6.0	5.4	6.1	N/A	7.4
Juiciness	6.4	4.7	5.4	N/A	4.9
Overall flavor	6.2	5.0	5.8	N/A	6.2
Beef flavor	6.6	5.6	6.4	N/A	6.1

FOODSERVICE RIBEYE STEAKS

Overall like	6.3	5.4	5.6	5.9	6.1
Tenderness	6.8	6.2	6.1	6.5	7.2
Juiciness	6.0	5.3	5.5	5.1	5.7
Overall flavor	6.2	5.4	5.5	6.0	6.2
Beef flavor	6.2	5.7	5.8	5.9	6.1

CONCLUSIONS

For the most part, findings of the 1999 survey show that steaks had fewer tenderness problems than those evaluated in the 1990 study. This recent survey indicated that there was a 20% increase in tenderness as compared to 1990. This is good news for the beef industry as efforts to reverse a decline in beef's marketshare are closely linked to having a great tasting product for the consumer.

"The findings of this survey are proof positive that cattlemen are indeed serious about becoming a consumer-driven industry," says Dave Nichols Iowa seedstock producer who chairs the NCBA's product enhancement subcommittee overseeing this study. "Tenderness is the single-most important factor in determining a good or bad eating experience for consumers. NCBA has taken the leadership to solve this problem at its source, which has resulted in the validation of DNA testing and improved genetics in the pasture."

Adds Texas A&M's Dr. Savell: "The results of the survey are very promising. Most cuts were more tender than those from the last survey. With continued emphasis on making sure that the beef eating experience is the best that it can be, the beef industry will benefit greatly by satisfying more consumers than in the past."

Researchers credit several factors for the improvement in tenderness:

First, in the 1999 survey, there were fewer "no-roll" steaks (steaks lower than Choice-quality grade) and higher percentage of steaks grading High Choice or Prime than in the 1990 study.

Second, since the early 1990s, beef packers have begun to chill product for a longer period of time than they did in 1990.

TABLE 3: CONSUMER LIKES AND DISLIKES

SENSORY PANEL RATINGS, RETAIL CLOD STEAKS
(10 = highest or best; 1 = lowest or worst)

	Top Choice	Choice	Select
Overall like	4.7	5.6	5.8
Tenderness	4.9	5.7	6.1
Juiciness	4.7	5.5	5.7
Overall flavor	4.6	5.8	5.7
Beef flavor	5.0	6.0	5.8

**TABLE 4:
HOW WE COMPARE TO 1990**

	Warner-Bratzler shear values (lbs)	
	1990	1999
RIBEYE	7.5	6.2
PORTEHOUSE	N/A	5.7
T-BONE	N/A	5.9
TOP LOIN	7.3	5.9
TOP SIRLOIN	7.9	6.4
CUTS FROM CHUCK AND ROUND		
CLOD	8.8	6.6
CHUCK ROLL	9.2	7.3
TOP ROUND	11.4	7.9
EYE OF ROUND	10.3	9.0
BOTTOM ROUND	9.7	11.0

Instead of chilling carcasses rapidly for 20 to 24 hours, the period is now 36 to 48 hours.

It is well documented that cold shortening/cold toughening – caused by a shorter and more rapid chilling period – can play a part in causing beef toughness.

These longer and more gradual chilling methods may be producing a pleasant side-effect of fewer tougher steaks.

Third, the top sirloin steak performed much better than it did in

1990. One possible explanation for this is that the top sirloin butt has a much lower incidence of injection-site blemishes and associated toughness today than it did in 1990. Efforts by NCBA to reduce this problem have resulted in a major decline of injection-site lesions in the top sirloin over the past decade.

Fourth, the tenderness aging period increased when compared to the 1990 survey; this was true for both retail and foodservice cuts.

However, there are still a number of retail cuts from the round that exceed 8.6 pounds of shear-force and are at the tough end of the tenderness scale, so improvements can be made in the round.

The utilization of a single cooking method allowed for the determination of relative tenderness between all of the retail cuts sampled in 1999. However, the single cooking method did not allow for the use of other cooking methods that may optimize the palatability of cuts that contain higher connective tissue levels. Efforts should be made to emphasize cooking methods that optimize the palatability of all beef cuts for consumers.

“Cattle producers must continue to keep the consumer in the top of their minds,” says Dr. Savell. “Beef is a repeat business, and nothing brings consumers back to the store or restaurant than great tasting and tender beef.”

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methods. Cuts from more tender parts of the carcass (such as the rib or loin) are better when cooked by dry heating methods.

And, researchers found, larger cuts, such as roasts, react similarly when roasted, despite their differences in marbling. However, roasts tended to be less desirable when cooked to higher temperatures.

“Overcoming our product’s tenderness problems is a multifaceted challenge that is affected by everything from genetics, to animal handling, to processing and preparation,” says NCBA’s Dr. Bo Reagan. “But it’s a challenge all of us in the industry need to take seriously, because tenderness affects not only millions of eating experiences each day, it also impacts how consumers perceive our product.”

Adds Texas A&M’s Jeff Savell: “If we deliver beef that’s undesirably tough, then consumers will simply spend their money on something else. It’s in everybody’s best interest – from the producer to the processor – to ensure our products are consistently tender, consistently flavorful and consistently high in quality.”

With that in mind, in 1998 the National Cattlemen’s Beef Association felt it necessary to conduct a follow-up study to the 1990 survey to see if the industry was making progress – or falling behind – on the tenderness issue.

Unlike the first study, the 1999 version was expanded to include products from the foodservice segment (restaurants). By not limiting the study to beef from retail outlets, as was the case in 1990, this study was more able to accurately and completely characterize the situation for the industry.

Called the 1999 National Beef Tenderness Survey, the study was conducted for the National Cattlemen’s Beef Association on behalf of the Cattlemen’s Beef Board by Texas A&M University. Texas A&M scientists collaborated with researchers from the University of Florida, Pennsylvania State University, Iowa State University, and Oklahoma State University.

The survey had three main objectives:

- ◆ To determine the tenderness of beef from the retail case based on Warner-Bratzler shear force and consumer evaluation panels;
- ◆ To determine the tenderness of beef from the foodservice industry based on Warner-Bratzler shear force and consumer evaluation panels; and
- ◆ To compare results of the 1990 survey with those of the 1999 survey.

The results of this survey are included in the following pages.



Correct preparation for select cuts of beef is essential in maintaining tenderness.



Overcooking choice cuts of beef is a common cause of losing tenderness.



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