Consumer impressions of Tender Select beef[1]

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ABSTRACT: With the recent development of technology to classify beef for tenderness, it is now possible for packers and retailers to market brands of beef known to be consistently tender. The present experiment was conducted to determine consumer impressions of Tender Select, a model beef brand comprised of cuts from tender U.S. Select carcasses. A telephone survey was conducted in metropolitan Denver, CO, to recruit consumers (n = 1,036) for this study. Consumers who met minimal limits for household income, age, and beef consumption were invited to participate in a beef shopping and usage study in a local supermarket. Point-of-purchase material was developed that described Tender Select as "the only steak guaranteed tender and lean." When shown a copy of the Tender Select concept card, 89% of participating consumers (n = 759) indicated that they would definitely or probably buy that product. Of those consumers that said they would buy the product, 35% indicated that their purchases of Tender Select would be in addition to their current fresh meat purchases. Most consumers (54.1%) indicated that if Tender Select was available at their grocery store, 1 or 2 of their next 10 purchases of beef cuts would be Tender Select. Sixty-five percent of consumers indicated that if a grocery store carried a line of beef cuts guaranteed to be tender, they would buy all of their beef at that store. Both strip loins from 104 U.S. Select beef carcasses, representing a broad range (8.7 to 43.4 kg; CV = 42%) in slice shear force (SSF) at 14 d postmortem, were used to determine the effect of SSF classification on consumer satisfaction and the correlation among trained sensory panel descriptive attribute ratings and in-home consumer ratings of beef longissimus steaks. Both trained sensory panelists and consumers rated low-SSF steaks higher than the high-SSF steaks for all traits ($P < 0.001$). All consumer traits (like, tenderness, juiciness, flavor like, flavor amount, and overall satisfaction) were more highly correlated with SSF and trained sensory panel tenderness ratings than with sensory panel flavor or juiciness ratings. These data show that tenderness is the primary determinant of satisfaction among consumers of U.S. Select top loin steaks and that a segment of consumers would pay a premium to purchase guaranteed-tender U.S. Select steaks.

Key Words: Beef, Consumer Attitudes, Marketing, Tenderness

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Introduction

The advent of tenderness-based beef classification makes it possible for beef packers to identify carcasses with superior tenderness. A logical use for a tenderness classification system is as a tool to add value to carcasses that are undervalued by the current marbling-based marketing system. Arguably the largest class of undervalued carcasses in the United States is the Select grade. Select carcasses, which represent 47% of U.S. steer and heifer carcasses (Boleman et al., 1998), are marketed at a discount as compared to Choice carcasses because average palatability is lower for Select. Yet most U.S. Select carcasses yield tender top loin steaks

[1]Names are necessary to report factually on available date; however, the USDA neither guarantees nor warrants the standard of the product, and the use of the name by USDA implies no approval of the product to the exclusion of other products that may also be suitable. The authors are grateful to Patty Beska, Kathy Mihm, and Pat Tammen for their assistance in the execution of this experiment and to Marilyn Bierman and Carol Grummert for their secretarial assistance. This project was partially funded by the beef producers through their $1-per-head check-off and was produced for the Cattlemen's Beef Board and state beef councils.

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Table 1. Level of consumer (n = 1,036) agreement with statements about meat shopping and preparation behavior

Statement[a]	Response, %			
	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
I feel badly if I go over my budget for food	10[b]	27	29	33
I really don't let price govern my purchase decisions when it comes to food	23[b]	34	29	14
The main reason I don't eat more meat is because it is too expensive	4[b]	14	29	53
It's really important to limit the amount of fat in one's diet, even if you are not concerned about weight control	56[b]	32	7	5
I make a real effort to avoid foods that are high in cholesterol	28[b]	38	21	13
I have, or plan to cut down on the amount of meat I eat for health reasons	14[b]	25	28	33
I really enjoy spending time on meal preparation and cooking	29[b]	34	19	18
The microwave has changed the way I prepare dinner	24	26	20	29
It is a real advantage to buy take out foods already prepared	14	33	24	29

[a]Statements were posed to qualified consumers at the end of the recruitment survey.
[b]The proportion of consumers that agreed (either strongly or somewhat) with this statement differed from the proportion of consumers that disagreed (either strongly or somewhat) with this statement ($P < 0.001$).

(Wheeler et al., 1994). Thus, it would appear that there are a large number of U.S. Select carcasses that are undervalued by the current U.S. beef marketing system.

The present experiment was conducted to determine 1) the effect of availability of a consistently tender brand of beef on consumers' beef-purchasing decisions, 2) whether consumers can detect tenderness differences within U.S. Select strip loin steaks, and 3) whether consumers are willing to pay a premium for a product that excels in tenderness.

Materials and Methods

Beef market research data was collected for households located within a 3.2-km radius of each of four different retail grocery stores, all of which were located in the suburban region of Denver, CO, and owned by a single grocery chain. A consumer who

1. was the primary food shopper/preparer in the household;
2. was between 21 and 64 yr of age;

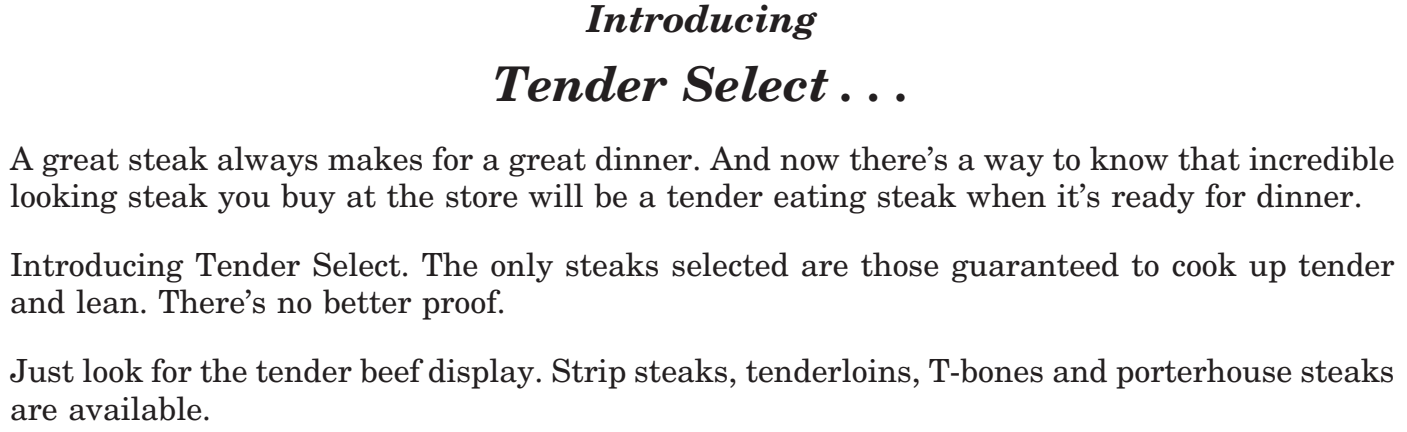

Figure 1. Tender Select concept card.

Table 2. Assignment of steaks

Steak	Left strip loin	Right strip loin
Anterior end	Not used[a]	Slice shear force[b]
1	Consumer	Consumer
2	Consumer	Consumer
3	Consumer	Consumer
4	Consumer	Consumer
5	Trained descriptive-attribute sensory panel	
6	Consumer	Consumer
7	Consumer	Consumer
8	Consumer	Consumer
9	Consumer	Consumer

[a]Removed fresh and discarded.
[b]Removed fresh.

3. had an annual household income of at least $30,000 for households with three or more residents or at least $20,000 for households with fewer than three residents;
4. consumed beef steaks or roasts at least once in an average 2-wk period;
5. did not have anyone in their immediate family who worked in livestock production, meat processing, retail sales of fresh meat, advertising, market research, or news reporting;
6. had not been interviewed about any food products in the past 6 mo as part of a market research study; and
7. did not have any allergies or food sensitivities that would prevent the consumer or anyone in his or her household from taking part in a beef taste test

was accepted into the study (n = 1,036) and was asked to indicate his or her level of agreement with a series of questions (Table 1) about meat shopping and preparation behavior.

At the end of the recruitment survey, consumers were invited to participate in the in-store phase of this study using the following script:

> In addition to this survey we just completed, we are conducting a beef shopping and usage study in a local supermarket and would like to include you as a participant. Again, this is in no way a sales call; we are only interested in your opinions as a shopper and beef consumer.
>
> If you participate, initially we would ask you to make a normal shopping trip at a grocery store in your area. For your participation, and recognizing your opinions are valuable, we will provide you with a $25 coupon to use toward your shopping trip. We will be in your area, at the _____ store on _____ Road from (day/month/date) to (day/month/date). Your shopping trip would need to take place some time between those dates.

Table 3. Consumers (n = 759) were shown a copy of the Tender Select concept card and asked, "If this product was available in your store, how likely would you be to buy it?"

Response	Frequency, %
I definitely would buy it	23[a]
I probably would buy it	66
I probably would not buy it	10
I definitely would not buy it	1

[a]The proportion of consumers that indicated they would definitely or probably buy Tender Select was greater than the proportion of consumers that indicated that they would definitely or probably not buy Tender Select ($P < 0.001$).

Table 4. Consumers (n = 759) were shown a copy of the Tender Select concept card and asked, "Based on what you can see and the description of this product, please tell me how much you believe that this beef product is significantly more tender than other fresh beef cuts? Would you say it is very believable, somewhat believable, slightly believable or not at all believable?"

Response	Frequency, %
Very believable	25[a]
Somewhat believable	55
Slightly believable	15
Not at all believable	5

[a]More ($P < 0.001$) consumers indicated that the statement was very believable or somewhat believable than slightly believable or not at all believable.

In-store data collection was conducted on Thursdays, Fridays, Saturdays, Sundays, and Mondays. Data collection was conducted in a different store on each of four weekends. Data were collected during peak shopping hours (between 1530 and 2000 on the weekdays and between 0930 and 2000 on Saturday or Sunday). For consumers who accepted the invitation to participate in the beef shopping and usage study, an appointment was made for their shopping trip to facilitate data collection.

Upon arrival at the store, the consumers (n = 759) were greeted by a member of the research team and instructed as follows:

> The first step in your participation is to go ahead and shop for the types of fresh meat products you would purchase on a normal shopping trip to the grocery store. It is very important you select only the fresh meat products you would normally buy. Go ahead and take as much time as you usually would during a regular shopping trip. Also, after you have finished shopping for your fresh meats we will need about 10 minutes of your time. After you have made your meat selections, please return directly to this location to continue your participation with the survey. Do you have any questions at this point?

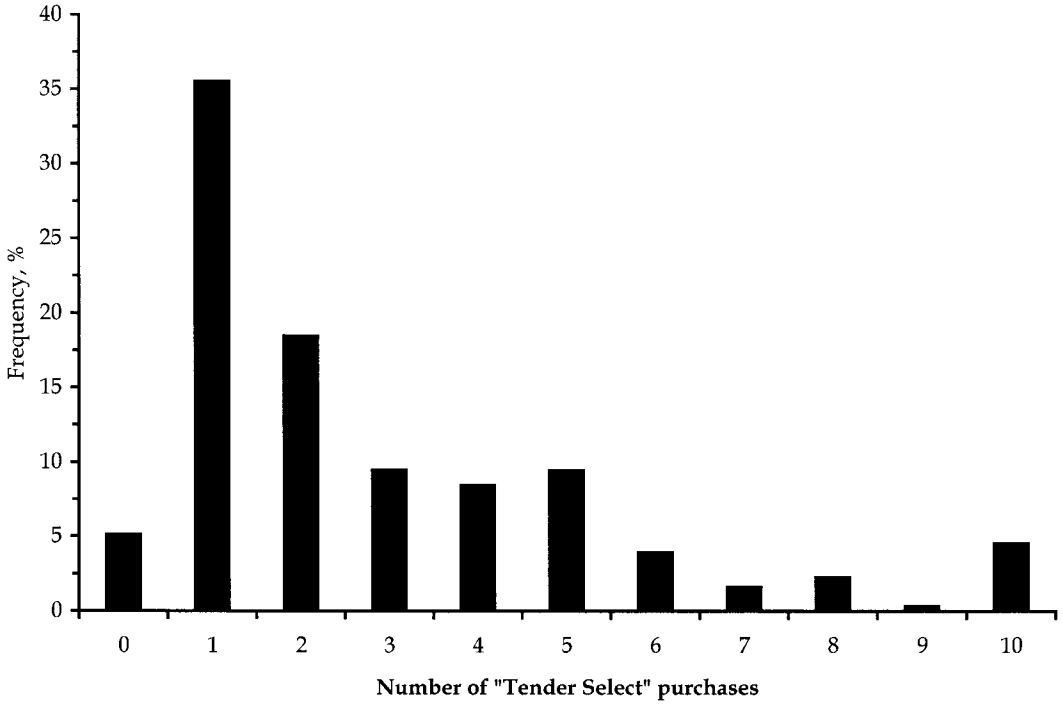

Figure 2. Consumers were shown the Tender Select concept card and asked, "If this product were available in your local grocery store, out of your next ten purchases of beef cuts how many times would you purchase this product?"

In addition to the store's normal selection of beef cuts, which consisted primarily of U.S. Select steaks and roasts, a portion of the beef retail case was devoted to a test brand of porterhouse, T-bone, and boneless New York strip steaks, which were called *Tender Select*. Point-of-purchase material (Figure 1) was used to introduce the brand and to describe the products to consumers. No other advertising or promotion was used to market the brand. Tender Select steaks and point-of-purchase materials were offered in each store only during that store's 5-d-long data collection period.

Short Loin Selection. At the time of normal carcass grading (36 to 60 h postmortem), yield grade 1 or 2 U.S. Select carcasses were selected from the normal production of a commercial beef-processing facility and tenderness was tested using the MARC beef classification system (Shackelford et al., 1999). Short loins (IMPS #174; NAMP, 1997) were obtained from those carcasses that were classified as "tender," vacuum-packaged, boxed, and shipped (0 to 2°C) to the test stores. These short loins were cut into Tender Select porterhouse, T-bone, and boneless New York strip steaks.

Questions. Consumers were shown a copy of the Tender Select concept card (Figure 1) and asked, "If this product were available in your local store, how likely would you be to buy it? Would you say you would definitely buy it, probably buy it, probably not buy it or definitely not buy it?" Consumers who indicated that they would definitely or probably buy Tender Select, were asked, "If you buy this type of product in the future, do you feel it will be in addition to the fresh meat products you currently buy, or will it be a replacement for fresh meat products?" Those consumers that indicated that Tender Select would be a replacement for their current fresh meat products were asked, "What kind of meat products will this product replace?"

Consumers were again shown the concept card and asked, "Based on what you can see and the description of this product, please tell me how much you believe that this beef product is significantly more tender than other fresh beef cuts? Would you say it is very believable, somewhat believable, slightly believable or not at all believable?" Consumers were asked, "If this product were available in your local grocery store, out of your next ten purchases of beef cuts how many times would you purchase this product?"

Strip Loin Selection. Boneless strip loins (IMPS #180; NAMP, 1997) were obtained from both sides of 191 U.S. Select carcasses at a commercial beef-processing plant. Subprimals were vacuum-packaged, boxed, transported (0 to 2°C) to the U.S. Meat Animal Research Center, and aged (0 to 2°C). At 14 d after slaughter, subprimals were unpackaged, s.c fat in excess of 0.64 cm was removed, and the loin tail was removed by a straight cut extending from the lateral end of the loin eye on the posterior end of the strip loin to a point 2.54 cm from the lateral end of the loin eye on the anterior end of the strip loin.

A 2.54-cm-thick steak was removed from the anterior end of the strip loin from the right side of each carcass, and slice shear force (**SSF**) was determined (Shackelford et al., 1999). The strip loins were ranked based on SSF value and divided into low-SSF (the lowest ⅓ of SSF values), intermediate-SSF (middle ⅓ of SSF val-

Table 5. Level of consumer (n = 533) agreement with statements about "guaranteed-tender" beef cuts

Statement	Response, %			
	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
If a grocery store carried a line of beef cuts guaranteed to be tender, I would buy ALL of my beef at that store	27	41[a]	22	10
If a grocery store carried a line of beef cuts guaranteed to be tender, I would buy MORE beef at that store	47	37[a]	12	4
I would like a grocery store to offer a brand of guaranteed tender beef	58	36[a]	5	1

[a]The proportion of consumers that agreed (either strongly or somewhat) with this statement differed from the proportion of consumers that disagreed (either strongly or somewhat) with this statement ($P < 0.001$).

ues), and high-SSF (highest ⅓ of SSF values) groups. At random, 104 strip loins (both sides from 52 carcasses) were selected from the low-SSF group (mean = 12.6 kg, SD = 1.6 kg) and 104 strip loins (both sides from 52 carcasses) were selected from the high-SSF group (mean = 28.3 kg, SD = 5.1 kg) for use in the trained sensory panel and consumer evaluation. It is important to note that the SSF values that we used to classify the strip loins in this study were measured at the completion of the aging period (14 d postmortem) rather than near the beginning of the aging period and, thus, are distinctly different from the values Shackelford et al. (1999) used to classify carcasses at 3 d postmortem.

Strip loins were vacuum-packaged and frozen (–20°C) at 14 d postmortem. Nine 2.54-cm-thick steaks were removed from each frozen loin (Table 2). To provide enough samples for the trained descriptive attribute sensory panel, the fifth steak from the left side of each carcass was combined with the fifth steak from the right side of each carcass. Steaks 1, 2, 3, 4, 6, 7, 8, and 9 were used for consumer evaluation. Thus, there were a total of 16 consumer steaks per carcass, for a total of 880 low-SSF steaks and 880 high-SSF steaks. Consumer steaks were labeled with a four-digit, blind code.

For descriptive-attribute trained sensory panel (**TSP**) analysis, steaks were thawed, cooked to an internal temperature of 70°C, and portioned as described by Shackelford et al. (1999). The eight-member TSP evaluated 1 cm × 1 cm × cooked steak thickness samples for tenderness, juiciness, and beef flavor intensity (1 = extremely tough, dry, or bland and 8 = extremely tender, juicy, or intense). The eight-member sensory panel was selected and trained according to Cross et al. (1978). With the protocol used in this experiment, the eight-member sensory panel has been reported (Wheeler et al., 1998) to measure each sensory trait with a high level of repeatability: tenderness (0.87), ease of fragmentation (0.88), amount of connective tissue (0.66), juiciness (0.51), beef flavor intensity (0.52), and off-flavor (0.51).

Table 6. Effect of slice shear force classification on trained descriptive-attribute sensory panel ratings

Trait[a]	Slice shear force class	
	Low	High
Tenderness[b]	7.1 ± 0.07	4.8 ± 0.15
Juiciness[b]	5.7 ± 0.04	5.5 ± 0.05
Beef flavor intensity[b]	5.3 ± 0.04	5.0 ± 0.05

[a]Low- and high-slice shear force samples differed for all traits ($P < 0.001$).
[b]1 = extremely tough, dry, or bland and 8 = extremely tender, juicy, or intense.

At the completion of the in-store phase of this study, each consumer was given one low-SSF steak and one high-SSF steak to take home and evaluate. The low-SSF and high-SSF steaks were distributed in pairs that were matched with regard to anatomical location within the strip loin. Consumers were instructed to thaw, cook, and evaluate both steaks at the same time within 5 d of receiving the steaks. No other cooking instructions were provided. Consumers were provided a copy of the beef steak color guide (AMSA, 1995) and asked to record the degree of doneness of each steak.

Consumers rated each steak on an 11-point scale for overall like/dislike, tenderness, juiciness, flavor like, flavor amount, and overall satisfaction (0 = dislike extremely, not at all tender, not at all juicy, dislike extremely, none at all, or not at all satisfied and 10 = like extremely, very tender, very juicy, like extremely, an extreme amount, or very satisfied). Consumers were asked, "How willing would you be to pay 50¢ per pound ($1.10/kg) more to purchase that steak?" Consumers were asked which, if either, of the two steaks they preferred overall.

Statistical Analysis. Chi-square goodness-of-fit tests (SAS Inst. Inc., Cary, NC) were used to determine whether the proportion of positive consumer responses to each question or statement differed from the proportion of negative responses.

The effect of slice shear force class on trained sensory panel ratings was determined using one-way ANOVA.

Table 7. ANOVA of slice shear force classification and degree-of-doneness effects on consumer ratings

	Mean square error			
Consumer rating	Slice shear force class (df = 1)	Degree of doneness (df = 5)	Interaction (df = 5)	Error (df = 992)
Like	309.5***	10.2*	2.4	4.2
Tenderness	556.6***	16.7**	3.3	5.0
Juiciness	240.5***	60.8***	3.1	4.4
Flavor like	179.0***	10.4*	6.1	4.1
Flavor amount	152.5***	5.2	6.8	4.1
Overall satisfaction	356.1***	13.4*	5.6	5.0

*$P < 0.05$.
**$P < 0.01$.
***$P < 0.001$.

For consumer data, the analysis included effects of slice shear force class and degree of doneness and their interaction.

To investigate the relative importance of tenderness, juiciness, and flavor to consumer ratings, all of the individual consumer ratings were averaged for each carcass and the simple correlation was determined between the average consumer rating and the trained sensory panel rating for each carcass using the PROC CORR procedure of SAS.

Results and Discussion

Demographics. The distribution of annual income for the households surveyed was 4.4% from $20,000 to

Table 8. Effect of slice shear force (SSF) classification and degree of doneness (DOD) on consumer ratings

Item		Consumer ratings[a]					
		LI	TE	JU	FL	FA	OS
Slice shear force							
Low		7.0***	6.9***	6.5***	6.8***	6.9***	6.8***
High		5.5	4.8	5.1	5.7	5.8	5.2
SEM		0.1	0.1	0.1	0.1	0.1	0.1
Degree of doneness							
Very rare/rare		6.8[b]	6.7[b]	7.0[b]	6.8[b]	6.7[b]	6.7[b]
Medium rare		6.5[b]	6.1[bc]	6.5[b]	6.5[b]	6.6[b]	6.3[bc]
Medium		6.2[bc]	5.9[c]	5.9[c]	6.2[b]	6.3[b]	6.0[c]
Medium well		6.3[bc]	5.7[cd]	5.5[cd]	6.3[b]	6.3[b]	6.0[cd]
Well done		6.2[bc]	5.9[c]	5.4[d]	6.2[bc]	6.3[b]	5.9[cd]
Very well done		5.6[c]	4.9[d]	4.4[e]	5.5[c]	6.0[b]	5.2[d]
SEM		0.2	0.2	0.2	0.2	0.2	0.2
SSF	DOD						
Low	Very rare/rare	7.2	7.3	7.3	6.7	6.6	6.9
Low	Medium rare	7.4	7.2	7.2	7.2	7.2	7.2
Low	Medium	7.0	7.0	6.7	6.9	6.9	6.9
Low	Medium well	7.2	6.8	6.3	7.0	6.9	6.9
Low	Well done	7.1	7.0	6.1	6.9	6.8	6.9
Low	Very well done	6.4	6.1	5.4	6.3	7.1	6.1
High	Very rare/rare	6.5	6.1	6.8	6.8	6.8	6.5
High	Medium rare	5.7	5.0	5.9	5.8	6.0	5.3
High	Medium	5.3	4.7	5.2	5.5	5.7	5.1
High	Medium well	5.4	4.6	4.8	5.6	5.8	5.1
High	Well done	5.3	4.8	4.6	5.5	5.8	4.9
High	Very well done	4.8	3.7	3.5	4.7	4.9	4.2
SEM		0.3	0.3	0.3	0.3	0.3	0.3

[a]LI = like, TE = tenderness, JU = juiciness, FL = flavor like, FA = flavor amount, and OS = overall satsifaction. 0 = dislike extremely, not at all tender, not at all juicy, dislike extremely, none at all, or not at all satisfied and 10 = like extremely, very tender, very juicy, like extremely, an extreme amount, or very satisfied.
[b,c,d,e]Means within a column that do not share a common superscript letter differ ($P < 0.05$).
***Low- and high-slice shear force samples differed for all traits ($P < 0.001$).

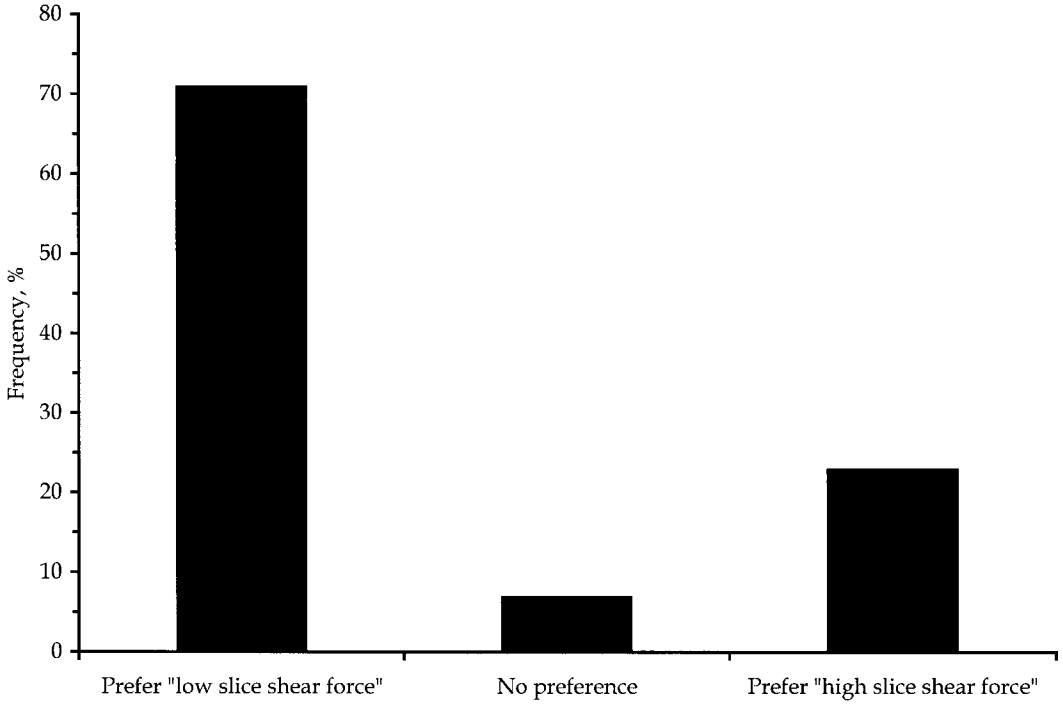

Figure 3. Frequency of consumers that preferred the low-slice shear force steak over the high-slice shear force steak.

$30,000, 11.9% from $30,000 to $40,000, 11.5% from $40,000 to $50,000, 14.1% from $50,000 to $60,000, 16.5% from $60,000 to $75,000, and 41.6% greater than $75,000.

Meat Shopping and Preparation Behavior. Most of the consumers surveyed indicated that the main reason they don't eat more meat is not because it is too expensive (Table 1). Moreover, most of the consumers indicated they do not feel bad if they go over their budget for food. Also, over half of the consumers indicated that they don't let price govern their food-purchasing decisions. The lack of concern over the cost of meat ex-

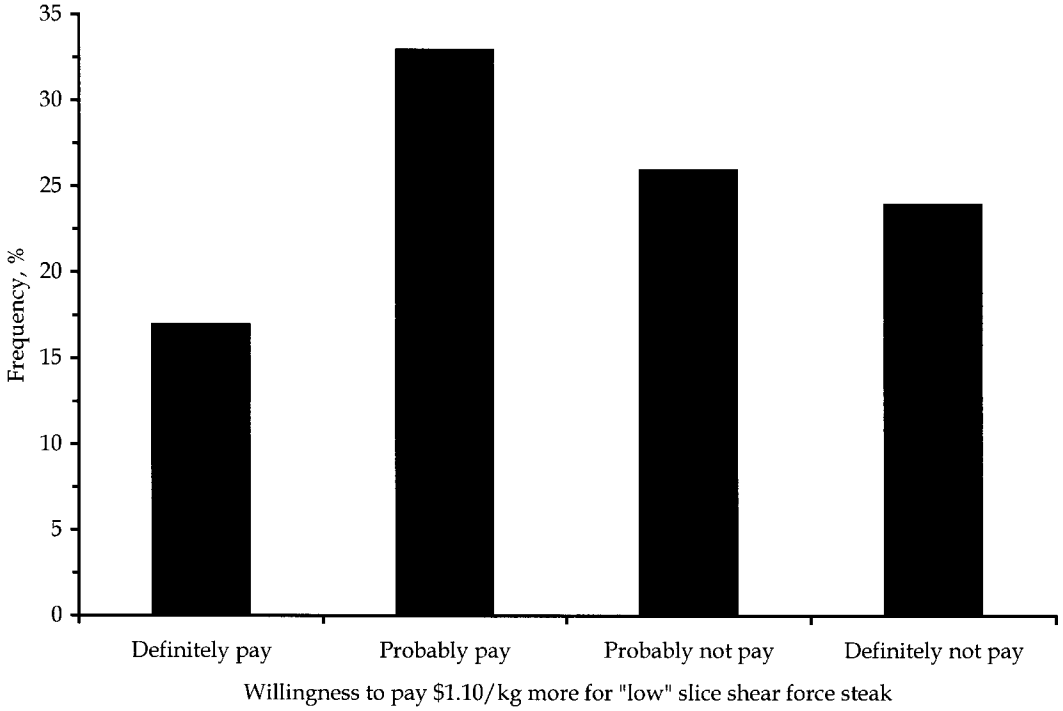

Figure 4. Willingness of consumers to pay 50¢/pound ($1.10/kg) more to purchase the "low" slice shear force steak.

pressed by these consumers may partially be a function of their relatively high level of income. However, income level accounted for less than 6% of the variation in the consumers' responses to these questions.

Most consumers appeared to be concerned about fat and cholesterol consumption because there was a high level of agreement with the statements "It's really important to limit the amount of fat in one's diet, even if you are not concerned about weight control" and "I make a real effort to avoid foods that are high in cholesterol." But only 39% of the consumers surveyed agreed with the statement "I have, or plan to cut down on the amount of meat I eat for health reasons."

The consumers had mixed responses to questions regarding the amount of time spent on meal preparation. Approximately one-half of consumers agreed that "it is a real advantage to buy take out foods already prepared" and that "the microwave has changed the way I prepare dinner."

Consumer Response to the Tender Select Concept. When shown a copy of the Tender Select concept card (Figure 1), most (89%) consumers indicated that they would definitely or probably buy Tender Select steaks if Tender Select was available at their local store (Table 3). Of the consumers who said that they would buy Tender Select steaks, 35% indicated that their purchases of Tender Select would be in addition to their current fresh meat purchases. Of the consumers who indicated that Tender Select would be a replacement for current fresh meat purchases, 94% indicated that Tender Select would replace other beef cuts.

Most consumers (80%) indicated that, based on the description of Tender Select given on the concept card, they believed that Tender Select is more tender than other fresh beef cuts (Table 4). Most consumers (54%) indicated that if Tender Select was available at their grocery store, 1 or 2 of their next 10 purchases of beef cuts would be Tender Select (Figure 2). Only 5% of consumers indicated that if Tender Select was available at their grocery store, none of their next 10 purchases of beef cuts would be Tender Select.

Sixty-eight percent of consumers indicated that if a grocery store carried a line of beef cuts guaranteed to be tender, they would buy all of their beef at that store (Table 5). Eighty-four percent of consumers indicated that if a grocery store carried a line of beef cuts guaranteed to be tender, they would buy more of their beef at that store. Ninety-four percent of consumers indicated that they would like a grocery store to offer a brand of guaranteed-tender beef.

Effect of Slice Shear Force Classification. Both trained sensory panelists and consumers rated the low-SSF steaks higher than the high-SSF steaks for all traits ($P < 0.001$; Tables 6, 7, and 8). Over 70% of consumers preferred the low-SSF steak (Figure 3). One-half of the consumers indicated that they would definitely or probably pay 50¢ more per pound ($1.10/kg) to purchase the low-SSF steak (Figure 4).

The effect of tenderness class on consumer ratings was much larger than the effect of degree of doneness (Table 7). Degree of doneness did not ($P = 0.35$) affect consumer like ratings of low-SSF steaks; however, consumer like ratings of high-SSF steaks decreased with increasing degree of doneness ($P < 0.05$; Table 8). The mean consumer like rating for low-SSF steaks cooked very well done did not differ ($P > 0.05$) from the mean consumer like rating for high-SSF steaks cooked rare. These findings are consistent with the effect of the interaction between end-point temperature and tenderness on Warner-Bratzler shear force values for beef longissimus (Wheeler et al., 1999).

There was a high level of autocorrelation among all consumer traits (Table 9); therefore, the use of correlations among consumer traits to identify the determinants of consumer satisfaction would be misleading. A more meaningful indicator of the relative importance of the palatability traits to consumer satisfaction is the correlation of consumer traits with TSP ratings. All consumer traits (like, tenderness, juiciness, flavor like, flavor amount, and overall satisfaction) were more highly correlated with slice shear force and TSP tenderness ratings than with TSP flavor or juiciness ratings (Table 10). Therefore, efforts to increase consumer satisfaction with U.S. Select longissimus steaks should be focused on controlling variation in tenderness rather than on juiciness or flavor.

General Discussion

Consumers indicated that diet or health concerns limit beef sales to a greater extent than do budgetary constraints. Thus, it would appear that there is a pre-

Table 9. Correlation coefficients among consumer ratings

	Trait number					
Trait number	1	2	3	4	5	6
1. Like***		0.87	0.75	0.85	0.80	0.92
2. Tenderness	0.87		0.79	0.78	0.73	0.89
3. Juiciness	0.75	0.79		0.75	0.72	0.77
4. Flavor like	0.85	0.78	0.75		0.88	0.87
5. Flavor amount	0.80	0.73	0.72	0.88		0.81
6. Overall satisfaction	0.92	0.89	0.77	0.87	0.81	

***All coefficients were significant ($P < 0.001$).

Table 10. Correlation among slice shear force, trained sensory panel descriptive-attribute ratings, and consumer ratings of beef longissimus steaks

Consumer rating	Slice shear force	Trained sensory panel ratings		
		Tenderness	Beef flavor intensity	Juiciness
Like	0.71***	0.72***	0.40***	0.32**
Tenderness	0.72***	0.75***	0.44***	0.30**
Juiciness	0.59***	0.59***	0.36***	0.23*
Flavor like	0.67***	0.63***	0.41***	0.25*
Flavor amount	0.62***	0.57***	0.37***	0.22*
Overall satisfaction	0.68***	0.69***	0.40***	0.26**

*$P < 0.05$.
**$P < 0.01$.
***$P < 0.001$.

mium market for products that can consistently deliver leanness and high palatability. It appears that marketing a product such as Tender Select represents a potential to increase meat consumption rather than solely as a method to move demand from one meat product to another. Although most Tender Select purchases would replace other beef purchases, 35% of those consumers that said they would buy Tender Select steaks indicated that their purchases of Tender Select would be in addition to their current fresh meat purchases.

Boleman et al. (1997) found that consumers in the Bryan/College Station, TX, area could detect differences in tenderness among beef top loin steaks that had been categorized based on Warner-Bratzler shear force. Although there are numerous differences between our study and the study of Boleman et al. (1997), the results of our study support the previous finding that consumers can detect differences in beef tenderness. The present study shows specifically that consumers can detect differences in tenderness within the range in tenderness that exists within U.S. Select strip loins after 14 d of postmortem aging. Moreover, this study shows that 50% of consumers are willing to pay a 50¢/pound ($1.10/kg) premium for the assurance of tenderness associated with the Tender Select concept. Lusk et al. (2000) evaluated the willingness of consumers to pay a premium for more-tender steaks using a comparison of steaks that differed greatly in SSF (<15 kg vs >35 kg). Lusk et al. (2000) evaluated consumer responses in two scenarios. In the first, consumers did not have any knowledge of the tenderness differences among samples except for the knowledge that they gained from eating the samples. In the second scenario, the low-SSF steak was labeled "guaranteed tender" and the high-SSF steak was labeled "probably tough." In the first and second scenarios, respectively, 69% and 84% of consumers preferred the low-SSF steak. In the first and second scenarios, respectively, 36% and 51% of consumers were willing to pay a premium to exchange a tough steak for a tender steak. Of the consumers willing to pay a premium, the average premium was $1.23/pound ($2.71/kg) and $1.84/pound ($4.05/kg) in the first and second scenarios, respectively.

The present study indicates that beef retailers may potentially profit from the implementation of lean guaranteed-tender products such as Tender Select. Some of the factors that must be considered by retailers as they decide whether or not to implement such a product include 1) how large does the premium for this product line have to be to offset the cost of identifying, branding, and marketing the product line; 2) at the aforementioned premium price is there a sufficiently large enough market for that product line; 3) will sales of this branded product increase or decrease the sales of other higher-profit items; and 4) will there be a steady supply of the product line. The costs of identifying the product include the cost of testing each carcass/cut and the proportion of carcasses/cuts that meet the product specification. For instance, if the cost of testing each carcass is $4 and 20% of carcasses meet the product specification, then assuming that those carcasses that do not qualify are still sold at parity, each qualified carcass has to net a $20 ($4 × [100 ÷ 20]) premium to break even on the testing process. But, if 80% of carcasses meet the product specification, the net premium on qualified carcasses only has to be $5 ($4 × [100 ÷ 80]).

With slice shear force testing, a higher proportion of cuts could be accurately classified as tender if classification was conducted after aging rather than at the packing plant (i.e., 14 d postmortem rather than 1 to 5 d postmortem). However, this would require either testing each cut individually or accurately tracking all of the relevant cuts from each carcass such that a given slice shear force value could be linked to all of the relevant cuts from that carcass.

Implications

The beef industry could profit from the development of a beef brand that excels in both leanness and tenderness. To accomplish this, direct tenderness testing will likely be required to accurately identify carcasses and cuts that combine a low level of marbling with consistent tenderness.

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