

CONSUMER EVALUATION OF BEEF OF KNOWN TENDERNESS LEVELS

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INTRODUCTION

Findings from the National Beef Tenderness Survey (Morgan et al., 1991) revealed that beef was too variable in tenderness. Consumer studies such as the National Consumer Retail Beef Study (Savell et al., 1987, 1989) have used grades or marbling scores to create different kinds or categories of beef for consumers to evaluate. These kinds or categories of beef have been thought to have different potential palatability characteristics, and the findings of these studies have shown that consumers found various levels of tenderness/toughness within each category. Results of studies such as those reported by Savell et al. (1987, 1989) can be used to recategorize or possibly redraw grade lines, but they do not address whether consumers will be more satisfied, or more importantly, be willing to pay more in the marketplace for beef that is guaranteed tender. Until some measure of what real, not perceived, differences in tenderness are worth to the consumer, there is no accurate information to convince those in the beef industry that tenderness is something to search for, manage, and market. Without economic incentives, most entities within the beef industry will continue to ignore tenderness, and beef will still be variable in eating quality to the consumer. Therefore, this study was designed to determine consumer perceptions of beef strip steaks of known shear force and to evaluate how buying trends are modified by price variations of these steaks.

METHODS AND MATERIALS

Sample Preparation. Strip loins (IMPS 180A) were cut into 2.54-cm-thick steaks with .32 cm fat trim and 1.27 cm tails, and steaks with an exposed gluteus medius were eliminated from the study. The steaks were individually vacuum packaged, blast frozen, and stored at -23°C. The center steak of each strip loin was designated for Warner-Bratzler shear force determination. Shear force steaks were cooked following AMSA (1978) guidelines and six cores (1.27 cm) were removed from each steak parallel to the muscle fibers and sheared using a Warner-Bratzler shearing device. The remaining steaks were placed into one of the following categories based on their respective shear force values and color-coded, accordingly: 1) 2.27 to 3.58 kg (Red); 2) 4.08 to 5.40 kg (White); and 3) 5.90 to 7.21 kg (Blue).

Phase I. Forty-two families were recruited to serve as consumers for the study. Two steaks from each category were delivered to each household. The household was instructed as to the order in which the categories of steaks should be evaluated. Two participating adults from each family were given two weeks to prepare and evaluate the steaks as they wished. An evaluation form for each steak was completed by each participant.

Phase II. A retail display of the color-coded steaks was made available at the Rosenthal Meat Science and Technology Center. All three categories were priced the same, regardless of their known shear force values. Consumers were given the opportunity to purchase steaks based on their observations from Phase I. As an incentive to purchase meat, a price reduction was given to the consumers. Phase II was accessible to consumers on three consecutive days. Data were collected as to the number of steaks purchased from each category.

Phase III. Consumers were given the opportunity, once again, to purchase steaks based on their observations from Phase I. However, the steaks were priced according to their shear force category with a \$1.10/kg difference between each of the three groups. Additionally, consumers were informed of the known shear force values. As in Phase II, a price reduction was given as an incentive to purchase steaks. Data were collected as to the number of steaks purchased from each category.

Statistical Analysis. Analysis of variance was performed using the general linear models procedure of SAS (1985). The main effect of shear force category was analyzed for differences in overall satisfaction, tenderness, tenderness satisfaction, juiciness, juiciness satisfaction, flavor, and flavor satisfaction. When analysis of variance indicated significance, mean separations were performed using Tukey's test.

RESULTS AND DISCUSSION

Phase I. Table 1 presents mean scores for evaluations of beef strip steaks based on a 23-point scale. Overall satisfaction was highest ($P < .05$) for Red steaks, and no difference ($P > .05$) was detected in overall satisfaction between White and Blue steaks. Consumers were able to detect differences between each of the three levels of tenderness ($P < .05$), with Red steaks

receiving the highest tenderness scores and Blue steaks receiving the lowest tenderness scores. Similar results were observed for tenderness satisfaction, where consumers were the most satisfied with the tenderness of the Red steaks and least satisfied with the tenderness of the Blue steaks ($P < .05$). Both juiciness and juiciness satisfaction were the highest ($P < .05$) for the Red steaks compared to either the White or Blue steaks. No difference ($P > .05$) was observed between the White and Blue steaks for these two traits. Consumers gave more desirable ($P > .05$) flavor scores to Red steaks compared to Blue steaks, and they were the most satisfied ($P < .05$) with the flavor of the Red steaks compared to either the White or Blue steaks.

Table 1. Mean scores for evaluations of beef strip steaks^a.

Variable	Red (Tender)	White (Intermediate)	Blue (Tough)	SEM
Overall satisfaction	16.91 ^b	14.06 ^c	12.90 ^c	.44
Tenderness	16.61 ^b	13.66 ^c	11.61 ^d	.46
Tenderness satisfaction	16.51 ^b	13.53 ^c	11.53 ^d	.48
Juiciness	16.40 ^b	13.24 ^c	12.51 ^c	.45
Juiciness satisfaction	16.43 ^b	13.29 ^c	12.53 ^c	.46
Flavor	15.81 ^b	14.43 ^c	12.98 ^c	.46
Flavor satisfaction	16.07 ^b	14.47 ^c	13.34 ^c	.48

^aBased on a 23-point scale: 23 = most desirable and 1 = least desirable.

^{b,c,d}Means within rows with different superscripts differ ($P < .05$).

Phases II and III. Table 2 contains the percentages of steaks purchased in Phases II and III. Twenty-eight of the 42 families attended Phase II of the study, and 19 of these 28 families purchased steaks. A total of 103 steaks were purchased with the following numbers of steaks being purchased from each category: 1) Red, 57; 2) White, 13; and 3) Blue, 33. The higher number of steaks purchased from the Red category is indicative of the higher tenderness scores given to steaks in this same category. However, the fact that more steaks were purchased from the Blue category than the White category does not follow the results of the tenderness evaluations. It is possible that the number of Blue steaks purchased was influenced by the fat trim level of some of the Blue steaks. Product that met the specifications for this category was difficult to obtain. Therefore, it was necessary to obtain a limited number of steaks with zero fat trim from an outside source. As a result, consumer purchasing decisions may have been influenced by fat trim level.

In Phase III, 17 families were in attendance and a total of 111 steaks was purchased. The following numbers were purchased from each category: 1) Red, 105; 2) White, 4; and 3) Blue, 2. Although a \$1.10/kg price difference was placed between each category, purchases continued to reflect the results of the evaluation scores. The disclosure of the shear force levels, most likely, reinforced consumer purchasing decisions, resulting in the purchase of 94.6% Red steaks.

Table 2. Percentages of beef strip steaks purchased in Phases II and III.

Category	Phase II	Phase III
Red (Tender)	55.34	94.60
White (Intermediate)	12.62	3.60
Blue (Tough)	32.04	1.80

CONCLUSIONS

These results suggest that consumers can detect differences between three levels of tenderness in beef strip steaks. Additionally, these same consumers were willing to pay a premium for guaranteed tenderness. Therefore, it is possible that economic incentives may be used in the beef industry to promote the production of tender beef.

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