

CUSTOMER SATISFACTION OF BEEF: FACTORS AFFECTING CONSUMER OVERALL-LIKE RATINGS

T.R. NEELY¹, C.L. LORENZEN¹, J.W. SAVELL¹, R.K. MILLER¹, J.D. TATUM², J.W. WISE³, J.O. REAGAN⁴ AND J.F. TAYLOR¹

¹Department of Animal Science, Texas A&M University, College Station, TX 77843-2471, USA.

²Department of Animal Science, Colorado State University, Fort Collins, CO 80523, USA.

³Agricultural Marketing Service, United States Department of Agriculture, Washington, DC 20090-6456, USA.

⁴Product Technology Research, National Live Stock and Meat Board, Chicago, IL, 60611, USA.

INTRODUCTION: Large-scale in-home consumer behavior research, directed towards understanding the types of beef that best deliver high customer satisfaction, is not available to use in improving grade standards and/or in recommending more appropriate cooking methods and degrees of doneness. In the U.S., beef carcasses are segmented into quality grades based on expected differences in cooked beef palatability (USDA, 1989). To determine if USDA beef quality grades should be modified, a study to evaluate consumers' perceptions of beef steaks from carcasses differing in quality grade was needed. In addition, information on how consumers prepare beef steaks (cooking method and degree of doneness) was needed to more thoroughly understand how they impact customer satisfaction. The objective of this study was to determine the relationship of beef quality level (marbling score) to overall consumer like rating in three different retail cuts prepared and evaluated in the homes of moderate to heavy users of beef, and to obtain pertinent information with regard to cooking methods and degree of doneness of beef prepared in the homes of beef consumers.

MATERIALS AND METHODS: Beef carcasses (n=600) were selected for marbling level so that an equal number represented low Select (lower Slight marbling), high Select (upper Slight marbling), low Choice (Small marbling) and top Choice (Modest and Moderate marbling). Top loin steaks (IMPS #1180; 2.54 cm thick), top sirloin steaks (IMPS #1184B; 2.54 cm thick), and top round steaks (IMPS #1168; 1.59 cm thick) were fabricated from each carcass 14 to 21 days postmortem, vacuum-packaged and frozen. Frozen steaks were delivered weekly for six weeks to consumer households in Houston, Chicago, Philadelphia, and San Francisco. Consumers (moderate to heavy beef eaters; n=2,212) in each household (a total of 1,106 households with 2 consumers per household) prepared steaks as they normally would and completed a questionnaire using a 23-point hedonic scale (23=like extremely; 1=dislike extremely) for overall-like/dislike. Each questionnaire included questions regarding cooking method and preparation techniques that the meat preparer answered. Preparation definitions were provided to determine cooking methods as follows: outdoor grill, broil, indoor grill, oven roast, pan broil, pan fry, stir fry, braise, simmer/stew, deep fry and other (for methods not defined). Consumers were provided a National Live Stock and Meat Board Beef Steak Color Guide to use as an aid in determining degree of doneness.

The GLM procedure of SAS (1990) was used to fit appropriate linear models and construct analyses of variance. Frequencies were generated and used to determine classifications for cooking method and degree of doneness within subprimals. For consumer data, Box-Cox transformations (Neter et al., 1989) were used to produce normally distributed errors. Least-squares means were generated and tested for significance ($P < .05$) using Bonferroni's procedure (Lentner and Bishop, 1993).

RESULTS AND DISCUSSION: Quality level, cut, city, cut x city, ($P < .0001$) and quality level x cut ($P < .013$) were significant for overall-like ratings. Overall-like ratings were higher for top loin steaks than top sirloin steaks, and top sirloin steaks were rated higher than top round steaks (Tables 1 and 2). Top sirloin steaks did not differ in overall consumer like ratings across the four quality levels; however, for top loin, top Choice steaks were rated higher for overall-like than Select steaks; low Choice top loin steaks were intermediate for overall consumer like ratings. Top Choice top round steaks had higher overall-like ratings than the other three quality levels. Regardless of cut or quality level, Houston consumers generally had higher overall-like rating scores than consumers in the other three cities, while San Francisco consumers had the lowest overall-like ratings for top loin and top round steaks (Table 2). Consumers in Philadelphia and San Francisco had similar ratings for top sirloin steaks for overall-like.

Table 1. Least-squares means for cut by quality level effects on consumer overall-like ratings (23 = like extremely; 1 = dislike extremely).

Cut	Quality level			
	Top Choice	Low Choice	High Select	Low Select
Top Loin	19.3 ^a	19.1 ^b	18.9 ^{bc}	18.8 ^c
Top Sirloin	18.0 ^d	18.1 ^d	17.9 ^d	18.0 ^d
Top Round	17.1 ^e	16.9 ^f	16.7 ^f	16.7 ^f

a,b,c,d,e,f Consumer overall-like ratings with different superscript letters differ significantly ($P < .05$).

Table 2. Least-squares means for cut by city effects on consumer overall-like ratings (23 = like extremely; 1 = dislike extremely).

Cut	City			
	Chicago	Houston	Philadelphia	San Francisco
Top Loin	19.1 ^b	19.6 ^a	19.0 ^b	18.5 ^d
Top Sirloin	18.0 ^e	18.8 ^c	17.7 ^{fg}	17.6 ^g
Top Round	17.1 ^h	17.8 ^{ef}	16.0 ^j	16.5 ⁱ

a,b,c,d,e,f,g,h,i,j Consumer overall-like ratings with different superscript letters differ significantly ($P < .05$).

Cooking method and degree of doneness had an effect on consumer overall-like ratings, and frequencies for degree of doneness and cooking method were used in determining categories for analysis of variance. Degree of doneness achieved and cooking methods used by consumers differed by cut. A higher percentage of consumers cooked the strip steak to medium (29.4%) or medium-rare (21.3%) degree of doneness or to higher degrees of doneness (medium well = 19.2%; well done = 19.5%). Top sirloin steaks were cooked to medium, well done, medium well and medium-rare degree of doneness 24.8%, 23.9%, 20.1% and 18.8% of the time, respectively, while 74% of the top round steaks were cooked to medium well or higher degrees of doneness (well done = 37.2%; medium well = 20.2%; very well done = 17.1%). Consumers tended to cook top round steaks to higher degrees of doneness than top sirloin steaks, and they cooked top sirloin steaks to higher degree of doneness than top loin steaks. Outdoor grilling (49.9%) was the cooking method most often selected for the top loin steak followed by broiling (23.6%), pan frying (8.3%), and simmer/stew (5.6%). Outdoor grilling and broiling were used most often for the top sirloin steak (40.9% and 21.0%, respectively), followed by pan frying (13.2%) and simmer/stew (5.4%). Consumers prepared the top round using pan fry (20.3%), simmer/stew (19.1%), outdoor grill (18.9%), stir fry (12.3%) and broil (10.9%) cooking methods. Quality level, city, degree of doneness ($P < .0001$), cooking method ($P < .01$) and city x cooking method ($P < .0001$) were significant sources of variation for top loin steaks. Overall-like ratings for the top loin were highest (19.3) when they were cooked to medium-rare or less and lowest (18.7) when top loin steaks were cooked to medium degree of doneness. Consumer overall-like ratings for top sirloin steaks were affected by city and cooking methods ($P < .0001$) and interactions of quality level x cooking method ($P < .02$), city x cooking method ($P < .0001$), city x degree of doneness ($P < .02$), and cooking method x degree of doneness ($P < .0098$). City ($P < .0001$), cooking method ($P < .0001$), degree of doneness ($P < .04$), and quality level by degree of doneness ($P < .0006$) were significant for the top round. Consumer research using top loin steaks reported that marbling, degree of doneness and marbling x city interaction were significant ($P < .05$; Savell et al., 1987). Consumers in different regions of the country responded differently to marbling or quality levels. In this study, the city x quality level interaction was not significant. Quality level was significant in the original model, but when degree of doneness and cooking method were included into the model for each cut, quality level was significant only for top loin steaks ($P < .0001$). Cooking method interactions were significant for all three steak types. Cooking method may play a more important role in consumer overall-like ratings for the top sirloin than other factors as all interactions that included cooking method were significant.

CONCLUSIONS: Quality level had an impact on consumers' overall-like ratings of cooked beef steaks. However, consumers' responses were dependent upon the steak evaluated; quality level impacted ratings for top loin and top round steaks, but not top sirloin steaks. City had an impact on consumers' overall-like ratings. Houston consumers rated steaks higher for overall-like than consumers in other cities, and San Francisco consumers tended to rate steaks lower for overall-like ratings. Cooking method and degree of doneness had a major impact on consumer overall-like ratings. Information on how to best prepare beef steaks from various cuts and differing quality levels to maximize overall consumer like ratings is needed to improve overall customer satisfaction of beef.

REFERENCES

- Lentner, Marvin and Thomas Bishop. 1993. Experimental Design and Analysis (2nd Ed). Valley Book Co., Blacksburg, VA.
- Neter, John, William Wasserman and Michael H. Kutner. 1989. Applied Linear Regression Models (2nd Ed). Richard D. Irwin, Inc., Burr Ridge, IL.
- Savell, J.W., R.E. Branson, H.R. Cross, D.M. Stiffler, D.B. Griffin, and G.C. Smith. 1987. National Consumer Retail Beef Study: Palatability evaluations of beef loin steaks that differed in marbling. J. Food Sci. 52:517-519, 532.
- SAS. 1990. SAS/STAT® Users Guide (Version 6, 4th Ed). SAS Inst. Inc., Cary, NC.
- USDA. 1989. Official United States Standards for Grades of Beef Carcasses. Agric. Marketing Serv., USDA, Washington, DC.