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The Contribution of Tenderness, Juiciness, and Flavor to Overall Consumer Beef Eating Experience

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Objectives

To combine consumer palatability data from studies conducted within the past 5 yr to evaluate the contribution of tenderness, juiciness, and flavor to overall consumer eating satisfaction.

Materials and Methods

Eleven consumer studies conducted within the last 5 yr were used to determine a beef palatability model. Each study used the same 100 mm lines scales for consumer evaluation of steak tenderness, juiciness, flavor, and overall liking. Moreover, consumers rated each trait as either acceptable or unacceptable. Samples in all studies were cooked using similar dry-heat grilling procedures. Collectively, these studies resulted in more than 12,000 individual consumer observations. The raw data from all studies were compiled as a single dataset with the average sensory score for each palatability trait determined for each sample by averaging across the individual consumer ratings for the sample. The relative contribution of tenderness, juiciness, and flavor to consumer overall liking scores were determined by creating a multivariate regression model using sample means. The odds and relative risk of an unacceptable overall eating experience were determined based on the acceptability of the 3 individual sensory traits.

Results

The final beef palatability model determined was: Consumer overall liking = $(0.42 \times \text{tenderness}) + (0.07 \times \text{juiciness}) + (0.48 \times \text{flavor})$. The model accounted for more than 99% of the variation ($R^2 > 0.99$) in consumer overall liking scores and indicates flavor contributes the

most (49.4%), followed by tenderness (43.4%), and juiciness (7.4%). The interaction terms among the traits were not significant ($P > 0.05$) and therefore were excluded from the model. The odds of overall palatability failing when tenderness was acceptable were 1 in 10 (10%) but increased to 2.2 to 1 (69%) when tenderness was unacceptable. When flavor was acceptable, only 1 in 15 (6.7% chance) steaks failed for overall palatability, but this increased to 3.3 to 1 (76% chance) when flavor was unacceptable. For juiciness, 1 in every 9 steaks (11% chance) failed for overall palatability when juiciness was acceptable, however this increased to close to 2 out of every 3 (66% chance) when juiciness was unacceptable. The odds ratios for overall palatability failure were 20.8, 17.1, and 49.0 for tenderness, juiciness, and flavor, respectively, with the risk of overall palatability failing 7.2, 6.5, and 12.3 times more likely if tenderness, juiciness or flavor, respectively failed. If multiple palatability traits failed, the odds of overall palatability failure increased to 86 to 96%. With respect to USDA quality grade of longissimus lumborum steaks, the odds of palatability failure increased ($P < 0.05$) as quality grade decreased from Prime (8.6% failure rate), to Average and High Choice (13.2% failure rate) to Low Choice (16.9% failure rate) to Select (25.3% failure rate) and Standard (28.0% failure rate).

Conclusion

These results indicate the relative contribution of tenderness, juiciness, and flavor to overall beef palatability. They indicate that the failure of even a single palatability trait dramatically increases the likelihood of overall palatability failure, indicating that no single palatability trait is most important, as beef palatability is dependent on the acceptance of all 3 traits; tenderness, juiciness and flavor.