Effects of USDA Carcass Maturity on Eating Quality of Beef from Fed Steers and Heifers that have been Classified into Age Groups Using Dentition

Principal Investigator: J. Daryl Tatum, PhD
Department of Animal Science, Colorado State University

Study Completed
March 2015
Effects of USDA Carcass Maturity on Eating Quality of Beef from Fed Steers and Heifers that have been Classified into Age Groups Using Dentition: Project Summary

Background and Objective

Carcasses of cattle processed in United States federally inspected beef plants currently are segregated into 2 age groups, less than 30 months of age (MOA) and 30 MOA or older, using actual age documentation or dentition. However, dental age is not considered when USDA quality grades are assigned. Instead, skeletal and lean maturity indicators are used to classify carcasses into 1 of 5 maturity groups (designated A through E).

Most (> 95%) U.S. fed steers and heifers are less than 30 MOA based on dentition assessments at the time of slaughter and cattle 9 to 30 MOA are expected to produce A-maturity carcasses. However, due to premature skeletal ossification, not all of these cattle produce A-maturity carcasses as expected. According to previous research, 7.2% of carcasses produced by fed steers and heifers are classified as B maturity or older based on USDA carcass maturity indicators.

A recent study, funded by the Beef Checkoff, evaluated the relationship between USDA carcass maturity and eating quality of Strip Loin Steaks produced by fed steers and heifers that had been classified as less than 30 MOA using dentition. Results of that study showed that sensory panelists were unable to detect any differences in tenderness, juiciness or flavor between steaks from carcasses classified by USDA graders as A maturity and steaks from carcasses classified by graders as either B or C maturity.

Objectives

This study expanded upon the work of a previous checkoff study and examined the relationship between USDA carcass maturity and eating quality of Strip Loin Steaks among cattle representing 2 dental age classes: less than 30 MOA and 30 MOA or older.

Methods

Carcasses (N = 600) were selected at commercial beef processing facilities to represent 2 dental age classes (< 30 MOA and 30 MOA and older), 2 USDA maturity groups (A<sup>00</sup> to A<sup>99</sup>, A; and B<sup>00</sup> to D<sup>99</sup>, B-D) and 3 marbling categories (Slight, SL; Small, SM; and Modest-Moderate, MT-MD) with 50 carcasses representing each dental age × maturity group × marbling subclass. Strip Loin Steaks were obtained from both sides of each carcass and aged for 14 days. One steak was used to obtain Warner-Bratzler shear force (WBSF) and slice shear force (SSF) measurements. The other steak was rated by a trained sensory panel for juiciness (0 = extremely dry, 15 = extremely juicy), tenderness (0 = extremely tough, 15 = extremely tender) and detectable levels of several flavors (0 = no presence, 15 = very strong presence): including meaty/brothy (basic flavor and aroma of grilled or roasted beef; simulated by the flavor of beef broth), buttery/beef fat (flavor and aroma associated with cooked fat from grain-finished beef; often described as a buttery flavor), bloody/serummy (flavor and aroma associated with blood in beef cooked to a rare degree of doneness; sometimes described as a metallic taste), livery/organy (flavor and aroma associated with cooked beef liver or kidney), grassy (flavor and aroma of beef produced by grass-finished or short-fed cattle; often described as green or hay-like) and gamey (flavor characteristic of wild game meat).

Important Results

No differences (P > 0.05) in Strip Loin Steak tenderness, juiciness or flavor were detected between carcass maturity groups in either dental age class. The lack of difference (P > 0.05) between USDA maturity groups (A vs. B-D) in Strip Loin Steak shear force and sensory attributes observed in the current study was consistent with the findings of the
previous study. Correspondingly, neither study produced evidence supporting the use of current USDA maturity assessments for reflecting age-associated differences in sensory properties of Strip Loin Steaks from conventionally produced grain-fed steers and heifers.

In the current study, dental age was somewhat more effective than USDA carcass maturity for identifying differences in tenderness and flavor attributes. Advanced dental age was associated with increased intensity of certain off-flavors and decreased steak tenderness within the SL marbling group.

Marbling categories effectively stratified carcasses (MT-MD > SM > SL) according to differences ($P < 0.0001$) in sensory panel ratings for Strip Loin Steak tenderness, juiciness, meaty/brothy flavor and buttery/beef fat flavor. Increased marbling also was associated with lesser ($P < 0.01$) intensities of bloody/serumy, livery and grassy flavors and smaller ($P < 0.0001$) values for shear force.

**Industry Impacts**

Results of this study and the previous study determined that advanced carcass maturity characteristics, occurring prematurely among cattle with dental ages less than 30 MOA, have no detrimental effects on Strip Loin Steak sensory characteristics. Therefore, the practice of discounting prices of carcasses produced by cattle less than 30 MOA based on advanced carcass maturity appears unjustified. An alternative, perhaps more equitable approach might be to consider age classifications (< 30 MOA and ≥ 30 MOA) currently verified under the supervision of USDA-FSIS when assigning USDA quality grades and include all carcasses of cattle verified to be less than 30 MOA in the A maturity group, regardless of their skeletal maturity characteristics.

![Figure 1. Effect of maturity on sensory panel ratings for tenderness, juiciness, and various flavor attributes](image-url)
Figure 2. Effect of dental age on tenderness of Strip Loin Steaks

Figure 3. Effect of marbling on sensory panel ratings for tenderness, juiciness, and flavor attributes

This study was funded by the Beef Checkoff.