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Effect of Brahman Genetics on Myofibrillar Protein Degradation, Collagen Crosslinking, and Meat Tenderness

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Objectives

Numerous studies have indicated steaks from cattle of greater Brahman genetics are tougher. Additionally, research demonstrated that steers of increased Brahman genetics have increased expression of genes related to collagen crosslinking. The objective of this study was to examine the effect of Brahman genetics on myofibrillar protein degradation, collagen crosslinking, and meat tenderness of *Longissimus lumborum* (LL) steaks.

Materials and Methods

Seventy-two steers originating from the University of Florida's Multibreed herd were classified into 4 categories based on percentage of Angus and Brahman genetics. Breed groups were: 100% Angus/0% Brahman, 62.5% Angus/37.5% Brahman, 50% Angus/50% Brahman, 0% Angus/100% Brahman. Steers were harvested at a common compositional endpoint of 1.0 to 1.5 cm of backfat and a 7.62 cm LL roast, extending from the 13th rib toward the posterior end, were collected and aged 14 d postmortem. Three 2.54 cm LL steaks were fabricated with steak 1 used to measure objective tenderness by Warner-Bratzler shear force (WBSF), steak 2 utilized for trained sensory panel evaluation, and the remaining steak utilized for myofibrillar protein degradation and collagen crosslink analyses. Myofibrillar protein degradation analyses consisted of Western Blot quantification of degradation products of desmin (38 kDa band) and troponin-T (36, 34, and 30 kDa subunits). Collagen crosslinks were extracted by acid hydrolysis and hydroxylysylpyridinoline crosslinks were quantified utilizing a commercial ELISA kit. Data were analyzed utilizing preplanned linear and quadratic contrasts for the percentage of Brahman genetics.

Results

As the percentage of Brahman genetics increased, LL steak thaw loss and WBSF increased (linear, $P < 0.01$), but there was no effect on cook loss ($P = 0.14$). Further, as percentage Brahman genetics increased, sensory panel scores of LL steak tenderness, connective tissue, and juiciness decreased (linear, $P < 0.01$), indicating that steaks were tougher, had more connective tissue, and were less juicy. Brahman genetics had no effect on beef flavor or off-flavor scores ($P > 0.35$). Steaks from steers of greater Brahman genetics had decreased intensity of 38 kDa desmin, 36 kDa troponin-T, and 30 kDa troponin-T degradation bands (linear, $P < 0.03$). In contrast to these results, increasing Brahman genetics increased (linear, $P = 0.04$) intensity of 34 kDa degraded troponin-T band. Finally, there was no effect ($P = 0.14$) of Brahman genetics on amount of steak hydroxylysylpyridinoline collagen crosslinks.

Conclusion

As expected, LL steaks originating from steers of greater percentage of Brahman genetics had reduced tenderness when measured objectively and subjectively. Additionally, trained sensory panelists detected an increase in connective tissue content as percentage Brahman increased. Decreases in tenderness from Brahman steaks were most likely due to the reduction in degradation of desmin and troponin-T proteins and not increases in hydroxylysylpyridinoline crosslinks. It is hypothesized Brahman genetics may increase other heat stable crosslinks, which may be responsible for the increase in connective tissue detected by panelists.