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Meat and Muscle Biology™

Relating Muscle Fiber Morphometrics and Protein Degradation to Meat Quality in a Multibreed Herd

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Objectives

Brahman and Brahman-influenced cattle provide integral adaptations that benefit the cattle herd in the sub-tropical United States. Their heat tolerance and parasite resistance make them ideal for warmer climates; however, they tend to exhibit less desirable carcass and palatability traits. When compared to Angus, Brahman are lower marbling, less tender, and have more connective tissue. The objective of this study is to determine influence of Brahman genetics on muscle metabolic phenotype and postmortem proteolysis.

Materials and Methods

Cattle used in this study were part of a long-term genetic study involving Angus, Brahman, and Angus-Brahman crossbreeding. Although these cattle represent a continuous spectrum of Angus-Brahman genetic variation, they were divided into 6 breed groups for analysis: Angus; 3/4 Angus, 1/4 Brahman; Brangus; 1/2 Angus, 1/2 Brahman; 1/4 Angus, 3/4 Brahman; and Brahman. Steers (n = 6 per breed group) were harvested and samples from *longissimus lumborum* muscles were collected at 0 h, 24 h, and 14 d post-mortem. Western blotting was used to assess proteolysis during the 14 d aging period, including degree of autolysis of the proteolytic enzyme, μ-calpain; content of the calpain inhibitor, calpastatin; and the extent of degradation of desmin. Tenderness was determined objectively by Warner-Bratzler shear force (WBSF). The data was analyzed using multivariate methods in JMP. Nonparametric correlations were used to calculate the relationships between 24 h μ-calpain autolysis, WBSF, citrate synthase activity, and breed group.

Results

As the percentage of Brahman genetics increases, WBSF increase as expected (R = 0.45, P < 0.01). The degree of μ-calpain autolysis at 24 h decreases as WBSF values increase (R = -0.49, P < 0.01), and autolysis decreases as the percentage of Brahman increases (R = -0.43, P < 0.01). Brahman genetics tended to influence oxidative capacity (P = 0.06), as citrate synthase activity increased with greater percentage of Brahman genetics.

Conclusion

As expected, Brahman influenced cattle produced tougher steaks, evidenced by higher WBSF and decreased protein degradation. Postmortem proteolysis and muscle fiber type will be utilized to establish predictors for the optimum breed group that provides desirable meat quality and palatability traits, while having enough Brahman influence to thrive in sub-tropical climates.