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Protein Solubility during the Aging Period in Bos Taurus and Bos Indicus Beef

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Objectives

During the postmortem period, muscle cells are unable to maintain reducing conditions and this leads to oxidation of proteins that could affect function, solubility, and susceptibility to degradation. Compared to Bos taurus steers, Bos indicus influenced cattle exhibit differences in beef tenderness as well as muscle metabolic characteristics. Therefore, the objective of this study was to determine sarcoplasmic and myofibrillar protein solubility in beef during the aging period.

Materials and Methods

Bos taurus (Angus), Bos indicus (Brahman) and Brangus steers were harvested according to standard industry procedures ($n = 2$ per breed group for 3 harvest d). Longissimus lumborum was collected at 24h and 14d. Sarcoplasmic protein solubility was determined by homogenizing triplicate 0.1 g muscle samples with 0.025 M potassium phosphate (pH 7.2) buffer. The homogenate was incubated overnight at 4°C and then centrifuged at $1500 \times g$ for 30 min. The supernatant was collected and protein concentrations were measured using the BCA protein assay. Total protein solubility was determined by homogenizing triplicate 0.1 g muscles samples with buffer containing 8M urea, 2M thiourea, and 3% SDS. The homogenate was incubated at 4°C

for 30 min and then centrifuged at $1500 \times g$ for 30 min. The supernatant was collected and protein concentrations were measured using the Pierce 660 nm protein assay. Myofibrillar protein was calculated from the difference between total and sarcoplasmic protein solubility. Values are expressed as mg protein/g tissue. Data were analyzed using SAS (SAS Inst. Inc., Cary, NC) JMP and the model included fixed effects of breed, time, breed \times time, and harvest day.

Results

Sarcoplasmic protein solubility decreased from 24 h to 14 d (time, $P < 0.05$). Curiously, the decrease in sarcoplasmic protein solubility over time tended to be dependent on breed (breed \times time, $P < 0.1$); sarcoplasmic protein solubility decreased less in Brahman compared to Angus and Brangus. Breed did not influence myofibrillar protein solubility.

Conclusion

Breed-related changes in sarcoplasmic protein solubility suggest the cellular environment during the aging period may differ in longissimus muscle of Bos indicus compared to Bos taurus steers. Further work is needed to determine if protein oxidation or other cellular factors contribute to these protein solubility changes during aging.