



Comparing Heat Shock Proteins in Angus and Brahman Cattle and their Effect On Tenderness

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Objectives

Heat shock proteins (HSP) are biomarkers of stress and perform chaperoning functions to fold, unfold, and refold proteins after heat stress. Brahman are more heat tolerant than Angus, while Angus beef has been associated with greater palatability than Brahman. The objectives were to determine if HSP content in the *longissimus lumborum* differs between Angus and Brahman and examine how HSP content relates to the eating quality of beef.

Materials and Methods

Angus and Brahman steers ($n = 12$ per breed) were finished during summer in Florida and harvested at approximately 17 mo of age. Samples of *longissimus lumborum* were collected at 1 h after exsanguination and were immediately immersed in liquid nitrogen. Samples were then pulverized, diluted in extraction buffer, and homogenized. The protein samples were assayed to assess protein concentration and subsequently diluted to equal concentrations for loading into acrylamide gels. Proteins were separated by gel electrophoresis, and western blotting was used to evaluate content of $\alpha\beta$ -crystallin, HSP27, HSP60, HSP70, and HSP90. Target bands were detected and quantified using LI-COR Odyssey and target signal was normalized to total protein stain. Tenderness

was evaluated in 14d-aged steaks using Warner-Bratzler shear force (WBSF) and a trained sensory panel. Data were analyzed using one-way ANOVA and Pearson correlations were conducted for content of HSPs and objective and subjective tenderness.

Results

HSP27, HSP60, and HSP70 did not differ between breeds ($P > 0.05$); however, HSP90 and $\alpha\beta$ -crystallin were greater ($P = 0.005$) in the *longissimus lumborum* of Angus compared to Brahman. Even though WBSF did not differ ($P = 0.29$) between breeds, breed affected ($P < 0.0001$) sensory tenderness. Content of $\alpha\beta$ -crystallin was associated with sensory tenderness ($r^2 = 0.52$, $P = 0.0098$).

Conclusion

Longissimus dorsi from the Angus were contained more $\alpha\beta$ -crystallin and HSP90 than Brahman. Elevated concentrations of both $\alpha\beta$ -crystallin and HSP90 could be breed related or may have been influenced by the season they were harvested. While WBSF was not affected by breed, panelists rated Angus steaks as more tender after aging for 14d. Content of $\alpha\beta$ -crystallin is associated with tenderness; however further work is necessary to determine if this small HSP affects proteolysis.