South Dakota State University
Department of Animal Science

Beef Day 2020

Meats & Human Nutrition

Influence of beef production system on calpain-1 autolysis and Troponin-T degradation

Johnson, L.G., J.K. Grubbs, K.R. Underwood, M.J. Webb, A.D. Blair

Objective

The objective of this study was to determine the impact beef production systems utilizing different levels of growth promotant technology on calpain-1 autolysis and troponin-T degradation, which are measures of tenderness.

Study Description

Calpain-1 is an enzyme that degrades muscle proteins after being activated through a process known as autolysis. The active form of calpain-1 will degrade muscle proteins such as Troponin-T. Troponin-T is a muscle protein that is a well-established indicator of tenderness in beef. Steers (n = 16, 4/treatment) were finished under four different production systems. 1) No antibiotics (NT), 2) non-hormone treated cattle (ANT; 300 mg monensin and 90 mg tylosin during finishing phase); 3) implant (IMP; NHTC plus a series of three implants) and 4) all previous technologies plus a beta-agonist (BA; same technologies as IMP and fed 200 mg ractopamine hydrochloride per steer per day). Steaks (1 inch) were cut from striploins, vacuum packaged, aged for 7 day, and frozen. Western Blots were conducted for calpain-1 autolysis, intact troponin-T, and a well characterized troponin-T degradation product. Treatments were evaluated in PROC MIXED of SAS 9.2 where tests for fixed effects were significant at $P < 0.05$.

Take home points

Production system may play a role in the activation or autolysis of calpain-1 from the inactive to the active form. The IMP treatment had more calpain-1 in the active form compared to the BA and ANT treatments. Degradation of troponin-T, a target for calpain-1, was not different among the technology treatments. These data indicate while calpain-1 may remain active at day 7 postmortem in IMP treatment it may not influence protein degradation.

Keywords: beef, technology, tenderness, western blot