Objectives

Chromium supplementation can increase efficiency of growth in livestock species by amplifying insulin signaling. Previous research has shown chromium supplementation leads to increased nutrient utilization, increased muscle growth, and fat deposition. Therefore, the objective of this research was to determine the effect chromium has on carcass traits and the expression of PPARγ in beef cattle.

Materials and Methods

Four pens of 7 steers were allotted by body weight to either a control (Ctrl) or chromium propionate supplementation (Cr, 400 ppb) diet for 210 d, given a terminal implant (123 d), and fed Optaflex for the last 27 d prior to slaughter. Ten days prior to slaughter, longissimus muscle biopsies were collected from the 5 steers closest to the mean body weight of the pen. Cattle were transported to a commercial packing plant for slaughter. Carcass data and objective color were collected 36 h postmortem. Strip loins (n = 26, IMPS 180) were tracked through the plant, and transported back to SDSU for shear force and proximate analysis. A subset of wholesale ribs (n = 12, IMPS 103) from the 3 steers closest to the mean body weight of the pen was collected to estimate carcass composition. Strip loins were faced from the anterior portion followed by fabrication of three 2.54 cm steaks, then were sequentially designated to aging periods of 7, 14, or 21 d and frozen. Steaks were thawed 24h at 4°C, cooked to 71°C and cook loss was measured prior to determination of Warner Bratzler Shear force (WBSF). The face steak was powdered and used to determine moisture and chemical fat percentage of the longissimus muscle from each carcass. Carcass composition was estimated by dissection of the 9–10–11 rib section and subsequent proximate analysis of the soft tissue. Western blots were used to analyze protein concentration of PPARγ from muscle biopsy. Carcass traits, composition, and western blot data were analyzed using the mixed model in SAS (SAS Inst. Inc., Cary, NC) as a completely randomized design. Shear force data was analyzed as a repeated measures using the mixed model in SAS.

Results

Cr supplementation increases dressing percentage by 1.5% (P = 0.03) and kidney, pelvic, and heart fat percentage by 0.4% (P = 0.03). However, final body weight, HCW, 12th rib backfat, REA, or final yield grade were not different (P > 0.10). Furthermore, there was no difference in L*, a*, b*, or longissimus muscle pH (P > 0.10) between Cr and Ctrl steers. Control steaks were more tender (P = 0.01) than Cr, and steaks were more tender with increased aging (P < 0.01). There was no interaction between treatment and day on WBSF. Carcass composition was not altered (P > 0.10) by treatment. Cr resulted in decreased marbling score (P = 0.05), however there was no difference in percent chemical fat or percent moisture (P > 0.10) in the longissimus muscle. Also, there was no difference in abundance of PPARγ in the longissimus muscle (P > 0.10).

Conclusion

Even though there was an increase in shear force value with Cr, steaks were still considered tender (WBSF less than 4 kg) regardless of treatment. Additionally, Cr reduced marbling score, but did not alter PPARγ abundance indicating Cr did not decrease marbling through the inhibition of fat development. The mechanisms controlling these differences remain to be established; nonetheless, Cr can positively increase dressing percentage but have negative impacts on beef quality.