GROWTH PROMOTANT AND POSTMORTEM AGING EFFECTS ON COLLAGEN CHARACTERISTICS AND MEAT QUALITY OF *SEMIMEMBRANOSUS* MUSCLE FROM CROSSBRED ANGUS STEER CARCASSES

P. Coleman[1*], B. C. Roy[1], and H. L. Bruce[1],

[1]*Agricultural, Food and Nutritional Sciences, University of Alberta, Edmonton, Canada*,

*patience@ualberta.ca

I. OBJECTIVES

Our objective was to relate insulin-like growth factor I-1 blood concentrations to collagen and meat quality characteristics of the *semimembranosus* (SM) muscle as affected by selection for low residual feed intake (RFI) and use of steroids and ractopamine hydrochloride (RH).

II. MATERIALS AND METHODS

Forty-seven Angus steers selected for low (efficient, $n = 26$) (-0.33 ± 0.08 kg/d) RFI or as controls (inefficient, $n = 21$) (0.63 ± 0.09 kg/d) were randomly assigned to one of 4 treatments in a $2 \times 2 \times 2$ factorial design within RFI status: control (no implant; no RH) ($n = 12$); implant and RH ($n = 11$); RH only ($n = 12$); and implant only ($n = 12$). Implanted steers received a first implant (200 mg progesterone, 20 mg estradiol benzoate, 29 mg tylosin tartrate) at 332.21 ± 2.54 d of age and 383.19 ± 2.88 kg live weight, and a terminal implant (120 mg trenbolone acetate, 24 mg estradiol) about 100 d before slaughter. Blood samples were taken by jugular venipuncture 30 d after first implantation. RH was fed 28 d before slaughter at 200 mg head^{-1} day^{-1}. SM muscles were excised 48 h postmortem from the right carcass side and cut in half. Halves were randomly assigned to 3 and 12 d of aging at $4°C \pm 2°C$ and balanced within treatment for position within muscle. Warner-Bratzler shear force (WBSF), blood IGF-1 concentration, intramuscular fat (IMF) content, collagen heat solubility, and pyridinoline (PYR) concentrations were determined. Data were analyzed using RStudio as a split plot blocked by slaughter group with animal as the experimental unit in the whole plot and muscle halves as the experimental unit in the split-plot. Differences were considered significant at $P < 0.05$. Pearson correlation coefficients were computed between meat quality and collagen solubility characteristics with significance at $P < 0.05$.

III. RESULTS

Mean IGF-1 levels were unrelated to meat quality and collagen characteristics and were unaffected by RFI, steroids, RH, or their interactions ($P > 0.05$). Collagen did not contribute to increased mean WBSF (47.11 ± 1.02 N) of muscles from low-RFI steers relative to control steers (41.97 ± 1.14 N) ($P = 0.0012$) as there was no effect of RFI on collagen characteristics ($P > 0.05$). This difference may be due to increased IMF in muscles from control steers, as there was a negative correlation between IMF and WBSF ($r = -0.30$) ($P = 0.05$). Aging increased collagen heat solubility ($P < 0.05$), and collagen solubility percentage was negatively correlated with WBSF at day 12 postmortem ($P = 0.0279$) ($r = -0.32$) indicating that postmortem weakening of collagen occurred and became more important with postmortem aging. PYR concentration was positively correlated with WBSF at day 3 and 12 postmortem ($r = 0.35$ and $r = 0.32$, respectively) ($P < 0.05$), indicating that this crosslink contributes to SM toughness regardless of postmortem aging. Muscles from steers supplemented with RH had a higher mean collagen content than muscles from steers not supplemented with RH

(5.38 ± 0.20 vs. 4.74 ± 0.19 mg collagen/g raw meat) ($P = 0.0032$), suggesting muscle transformation in supplemented steers.

IV. CONCLUSION

Circulating IGF-1 was not affected by RFI status or steroid and RH use and was unrelated to collagen or meat quality characteristics, suggesting that localized IGF-1 is of importance. This study confirmed that PYR concentration affects WBSF in the SM and can affect final product toughness even after aging.

Keywords: beef tenderness, collagen, collagen cross-links, insulin-like growth factor I-1, implants