RELATIONSHIP OF SUBCUTANEOUS FAT COVERAGE TO INTRAMUSCULAR FAT EXPRESSION DETERMINED USING DIGITAL IMAGE ANALYSIS

B. B. Grimes[1*], T. Kirkpatrick[1], K. Wesley[1], S. Pillmore[1], K. B. Cooper[1], F. Francis[1], T. Tennant[1], W. Nichols[2], J. Hutcheson[2], and T. Lawrence[1],

[1]*Agricultural Sciences, West Texas A&M University, Canyon, TX, USA*,

[2]*Technical Services, Merck Animal Health, Madison, NJ, USA*,

*bbgrimes1@buffs.wtamu.edu

I. OBJECTIVES

Evaluation of subcutaneous fat coverage of beef carcasses has been used extensively in the European Union for subjectively categorizing carcasses into marketing groups rather than via evaluation of 12th rib intramuscular fat used in North America. Research that evaluated a 378 day of feed (DOF) duration and trenbolone acetate +estradiol-17β administration provided opportunity to investigate biometric measurements of extremely lean and overfinished beef steers.

II. MATERIALS AND METHODS

Charolais × Angus steers ($n = 80$; start of trial body weight [BW] [271 ± 99 kg]) were randomly allocated to implant treatment and harvest date in a 2 × 10 factorial design. Steers were paired to minimize variation in genetic group, initial BW, frame score, and adjusted final BW. Within each pair, a steer was randomly allocated to one of 2 treatments; implanted with Revalor-XS on day 0 and day 190 or nonimplanted control (CON). Eight steers comprising 4 pairs were randomly assigned to one of 10 harvest dates at day 0, 42, 84, 126, 168, 210, 252, 294, 336, or 378 DOF. Digital images of the lateral aspect of the right side of each carcass was captured 48 h postmortem, immediately prior to grading. Carcass grading data, evaluated by a human grader, included 12th rib fat thickness, marbling score (MARB), weighed percentage of kidney-pelvic-heart fat (KPH), and calculated yield grade (YG). Pixel analysis software objectively distinguished between fat (white) and lean (red) pixels of the entire carcass side via color thresholding. Percentage carcass surface fat was analyzed using mixed models to test ($\alpha = 0.05$) the fixed effects of DOF and treatment.

III. RESULTS

No treatment × DOF effect was exhibited ($P = 0.94$) for percentage carcass surface fat. Additionally, no treatment effect was exhibited ($P = 0.87$) for percentage carcass surface fat. A DOF effect was exhibited ($P < 0.01$) in which percentage carcass surface fat increased by approximately 0.0895%/d in a quadratic manner from 47% at day 0 to 83% at day 378. Pearson correlation coefficients revealed relationships ($P < 0.01$) between percentage of carcass subcutaneous fat coverage (%FAT) and carcass characteristics used to determine value. Strong positive relationships were observed between %FAT and MARB ($r = 0.74$), %FAT and 12th rib fat thickness ($r = 0.76$), %FAT and KPH ($r = 0.64$), and %FAT and YG ($r = 0.75$).

IV. CONCLUSION

These data suggest that utilizing a color thresholding method to evaluate subcutaneous fat coverage based on the area of lean and fat pixels could be an effective tool to estimate carcass

outcomes. These data also suggest that the outer deposition of subcutaneous fat coverage is strongly correlated to deposition of MARB, KPH, and YG of the carcass being evaluated.

Keywords: fat, image analysis, lean, marbling, steers