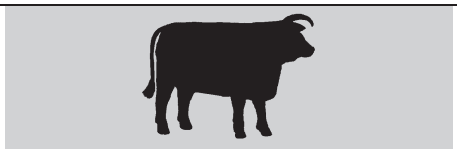
The Professional Animal Scientist 28 (2012):11–19



Relationships between feedlot health, average daily gain, and carcass traits of Angus steers[1]

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ABSTRACT

Angus steers (n = 17,919) fed at a single feedlot in southwestern Kansas between 1997 and 2007 were used to evaluate the relationships between feedlot health, ADG, and carcass traits. Cattle were not commingled and were predominantly preconditioned and backgrounded before shipment to the feedlot. Morbidity decreased and ADG increased with increasing initial BW ($P < 0.01$); percentage Choice was related (linear $P = 0.02$) to arrival BW in steers that were not treated for disease, but with only 2.8% units separating the least (<295 kg) and the greatest percentage Choice groups (375–409 kg). There were linear and quadratic decreases in ADG, final BW, HCW, QG, and YG with increased number of times treated ($P < 0.02$). With decreasing QG there were linear and quadratic decreases in ADG, final BW, HCW, and YG. Increasing YG from YG 1 and 2 to YG 3 increased percentage Choice by 16.1 points, and there was an additional 1.6-point increase moving to YG 4 and 5 (linear and quadratic, $P < 0.01$). Average daily gain was very similar among cattle that graded Prime, Choice, and Select, suggesting that performance and QG are not genetically linked; instead, much of the difference in QG can be explained by differences in YG.

Key words: carcass, feedlot, morbidity, quality grade, yield grade

INTRODUCTION

Morbidity reduces performance and QG (Gardner et al., 1999; Reinhardt et al., 2009), but there is little documentation on the effects of morbidity on QG independent of its effect on carcass fatness. Holland et al. (2010) reported that when fed to a fat-constant endpoint, differences in performance and QG of healthy and morbid cattle were minimized.

As feedlot cattle fatten, a greater proportion of their daily carcass gain goes to fat deposition (Dinkel et al., 1969), and greater carcass fat is consistent with greater marbling score (Wertz et al., 2001; Garcia et al., 2008; Reinhardt et al., 2009). It is often assumed that higher grading cattle must have reduced feedlot performance. Whereas Mader et al. (2009) reported a negative correlation between ADG and intramuscular fat, Reinhardt et al. (2009) reported a small (0.077) but positive correlation between ADG and marbling score. The objectives of this research were to document effects of various animal and nonanimal factors on feedlot ADG, health, and carcass traits in Angus steers and to correlate quality and YG components of carcass with live performance.

MATERIALS AND METHODS

Angus steers (n = 17,919) fed at a single commercial feedlot in southwestern Kansas between 1997 and 2007 were used to correlate ADG, health, and carcass traits. Animal care procedures were in compliance with the *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching* (FASS, 1999).

Factors of interest were health status, ADG, QG, and YG. Health status categories were no treatments, single treatment, 2 treatments, and more than 2 treatments for respiratory or other diseases. Animals were also grouped by rate of gain (<1.36, 1.36 to 1.55, 1.56 to 1.81, and >1.81 kg/d), QG (Prime, Choice, Select, Ungraded), and YG groups (YG 1 and 2, YG 3, and YG 4 and 5). Groups with fewer than 30 rep-

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resentative animals were removed from consideration before statistical analysis.

Cattle were fed at a commercial feedlot near Garden City, Kansas, with a one-time capacity of approximately 3,000 animals. Animals were all fed in similar outdoor, dirt-floor pens that used concrete fence-line bunks. Animals were provided with 19 to 23 m^2 of pen area and 22 to 30 cm of bunk space. Average estimated energy content (based on formulations) of the finishing diet across all years was 2.07 Mcal of NE_m/kg of DM feed and 1.39 Mcal of NE_g/kg of DM feed. Crude protein content before 2003 averaged 13.5% but then increased to 15.5% because of inclusion of wet distillers grains. The implant program across all years consisted of a mild estrogenic implant (Ralgro, Intervet/Schering-Plough Animal Health, De Soto, KS) upon arrival followed by a combination estrogenic/androgenic terminal implant (Revalor-S, Intervet/Schering-Plough Animal Health) administered approximately 70 d before anticipated date of slaughter.

Calves had been fully preconditioned (including weaning, vaccination, revaccination, deworming, feed bunk training, water tank training) for a minimum of 30 d before delivery to the feedlot. Some groups were placed in backgrounding lots or on pasture at or near the ranch of origin for an extended period (60 to 150 d) with their original ranch herdmates. Cattle were not commingled with calves from other ranch sources before delivery to or following arrival at the feedlot. These conditions resulted in low rates of morbidity and mortality compared with many commercial feedlot situations that feed nonbackgrounded calves. Animals were observed daily for morbidity by feedlot personnel. Animals were removed from home pens when they showed clinical signs of respiratory disease including lethargy, ocular or nasal discharge, or lack of appetite. All health evaluators were professional feedlot personnel. Of the animals removed for clinical symptoms, those exhibiting rectal temperatures ≥39.7°C received antimicrobial therapy and were returned to their original home pen.

Cattle were individually weighed upon arrival at time of processing; this is the BW used for determination of initial BW and for determination of ADG. Animals were visually evaluated for degree of finish by the general manager of the feedlot 60 to 80 d after administration of the terminal implant. Animals determined to be adequately finished (approximately 1.27 cm of fat thickness or estimated YG 3) were shipped to the abattoir. Animals not shipped with the first marketing group were evaluated for finish again 14 to 21 d later, and those meeting the criteria were shipped. A third group was subsequently shipped an additional 14 to 21 d after the second marketing group. Cattle were weighed in a group upon exiting the feedlot. Individual final BW were determined from HCW divided by the average dressing percentage of the group with which it was marketed. Carcass data were evaluated by USDA personnel.

Nonconforming data, as determined by outlier analysis, were removed from consideration. Outliers were determined by first calculating a test statistic from the equation $z = (x - \mu)/\sigma$, where x = individual value, μ = mean of the population, and σ = standard deviation of the population.

Individual values (not entire data line for an individual animal) were eliminated from analysis when $|z| \geq 2.5$ (approximate 99% CI). Remaining data are summarized in Table 1.

Data for continuous dependent variables were analyzed with the MIXED procedure of SAS version 9.1 (SAS Institute Inc., Cary, NC) with individual animal as the experimental unit. To account for differences in yard conditions among years, placement year was included as a random variable. Linear and quadratic contrast statements were included for independent variables with more than

Table 1. Selected live and carcass attributes for Angus steers fed in a single Kansas feedlot between 1997 and 2007 (n = 17,919)

Trait	Mean	Minimum	Maximum	SD
Initial BW, kg	358	184	522	62.7
Final BW, kg	581	446	702	45.7
ADG, kg/d	1.64	0.79	2.43	0.30
Days on feed	135	31	248	35.7
Mortality, %	0.8	—	—	—
Days fed before death	76	4	222	46
Percentage treated[1]	8.9	—	—	—
HCW, kg	374	221	515	30.7
USDA QG[2]	2.71	0	4	0.57
Prime, %	2.4	—	—	—
Premium Choice,[3] %	19.7	—	—	—
Choice, %	69.5	—	—	—
Select, %	27.2	—	—	—
Ungraded, %	0.9	—	—	—
USDA YG	2.86	1	5	0.66
YG 1 and 2, %	26.1	—	—	—
YG 3, %	60.7	—	—	—
YG 4 and 5, %	13.2	—	—	—

[1]Treated: includes any health treatments received while at the feedlot.

[2]QG: 4 = Prime, 3 = Choice, 2 = Select, 1 = ungraded.

[3]Premium Choice: qualified for Certified Angus Beef or Sterling Silver (≥Modest[0] marbling, medium or fine marbling texture, ≤30 mo of age, 64.5–103.2 cm^2 rib eye area, <455 kg carcass weight, <2.54 cm fat thickness, superior muscling, practically free of capillary ruptures, no dark cutters, no neck hump exceeding 5.1 cm).