

Feeder Cattle Health Management: Effects on Morbidity Rates, Feedlot Performance, Carcass Characteristics and Beef Palatability^{1,2}

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SUMMARY

The effects of morbidity on feedlot performance, carcass characteristics, and beef palatability traits were determined using 273 steer calves originating from three pre-conditioning programs. Morbidity was monitored on calves during the feeding phase of the project. Those cattle treated more than once had a lower ADG through re-implant ($P < .05$) in comparison to those that were not treated at the feedyard. Cattle treated more than once had lower hot carcass weights, lower marbling scores and lower yield grades ($P < .05$) in comparison to the cattle not treated. Cattle originating from the pre-conditioning programs had a lower average number of hospital visits in comparison to the cattle originating from the auction market ($P < .05$). No significant differences were seen in the effects of hospital visits or pre-conditioning treatment on palatability measures. Overall, morbidity resulted in economic losses due to mortality, reduced performance and increased costs associated with treatment.

Key Words: Health Management, Feedlot Performance, Morbidity, Carcass Composition

INTRODUCTION

Gardner et al. (1996) reported that costs associated with morbidity are the most important determinant of profitability of feedlot cattle. Morbidity rates account for approximately eight percent of all production costs without consideration of losses due to reduced performance

(Griffin et al., 1995). The Texas A&M Ranch to Rail program has clearly identified net return differences among cattle which remained healthy throughout the feeding period versus those which experienced morbidity. As such, preweaning health management programs are generally important to cattle buyers because of their significant role in determination of profitability and economic risk.

The 1995 National Beef Quality Audit identified inadequate tenderness, low overall palatability and inappropriate USDA Quality Grade mix as three of the top ten aggregate concerns among purveyors, retailers, restaurateurs and packers; economic losses were estimated at \$28.41 for every steer and heifer harvested in the United States in 1995 due to inadequate marbling. While it is documented that morbidity impacts marbling scores and quality grades, no documented research has established relationships among health management programs and(or) morbidity rates and their effect on beef palatability traits. The objectives of this project were to evaluate the effects of morbidity on feedlot performance, carcass characteristics, and beef palatability traits.

MATERIALS AND METHODS

Cattle Procurement and Management. Feeder steer calves from three different sources were utilized in the project. Two groups of calves originated from value-added calf (VAC) programs sponsored by the Kentucky Cattlemen's Association (KCA) including 1) Certified: Preconditioned for Health (CPH) (n=95, 558 lb) and 2) KCA Gold Tag (GT) (n=90, 564 lb). A third group consisted of calves of unknown history purchased from Auction Markets (AM) (n=88, 551 lb). Approximately one half of each group were black and black-baldy calves with the other half being comprised of Charolais and/or Charolais X Angus calves.

Cattle were transported directly from site of origin to a commercial feedyard in Colorado. Upon arrival at the feedyard, cattle were rested 24-36 hr before processing. Initial processing included individual identification plus administration of modified-live IBR/BVD vaccine, 7-way Clostridial bacterin and an anthelmintic (Dectomax). Additionally, AM cattle included 15 bulls that were banded at processing. Following a three week warm-up period, cattle were weighed, and implanted (Synovex-S) in early January. In mid-March, the calves were weighed, reimplanted (Synovex-Plus) and revaccinated (IBR/BVD).

Cattle were fed in adjacent pens to a subcutaneous fat thickness endpoint of 0.4 in as determined by visual appraisal. Cattle were harvested in three groups.

Data Collection Procedures.

Performance information, collected at the feedyard, included morbidity rate (number of hospital visits), average daily gain at time of re-implant and final average daily gain. Individual live weights were recorded at the time of (1) initial processing, (2) re-implant, and (3) the day prior to harvest.

Cattle were harvested at a commercial packing facility. After carcasses were chilled and ribbed, trained personnel from Colorado State University evaluated each carcass and recorded values for hot carcass weight, ribeye area, adjusted preliminary yield grade, percent kidney/pelvic/heart fat, marbling score and skeletal and lean maturity.

Sample Collection Procedures.

From the second harvest group, 120 carcasses were randomly selected to represent three morbidity groups (zero, one or two hospital visits) within each of two quality grades (USDA Choice and USDA Select). Strip loins were aged for 14 days and

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four 1 in thick steaks were cut, vacuum packaged and frozen. The first two steaks were used for Warner-Bratzler shear force analysis and the second two steaks were used for trained sensory panel evaluation.

Tenderness Determination. Thawed steaks were cooked until reaching the appropriate internal temperature (150 or 170°F). Six to ten 0.5 in cores were removed from each steak parallel to the muscle fiber orientation using a mechanical coring device. Shear force values were then determined by calculating the mean peak shear force required to shear cores from each steak.

Palatability Determination. Trained panelists evaluated the palatability attributes of the cooked steaks. When steaks were removed from the grill, 0.5 in cubes were cut for panel evaluation. Steaks were served to panelists in a random order within a panel session.

Value Determination. Values for all cattle were determined using a standardized grid to remove differences in pricing structures during the weeks that cattle were harvested. Specifically, a weighted average for the base price of the grid, as well as grid premiums and discounts, were calculated and all carcass values were calculated from these weighted averages. Values were determined using carcass grade characteristics and appropriate premiums and discounts and did not include adjustments for the number of hospital visits. The adjusted carcass value was computed utilizing the weighted average grid prices and subtracting from that final value the purchase cost and the freight cost. All values calculated, adjusted standardized carcass value and adjusted margin over purchase cost, were computed using the standardized grid prices previously explained.

Statistical Analysis. The General Linear Models analysis of variances procedure of SAS (1996) was used in analysis of dependent variables using hospital visits as the independent

variable and cattle as the experimental unit. Likewise, the General Linear Models analysis was used in the analysis of dependent variables using preconditioning treatment as the independent variable. In each analysis, least squares means were calculated and mean separation was performed using the pairwise t-test procedure in SAS (1996).

With respect to palatability traits, a repeated measures model in the General Linear Models procedure of SAS (1996) was utilized for statistical analyses. One analyses was conducted using preconditioning treatment as the independent variable and an additional analyses was conducted using hospital visits as the independent variable. For each analysis, least squares means were computed and mean separation was performed using a pairwise t-test procedure of SAS (1996).

RESULTS

Impact of Hospital Visits on Performance and Carcass Traits.

Hospital visits among all cattle were divided into three discrete categories (0, 1 and 2 or more hospital visits) for analysis purposes. Cattle visiting the hospital twice or more had lower ($P < .05$) average daily gain through the initial implant period (Table 1). Throughout the entire feeding phase, cattle going to the hospital once had higher ($P < .05$) average daily gains than those that did not require any treatments or those treated twice or more (Table 1). The effect of morbidity on differences in gain among cattle which received medication in comparison to those that did not decreased with increased time on feed. There is discrepancy among studies relative to the impact of morbidity and feedlot hospital visits on average daily gain in cattle.

Number of hospital visits had significant effects ($P < .05$) on hot carcass weight, dressing percentage, adjusted fat thickness and yield grade (Table 1). Hot carcass weights were significantly lighter ($P < .05$) for cattle requiring 2 or more hospital visits than for untreated cattle or for cattle hospitalized once. Cattle hospitalized

twice or more also had lower dressing percentages than cattle with no hospital visits. Adjusted fat thickness and USDA Yield Grade were more desirable ($P < .05$) for carcasses from cattle that had visited the hospital twice or more compared with carcasses from cattle with 0 hospital visits.

Number of hospital visits affected ($P < .05$) adjusted standardized grid price, adjusted standardized carcass value and adjusted margin over purchase cost (Table 3). Cattle not visiting the hospital or visiting the hospital only once had significantly higher adjusted standardized grid price, higher adjusted standardized carcass value and higher adjusted margin over purchase cost than those that visited the hospital twice or more.

Peterson et al. (1989) concluded that preconditioning was not a viable alternative when retaining ownership and that it was not profitable for integrated operators; however, all of their assumptions were based on a live pricing system and not on a grid-marketing system. Results of this study indicate that morbidity, specifically for cattle sent to the veterinary hospital two or more times, resulted in significantly lower adjusted standardized grid prices, adjusted standardized carcass values and adjusted margins over purchase cost in comparison to cattle that did not visit the hospital during their stay in the feedyard.

Impact of Pre-conditioning Treatment on Morbidity, Feedlot Performance and Carcass Traits.

Morbidity rates were 34.7, 36.7 and 77.3% while mortality rates were 1.1, 1.1 and 11.4% for CPH, GT and AM cattle, respectively (data not presented in tabular form). Pre-conditioning treatment had a significant ($P < .05$) impact on the average number of hospital visits per steer during the finishing phase (Table 2). Those cattle originating from the GT and CPH treatments had fewer ($P < .05$) trips to the hospital than did AM cattle. Additionally, there was a significant difference ($P < .05$) in

ADG through initial implant and in ADG to harvest when comparing the three treatments (Table 2). Cattle in the GT treatment experienced the lowest ADG through the initial implant period while CPH cattle possessed the highest ADG through initial implant; however, ADG through harvest was highest for AM, and lowest for CPH, cattle. Differences in ADG through initial implant primarily reflected differences in initial adaptation and consequent gain during the warm-up period. There were no significant differences ($P > .05$) in live weight of cattle at time of harvest among the three treatments (Table 2).

Table 2 also includes carcass data for all cattle in the project. While pre-conditioning treatment had an impact on hospital visits and average daily gains during the feeding period, there was no significant impact ($P > .05$) of pre-conditioning treatment on hot carcass weight or percent kidney, pelvic, heart fat (Table 2). Gold Tag cattle had a significantly larger ($P < .05$) mean ribeye area than the CPH or AM cattle (Table 2); the latter difference may be indicative of genetic differences, as well as treatment effects, among the groups of cattle. The differences ($P < .05$) in ribeye area among cattle from different VAC programs contributed to the differences among those groups in yield grades (Table 2).

Least squares means for profitability determinants for cattle in the three VAC program groups are presented in Table 2. The differences in adjusted standardized grid price and in adjusted standardized carcass value largely reflect the impact of morbidity and mortality in cattle among the three VAC program groups. As a result of increased hospital visits, higher percentages of sick cattle and higher mortality rates, the AM cattle had a significantly lower ($P < .05$) adjusted standardized grid price, adjusted standardized carcass value and adjusted margin over purchase cost than did the GT and CPH cattle (Table 2).

Impact of Pre-conditioning Treatment And Morbidity History on Palatability Traits. Neither pre-conditioning treatment nor morbidity history had a significant impact ($P > .05$) on shear force values, tenderness rating or juiciness ratings (data not presented in tabular form). Shear force values as well as ratings for tenderness and juiciness (determined by members of a trained taste panel) differed ($P < .05$) only among steaks cooked to different degrees of doneness and not among steaks from cattle from different VAC programs.

DISCUSSION

Morbidity resulted in economic losses due to mortality, reduced performance and increased costs for treating sick animals. Additionally, increased morbidity was associated with reduced marbling deposition (and, thus, lowered USDA Quality Grades; data not presented in tabular form); however, morbidity did not affect tenderness or juiciness of steaks from these carcasses.

Results of this study indicate that health management is an issue of risk management with newly received feeder cattle relative to their performance, profitability and carcass characteristics. The changing environment of the beef industry, especially in light of the recent FDA initiative regarding potential limitations on use of antibiotics, may force beef producers to redefine risk. Therefore, as value-based marketing is practiced for an increasing share of available fed cattle, health management will become an increasingly important critical management point in beef alliances. The direct impact of health management on palatability attributes of beef steaks does not appear to be significant. The future of the cattle industry is dependent upon its ability to lower costs while increasingly satisfying consumer demands for lean, palatable and more convenient beef products; cattle health will play an increasingly critical role in the industry's ability to lower costs while simultaneously providing higher

quality beef products. (Northcutt et al., 1996).

IMPLICATIONS

Based on the data from this study, it was determined that utilization of health programs and the frequency of morbidity have the potential to have a substantial impact on the final value of cattle. Cattle that have not been managed under proper health management programs will be critical to feedlot owners and operators as morbidity can affect feedlot performance as well as carcass value, through the decrease in carcass grade as well as the increased input costs. Thus, health programs will play a role in value-based or grid marketing programs used in the industry.

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Table 1. Least Squares Means for Individual Feedlot Performance, Carcass and Economic Characteristics^a Arrayed by Number of Hospital Visits

Trait ^{cd}	Hospital Visits ^b		
	0	1	2
ADG through initial implant ^e (lb/d)	3.86 ^c	3.95 ^c	3.42 ^d
ADG through harvest ^f (lb/d)	3.59 ^d	3.73 ^c	3.59 ^d
Live weight ^f (lb)	1222.7	1242.7	1204.2
Hot carcass weight ^f (lb)	780.1 ^c	788.1 ^c	759.8 ^d
Dressing percent ^f (%)	63.79 ^c	63.42 ^{cd}	63.08 ^d
Actual carcass value ^f (\$)	761.13 ^c	764.13 ^c	731.95 ^d
Marbling score ^f	SM 31 ^c	SL 99 ^{cd}	SL 87 ^d
KPH fat ^f (%)	1.86	1.74	1.73
Adjusted fat thickness ^f (in)	.49 ^d	.46 ^{cd}	.42 ^c
Ribeye area ^f (sq in)	14.22	14.22	14.12
Yield grade ^f	2.60 ^d	2.45 ^{cd}	2.28 ^c
Overall maturity score ^f	A 67	A 70	A 66
Adjusted standardized grid price ^{gh} (\$/lb)	214.30 ^c	210.44 ^c	160.97 ^d
Adjusted standardized carcass value ^{gi} (\$)	757.55 ^c	752.69 ^c	541.93 ^d
Adjusted margin over purchase cost ^{gj} (\$)	256.88 ^c	262.92 ^c	52.16 ^d

^a Data includes cattle from VAC program hierarchy: CPH (n = 95, 558 lb), KCA Gold Tag (n = 90, 564 lb) and "Auction Market" (n = 88, 551 lb).

^b 0 = no treatment required, 1 = 1 treatment required and 2 = 2 or more treatments required.

^{cd} Values in the same row with a common superscript letter do not differ statistically (P > .05).

^e Values based on 254 head implanted on 1/06/98 and reimplanted on 3/14/98.

^f Values based on 247 head harvested on a constant market-readiness basis: 36, 169 and 42 head harvested on 6/10/98, 7/07/98 and 8/05/98, respectively.

^g Values based on 273 head; adjusted for losses due to deaths and realizers.

^h Grid price determined utilizing standard base price and adjustment values at three separate harvest dates.

ⁱ Carcass value determined utilizing standardized grid base price and adjustment values at three separate harvest dates.

^j Values reflect adjusted standardized carcass value minus average purchase cost (\$489.77/hd).

Table 2. Least Squares Means for Individual Feedlot Performance, Carcass and Economic Characteristics^a Arrayed by VAC Program

Trait ^{cd}	VAC Program ^b		
	CPH	GT	AM
No. of hospital visits required	.55 ^d	.70 ^d	1.97 ^c
ADG through initial implant ^e (lb/d)	4.01 ^c	3.59 ^d	3.68 ^d
ADG through harvest ^f (lb/d)	3.55 ^d	3.64 ^{cd}	3.73 ^c
Live weight ^f (lb)	1222.0	1230.6	1215.4
Hot carcass weight ^f (lb)	784.1	778.6	768.0
Dressing percent ^f (%)	64.12 ^c	63.27 ^d	63.16 ^d
Actual carcass value ^f (\$)	765.56	752.27	746.53
Marbling score ^f	SM 00 ^c	SL 89 ^d	SM 27 ^c
KPH fat ^f (%)	1.76	1.80	1.77
Adjusted fat thickness ^f (in)	.47 ^c	.41 ^d	.49 ^c
Ribeye area ^f (sq in)	13.82 ^d	14.62 ^c	14.02 ^d
Yield grade ^f	2.64 ^c	2.28 ^d	2.56 ^c
Overall maturity score ^f	A 69 ^c	A 68 ^c	A 64 ^d
Adjusted standardized grid price ^{gh} (\$/lb)	208.61 ^c	208.66 ^c	177.47 ^d
Adjusted standardized carcass value ^{gi} (\$)	739.85 ^c	737.27 ^c	607.55 ^d
Adjusted margin over purchase cost ^{gj} (\$)	242.29 ^c	239.31 ^c	117.78 ^d

^a Data includes cattle from VAC program hierarchy: CPH (n = 95, 253 kg), KCA Gold Tag (n = 90, 256 kg) and "Auction Market" (n = 88, 250 kg).

^b CPH = Certified: Preconditioned for Health, GT = KCA Gold Tag and AM = no previous history.

^{cd} Values in the same row with a common superscript letter do not differ (P > .05).

^e Values based on 254 head implanted on 1/06/98 and reimplanted on 3/14/98.

^f Values based on 247 head harvested on a constant market-readiness basis: 36, 169 and 42 head harvested on 6/10/98, 7/07/98 and 8/05/98, respectively.

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