Relationships Between Feedlot Health, Average Daily Gain, and Carcass Traits of Angus Steers

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Introduction

Morbidity reduces performance and quality grade, but the effects of morbidity on quality grade independent of its effect on carcass fatness are rarely documented. As feedlot cattle fatten, a greater proportion of their daily carcass gain goes to fat deposition, and greater carcass fat is consistent with greater marbling score. Higher-grading cattle are often assumed to have reduced feedlot performance. Objectives of this research were to document the impacts of various animal and non-animal factors on feedlot average daily gain, health, and carcass traits in Angus steers and to correlate quality and yield grade components of carcass with live performance.

Experimental Procedures

Angus steers (n = 17,919) fed at a single commercial feedlot in southwestern Kansas from 1997 through 2007 were used to correlate average daily gain, health, and carcass traits. Factors of interest were health status, average daily gain, quality grade, and yield grade. Health status categories were as follows: no treatment, single treatment, 2 treatments, and more than 2 treatments for respiratory or other diseases. Animals were also grouped by rate of gain, quality grade, and yield grade.

Calves had been fully preconditioned for a minimum of 30 days prior to delivery to the feedlot. Some groups were placed in backgrounding lots or on pasture at or near the ranch of origin for 60 to 150 days with their original ranch herdmates. Cattle were not commingled with calves from other ranches prior to delivery to or following arrival at the feedlot. Animals were observed daily for morbidity by feedlot personnel. All health evaluators were professional feedlot personnel.

The general manager of the feedlot visually evaluated the animals for degree of finish 60 to 80 days after administration of the terminal implant. Animals determined to be adequately finished were shipped to the packing plant. Animals not shipped with the first marketing group were evaluated for finish again 14 to 21 days later, and those meeting the criteria were shipped. A third group was subsequently shipped an additional 14 to 21 days after the second marketing group. Carcass data were evaluated by USDA personnel.

Results and Discussion

Only 7.7% of the cattle were treated, with 3.1% treated once, 1.9% treated twice, and 3.4% treated 3 or more times (Table 1). Initial body weight, final body weight, and hot carcass weight decreased in linear and quadratic manners with increasing number of

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treatments ($P < 0.01$). Average daily gain decreased linearly ($P < 0.01$) with an increasing number of treatments for all causes of morbidity.

Hot carcass weight, quality grade, and yield grade all decreased linearly with increasing number of treatments ($P < 0.01$). As the number of treatments increased, the percentage of cattle grading Choice decreased ($P < 0.01$). The percentage of carcasses qualifying for a premium Choice program was greatest among cattle that were never treated ($P < 0.01$). No significant interactions occurred between the number of treatments and yield grade with respect to any measures of quality grade ($P > 0.10$).

Treated cattle had lower yield grades than their untreated counterparts ($P < 0.01$), and the percentages of yield grade 1 and 2 carcasses increased linearly with increasing number of treatments ($P < 0.01$).

Cattle that had greater quality grade had greater initial body weight (linear, $P < 0.01$; Table 2), final body weight, average daily gain, hot carcass weight, and yield grade (linear and quadratic $P < 0.01$), and reduced number of days on feed (quadratic, $P < 0.01$).

Average daily gain, final body weight, and hot carcass weight differed little among cattle that graded Prime, Choice, or Select, but performance was dramatically less for those cattle that were ungraded. The number of treatments was roughly double for ungraded cattle versus cattle that graded Prime or Choice (0.11 versus 0.05 and 0.06 for ungraded versus Prime and Choice, respectively), which may explain part of the performance difference based on quality grade.

Cattle with greater final yield grade had fewer treatments (linear and quadratic, $P < 0.01$). In cattle not treated for disease, cattle with greater yield grade had greater final body weights, average daily gain, days on feed, and hot carcass weights (linear, $P < 0.01$; Table 3), and greater quality grade (linear and quadratic, $P < 0.01$).

The proportion of cattle that graded Choice increased 16.1 percentage units between yield grade 1 and 2 cattle compared with yield grade 3 cattle, but the proportion increased only an additional 1.6 percentage units in yield grade 4 and 5 cattle (linear and quadratic, $P < 0.01$).

Yield grade was positively correlated to quality grade (r = 0.167; Table 4). The number of treatments per animal was negatively correlated with quality grade and average daily gain (r = -0.070 and -0.152, respectively). Initial body weight was negatively correlated with the number of treatments (r = -0.104) and positively correlated with average daily gain, final body weight, and hot carcass weight (r = 0.185, 0.425, and, 0.405, respectively), but initial body weight had nearly no relationship with quality grade or yield grade (r = 0.035 and 0.021, respectively).

Implications

The strong inter-relationship between average daily gain, yield grade, and quality grade suggests that beef producers who are attempting to raise and market highly marbled beef do not need to choose between the genetics for performance versus genetics for

marbling, but instead can select for high-performance cattle with high marbling potential. If producers reduce opportunities for nutritional stress (for example, nutrient restriction or health challenges), then ensure that the cattle are fed to their target fat content endpoint, they will more consistently achieve both excellent performance and quality grade.

Table 1. Main effects of number treatments for morbidity on feedlot performance and carcass traits for Angus steers fed in a single Kansas feedlot from 1997 through 2007

						P-value	
	Number of times treated[1]					Number of times treated	
Trait	0	1	2	≥ 3	SEM[2]	Linear	Quadratic
Number of cattle	10,700	333	204	360			
Initial body weight, lb	799	710	730	746	3.3	<0.01	<0.01
Final body weight, lb	1273	1293	1244	1229	6.8	<0.01	<0.01
Average daily gain, lb	3.62	3.68	3.27	3.27	0.049	<0.01	0.40
Hot carcass weight, lb	821	834	805	794	4.4	<0.01	<0.01
Prime, %	2.1	2.2	0.8	0.7	1.10	0.96	0.97
Premium Choice, %	18.6	13.0	11.5	12.4	3.00	<0.01	<0.01
Choice, %	69.0	65.5	58.3	57.1	3.50	<0.01	0.03
Ungraded, %	0.9	0.1	1.5	2.1	0.71	0.97	0.94
Yield grades 1 and 2, %	25.8	25.0	32.0	37.3	3.24	<0.01	0.79
Yield grades 4 and 5, %	14.4	15.5	5.4	9.2	2.55	0.93	0.94

[1] Treated: Includes all health treatments received while at feedlot.
[2] SEM = largest standard error in the analysis.

Table 2. Main effects of quality grade on feedlot performance and carcass traits for Angus steers never treated for disease fed in a single Kansas feedlot from 1997 through 2007

						P-value	
	Quality grade						
Trait	Prime	Choice	Select	Ungraded	SEM[1]	Linear	Quadratic
Number of animals	314	9,008	4,336	141			
Initial body weight, lb	814	791	787	778	11.7	0.09	0.01
Final body weight, lb	1279	1281	1268	1232	10.6	0.82	0.01
Average daily gain, lb	3.51	3.66	3.55	3.20	0.068	0.14	0.15
Number of treatments[2]	0.09	0.2	0.31	0.27	0.11	<0.01	0.33
Hot carcass weight, lb	822	825	818	794	6.8	0.85	0.01
Yield grades 1 and 2, %	18.9	20.9	35.7	59.4	3.53	<0.01	<0.01
Yield grades 4 and 5, %	17.1	15.1	11.9	8.1	2.80	<0.01	0.03

[1] SEM = largest standard error in the analysis.
[2] Includes all health treatments received while at feedlot.

Table 3. Effects of yield grade on feedlot performance and carcass traits for Angus steers never treated for respiratory disease fed in a single Kansas feedlot from 1997 through 2007

	Yield grade				*P*-value	
Trait	1+2	3	4+5	SEM[1]	Linear	Quadratic
Number of cattle	4,145	9,912	2,215			
Initial body weight, lb	791	794	789	3.1	0.95	0.29
Final body weight, lb	1261	1287	1321	2.2	<0.01	0.21
Average daily gain, lb	3.57	3.68	3.79	0.013	<0.01	0.72
Number of treatments[2, 3]	0.34	0.19	0.13	0.021	<0.01	<0.01
Hot carcass weight, lb	811	829	849	1.4	<0.01	0.18
Prime, %	1.7	2.4	2.9	0.33	<0.01	0.04
Premium Choice, %	14.9	25.2	1.3	0.85	<0.01	<0.01
Choice, %	57.6	73.7	75.3	0.99	<0.01	<0.01
Ungraded, %	2.1	0.5	0.4	0.2	<0.01	<0.01
Yield grade	1.95	3.00	4.04	0.003	<0.01	0.05

[1] SEM = largest standard error in the analysis.
[2] Includes all health treatments received while at feedlot.
[3] Includes all steers in the complete dataset. Animals that were treated for disease were removed from analysis of all other variables.

Table 4. Correlation coefficients (Pearson) of various traits in Angus steers fed in a single Kansas feedlot from 1997 through 2007 ($P < 0.01$)

Item	Initial body weight, lb	Average daily gain (ADG), lb	Final body weight, lb	Hot carcass weight, lb	Number of treatments[1]	Yield grade
ADG, lb	0.185					
Final body weight, lb	0.425	0.616				
Hot carcass weight, lb	0.405	0.562	0.986			
Number of treatments	-0.104	-0.152	-0.146	-0.140		
Yield grade	0.021	0.131	0.240	0.238	-0.073	
Quality grade[2]	0.036	0.074	0.104	0.097	-0.069	0.167

[1] Includes all health treatments received while at feedlot.
[2] Prime = 4, Choice = 3, Select = 2, Ungraded = 1.