OKLAHOMA COOPERATIVE EXTENSION SERVICE AGEC-610

Health Impacts on Animal Performance from the OK Steer Feedout Program

Shana E. Robson
Former Honors College Research Assistant

Clement E. Ward
Professor and Extension Economist

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Several people in the Oklahoma Cooperative Extension Service have contributed to and supported the OK Steer Feedout program since its inception. Special recognition goes to Wayne Shearhart for his continued support. Three area animal science specialists – Greg Highfill, Kent Barnes, and Bob LeValley – compiled and verified data from 16 years of the program. They then charged me to identify what might be learned from the data for the benefit of cattle producers and educators. This is the second of two Extension Fact Sheets reporting findings from the analysis. – Clem Ward

A previous Extension Fact Sheet (AGEC-609, Feedlot and Carcass Performance from the OK Steer Feedout Program) reported on the quality and performance of Oklahoma cattle placed in the OK Steer Feedout program over the period 1990 to 2005 (see *Feedlot and Carcass Performance from the OK Steer Feedout Program* at http://pods.dasnr.okstate.edu/docushare/dsweb/HomePage). This companion fact sheet reports on the effect animal health has on feedlot and carcass performance and on the value of carcasses. The same data were used for this work as for summarizing feedlot and carcass performance in the first fact sheet mentioned above. Recall the feedout program operates a separate test for spring-born calves (placed in the feedlot in November) and for fall-born calves (placed in the feedlot in August). Visit http://www.ansi.okstate.edu/exten/oksteer/ for additional information about the feedout program.

Link Between Animal Health and Performance

For simplicity, the cattle industry can be divided into three main segments; cow-calf, stocker, and cattle feeding. All ultimately lead to the harvesting stage. Health of an animal during the stocker and finishing phases relies considerably on the health of the calf as it emerges from the cow-calf phase. Calf health relies heavily on management of the cattle and starts with a vaccination program. Vaccinations are given to prevent many of the diseases that affect cattle, of which Bovine Respiratory Disease (BRD) is the most common. Vaccinations do not eliminate disease; they instead minimize risk of infection and minimize severe clinical signs of disease. Typically, all cattle vaccinations are given at a young age and should be given with the mindset of preparing the cattle for where they are going, not where they are currently. Calf vaccinations are typically given at branding time (2 to 4 months) and at weaning (5 to 9 months). While cattle that may become replacement heifers will continue to be vaccinated, calves may be given only one booster as they enter the feedlot to maintain the pen group's health. At branding time, a fundamental vaccination program would include Clostridial bacteria/toxoid (7-way/8-way depending on the location) and a parasite control program. Then, at weaning, calves in a basic vaccination program should be vaccinated with a Clostridial bacteria/toxoid again, and with a 4-way/5-way viral respiratory disease vaccine that includes IBRV, BVDV, PI_3V, BRSV, and Leptospirosis. Calves also should be treated for parasites. This vaccination program is essential to success of the calf through subsequent phases of the production chain and to ensure a lower risk of disease infection.

Upon infection, a calf's body, like other mammals, will initiate an immune response. This immune response consists of two parts, cell mediated immunity and humoral immunity. Upon the launch of the calf's immune response, immediate physiological effects include fever, depression, and a decrease in appetite and water intake. The decrease in food, increase in cell energy demand to function under a fever, and increase in protein demand to increase antibody production results in a loss of energy stores by the calf. This includes muscle and fat, which in beef cattle are valuable assets as they affect each of the performance characteristics. As previously mentioned however, vaccinations serve only to minimize the risk of infection; disease itself is the result of many factors.

Each disease is different, but each basic response to disease leads to the above immune response and corresponding effects. BRD complex is the disease most detrimental to cattle operations in Oklahoma and most states. This disease is the result of a combination of circumstances. These include viral, bacterial/mycoplasmal, and stress components. Cattle that undergo a proper vaccination program and/or a preconditioning program are better prepared to ward off each of these causes.

Preconditioning refers to a program generally implemented after cattle are weaned (around 5 to 9 months) to strengthen the calf's immune system while minimizing stress (Avent, Ward, and Lalman, 2003). In a management program that does not incorporate preconditioning practices, calves would normally be sold and transported to a stocker or feedlot at weaning, depending in part on the size of the calves.

Therefore, calves are removed from their mother, put on a completely different diet, placed with other calves, and often in an entirely new environment or location. Stated differently, calves are taken from their homes, put into large communities, and exposed to viral and bacterial agents in a stressful environment. This practice almost assuredly puts calves in a good position to meet the necessary conditions that increase its vulnerability to disease; viral and bacterial exposure and stress. Preconditioning programs allow calves to adjust to many of the changes they face during this vulnerable time and are a way to improve health and avoid losing valuable returns through poor feedlot performance and carcass characteristics.

Some producers in the cow-calf sector think the health of calves after they leave the ranch at weaning should not be the cow-calf producers' problem. The organization of the cattle industry creates a disconnect between production sectors, and cow-calf producers cannot always see the benefit of producing calves they sell to have higher average daily gains and higher carcass scores because it may not benefit them directly. This benefit, however, is substantial and can easily be obtained from implementing a vaccination program that costs only about $5 to 7 per head. In return, most research on preconditioning programs indicates buyers pay substantial premiums for calves that they expect to be healthier and perform better (Donnell, 2007). Premiums have been found to be as large as $7.91/cwt. across several sales.

Data and Procedures

Data from the OK Steer Feedout program were collected over the course of 16 years (1990-91 to 2004-05). Pertinent data for this study included year, placement frame and weight, sale frame and weight, days on feed, average daily gain, feed intake, feed conversion, carcass weight, fat thickness, ribeye area, yield grade, marbling, carcass index, and medical costs.

Data were analyzed for three periods; the entire 16 years, the first two years, and the last two years. Thus a comparison was possible between the early years of the feedout program and more recent years in addition to the entire data period.

Summary statistics were calculated and several regression models were estimated for a series of performance variables. The emphasis was on determining the effect medical costs had on several feedlot and carcass performance measures. Lastly, a grid calculator was used to value carcasses under alternative grids but with a common base price for the beginning and ending periods.

Summary statistics are shown in Table 1 for several variables. Cattle were divided into those that incurred medical costs while on feed compared to cattle which did not incur medical costs while in the feedlot. Some cattle may have been treated once and some more than once. No information is included on cattle that died in the feedlot.

Feeding Performance

Feedlot performance measures included average daily gain, feed conversion, and feed intake. There is limited evidence from Table 1 that cattle with medical costs greater than zero dollars per head had poorer feedlot performance than animals with zero medical costs. Higher ADG was found for healthy cattle for the entire data period and for 1990-91. Healthy cattle consumed less total feed and converted it more efficiently in 2004-05.

Taking other factors into account in the regression models, results also were mixed. Table 2 provides a capsule summary of the regression results for the primary variable of interest, medical costs. For the entire data period, healthy cattle had less total feed intake and converted it more efficiently to weight gain than treated cattle. Healthy cattle did not perform any better in the feedlot than treated cattle during 1990-91. However, in 2004-05, healthy cattle were associated with higher feed intake and poorer feed conversion, both unexpected results.

Carcass Performance

Carcass performance favored healthy cattle more than did feedlot performance. Carcass performance variables included three that comprise yield grade; carcass weight, fat thickness, and ribeye area. Carcass performance also

Table 1. Variable means by treated and nontreated cattle.

Variable	1990-05		1990-91		2004-05	
	Zero Medical Cost	Medical Cost >0	Zero Medical Cost	Medical Cost >0	Zero Medical Cost	Medical Cost >0
Average daily gain (lbs)	3.42[a]	3.39	3.32[b]	3.18	3.39	3.30
Feed conversion (lbs)	7.13	7.14	6.78	6.83	7.63[c]	7.30
Feed intake (lbs)	4021.7	4039.5	3740.2	3715.9	4256.6[c]	4061.9
Carcass weight (lbs)	721.6[a]	702.2	712.5[b]	685.7	730.5[c]	700.6
Fat thickness (in)	0.36[a]	0.34	0.37[b]	0.32	0.41	0.39
Ribeye area (in^2)	12.5[a]	12.3	12.9[b]	12.5	12.9[c]	12.4
Marbling	410.7[a]	403.1	414.3	404.7	426.5[c]	400.8
Carcass index	85.2[a]	83.0	86.7[b]	83.4	84.0[c]	79.9
Medical costs ($)	0.00[a]	30.00	0.00[b]	18.12	0.00[c]	111.30

[a] Significant differences in means across all years at 0.10 level or lower.
[b] Significant differences in means across all years at 0.10 level or lower.
[c] Significant differences in means across all years at 0.10 level or lower.

Table 2. Summary of regression results for effects of medical costs on feedlot and carcass performance variables.

Performance Variable	*1990-2005*	*1990-91*	*2004-05*
	Effects[a]	Effects	Effects
Feedlot			
Feed intake	Lower	No difference	Higher
Average daily gain	No difference	No difference	No difference
Feed conversion	Lower	No difference	Higher
Carcass yield grade			
Carcass weight	Larger	Larger	No difference
Fat thickness	No difference	No difference	No difference
Ribeye area	No difference	Larger	No difference
Carcass quality			
Marbling	No difference	No difference	More
Carcass index	Higher	Higher	Higher

[a] Effects are performance changes for healthy cattle compared with treated cattle.

included marbling, the key component of quality grades, as well as carcass index, an overall carcass quality indicator.

Table 1 shows healthy cattle were associated with larger carcasses (both carcass weight and ribeye area) for all three periods (all years and the beginning and ending two years). Healthy cattle had more marbling for all years and for 2004-05, along with higher fat thickness for all years and in 1990-91. Overall carcass index was higher for healthy cattle in all three periods.

The regression models took other factors into account in estimating the effect medical costs had on carcass performance (Table 2). Healthy cattle had larger carcasses for all years and in 1990-91 and larger ribeye area in 1990-91. Healthy cattle had better marbling only in 2004-05 but the carcass index was higher for healthy cattle in all three periods.

Estimated Carcass Value

Summary statistics and regression results showed some evidence, though inconsistent, that healthy cattle performed better in the feedlot and especially in carcass attributes than treated cattle in the OK Steer Feedout program. However, while results may not be statistically consistent, the results may have an important economic effect. One way to assess the value of cattle from the OK Steer Feedout program is with a grid calculator (Ward, 2002). The grid calculator used is available at http://agecon.okstate.edu/pricing/publications.asp in a Microsoft Excel spreadsheet.

Average prices and grid premiums and discounts were chosen at a single point in time (first week of October 2006) and applied consistently to the OK Steer Feedout carcass data for 1990-91 and 2004-05. The date chosen affects the *level* of prices but not necessarily the *relationship* between prices. Three hypothetical grids were used. An average grid used average premiums and discounts for quality and yield grades reported by USDA for a given week. The quality grid used higher reported premiums for upper quality grades and average discounts for lower quality grades, with average premiums and discounts for yield grades. The yield grid used higher reported premiums for better yield grades and average discounts for poorer yield grades, with average premiums and discounts for quality grades.

Table 3 shows the net grid price, premium sum, discount sum, and gross revenue (total carcass value) from three grids for two periods of feedout data. Figure 1 shows the net grid price for the three grids (labeled Average, Quality, and Yield) and for medical costs equal to zero and greater than zero.

Results are consistent and economically significant. For each of the two data periods and for each grid, the net grid price for healthy cattle was higher than for treated cattle. Across the three grids, the net grid price was $1.71/cwt. more for healthy cattle in 1990-91 and $2.47/cwt. more for healthy cattle in 2004-05. Healthy cattle did not always receive the highest premiums but always were discounted less. Healthy cattle for each period also had heavier carcass weights. Heavier weights combined with a higher net price resulted in more gross revenue (income) under each grid and for each time period. Average revenue for healthy cattle compared

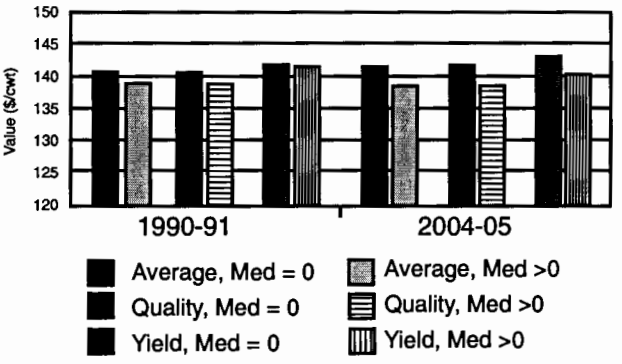

Figure 1. Estimated value of carcasses (net grid price) for cattle with no medical costs (Med = 0) and treated cattle (Med > 0) with alternative grids (Average, Quality, Yield), 1990-91 and 2004-05.

Table 3. Estimated net grid prices, premiums/discounts, and total value of carcasses for cattle with medical costs versus those with medical costs greater than zero, based on average carcass attributes from the OK Steer Feedout and alternative grids, 1990-91 versus 2004-05.

Year	Medical Costs ($/cwt)	Net Price Sum ($/cwt)	Premium Sum ($/cwt)	Discount Value ($/cwt)	Gross ($)
Average Grid					
1990-91	Zero	141.06	1.32	5.03	1005.05
>Zero	139.35	1.54	6.95	955.54	
2004-05	Zero	141.67	1.29	4.39	1034.92
>Zero	139.20	1.12	6.69	975.20	
Quality Grid					
1990-91	Zero	140.93	1.43	5.27	1004.10
>Zero	139.13	1.65	7.29	954.01	
2004-05	Zero	141.96	1.80	4.61	1037.05
>Zero	139.02	1.29	7.04	973.94	
Yield Grid					
1990-91	Zero	143.01	3.29	5.05	1018.94
>Zero	141.68	3.86	6.95	971.51	
2004-05	Zero	143.34	2.96	4.39	1047.11
>Zero	140.75	2.69	6.73	986.00	

with treated cattle across the three grids was $49.51/head in 1990-91 and $59.72/head for 2004-05.

Total feed costs are not known but Table 1 shows relatively little difference in feed intake between healthy and treated cattle for the two periods; just 25 lbs/head for 1990-91 and 5 lbs/head in 2004-05. However, medical costs between the two groups were very different. Healthy cattle had no medical costs per head, while treated cattle medical costs averaged $18/head in 1990-91 and $111/head in 2004-05.

Overall, healthy cattle brought higher prices and more revenue with lower apparent costs than treated cattle. Thus, feedout data confirm that placing healthy cattle on feed, cattle that have a strong immune system, pays significant economic dividends. The revenue and cost difference found here translates to about $10/cwt. in favor of healthy, 600-pound calves, even higher than buyers typically pay for preconditioned, source and age verified calves.

Summary and Conclusions

OK Steer Feedout data were used to study the relationship between cattle in the feedout program that did not incur medical costs (referred to as healthy cattle) and those treated once or more (referred to as treated cattle). Results for summary statistics and from regression models were not consistent but provided some evidence healthy cattle performed better in the feedlot and even better in carcass attributes.

What was not clear statistically, appears much clearer economically. A grid calculator and three alternative grids were applied to the beginning and ending two years of the feedout program data. Results were more consistent across grids and time periods. Healthy cattle were worth more in terms of higher prices and generated more income than treated cattle with less cost than treated cattle. Thus, healthy cattle had higher net returns. There is an economic incentive for both cow-calf producers to market healthy calves and for cattle feeders to purchase healthy calves to be placed in a feedlot.

References

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0907