Effects of Preconditioning on Health, Performance and Prices of Weaned Calves

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Abstract

Bovine respiratory disease is very costly to the beef industry because affected animals have reduced performance, increased cost of production and reduced carcass quality. Based on the limited data available, preconditioning (defined as the combination of appropriate vaccination, 45-day weaning and balanced nutrition) significantly reduces morbidity and mortality as well as improves weight gain and feed efficiency. Data is not available documenting the potential benefits of preconditioning relative to carcass quality. Further information is needed to better identify the true value of preconditioning programs in different situations. This information is necessary to forecast a realistic price that buyers can pay for preconditioned calves, while allowing cow/calf producers to reap some of the added value. Conservatively, preconditioning may capture $50 to $75 per head of additional value from weaning through the packing phase compared to a production system where weaning, vaccination and other management practices associated with preconditioning occur after shipment from the ranch of origin.

Introduction

In the beef industry, the term preconditioning is generally used to indicate management practices, implemented around the time of weaning, that are intended to optimize the animal's immune system and nutritional status while minimizing stress. The presumed outcome of this process is added value to the beef production system.

Organized efforts to encourage standardized management of beef calves prior to weaning and shipment began in 1967. In September of that year, approximately 200 animal and veterinary scientists met at Oklahoma State University to discuss the problems and scientific basis for developing and encouraging these management practices.[5] It was at this meeting that the concepts of vaccinating calves prior to weaning or shipping (prevaccinating) and "conditioning" calves were combined to coin the new term "preconditioning". Prior to that conference, the term "conditioning" generally referred to a combination of management practices such as dehorning, deworming, castrating, weaning and training calves to eat out of bunks or water troughs.

Today, numerous preconditioning protocols, designed and administered by animal health companies or industry organizations, are available to producers. In fact, most formal preconditioning protocols include process verification, where management practices and health products used are documented and this information may be provided to the potential or actual buyer of the cattle. Source verification is another feature of some, although not all, preconditioning protocols.

Industry adoption and application of the preconditioning concept was extremely slow with little progress until the early 1990s. Controversy surrounding the topic is still prevalent today. However, recent developments in the US beef industry have accelerated the adoption of preconditioning and process verification.

The Effects of Sickness on Performance and Carcass Traits

Previous work indicates that animal health and medicine costs are the most important animal performance measures determining feedlot cattle profitability.[4] For example, compared with steers without lung lesions, steers with lesions plus active lymph nodes had $73.78 less net return.[3] The effects of sickness on performance and profitability are also clearly demonstrated in data collected on over 16,000 head of cattle in the Texas A&M Ranch to Rail program[17] (Table 1). In this data, animals that were treated one or more times for bovine respiratory disease (BRD) were considered to be sick. The number of cattle treated for sickness in a given year ranged from 14 to 34%, with an average of 22.4%. Average medicine costs for each animal treated varied considerably among years, with a low of $21 to a high of $38 per head. This data shows that the frequency of the occurrence of BRD and associated medicine costs is difficult to predict. This difficulty arises from year-to-year environmental variation and management differences. Consequently, the true value of preconditioning

Table 1. Influence of sickness on performance, profitability and quality grade in eight years of the Texas A&M Ranch to Rail program.[a]

Item	Healthy	Sick
No. cattle	12,306	4,047
Medicine treatment cost, $/hd	0	27.03
ADG, lb**	2.99	2.67
Net return, $/hd**	67.32	-20.28
USDA Choice or higher, %**	39.6	27.5
USDA Standard, %*	10.0	5.25

[a] Source: McNeil[17]
*Healthy vs. sick differs ($P = .02$).
**Healthy vs. sick differs ($P < .01$).

programs is a moving target and will vary over time and in different situations.

In the Ranch to Rail data, cattle that were identified as being sick gained 0.32 lb (0.15 kg)/hd/day less compared to cattle that were never treated. This reduction in weight gain translates to less saleable carcass weight. Perhaps a more important question, and one that is yet to be addressed in published literature, is the affect of BRD on feed efficiency. Sickness reduced the number of carcasses grading Choice by 12 percentage points and increased the number of Standard grading carcasses by five percentage points. Obviously, this impact presents marketing limitations relative to grid pricing systems that are largely driven by quality grade. When death loss, medicine costs and reduced carcass value were considered, cattle that were identified and treated for sickness returned an average of $87.60 less compared to cattle that were never treated for sickness.

In an Oklahoma study,[19] cattle not treated for BRD graded 66% Choice, cattle treated once graded 59% Choice and cattle treated more than once graded 41% Choice. These and other experiments point out that the effects of sickness are variable, but have the potential to dramatically impact animal performance, profitability and product quality.

How Does Preconditioning Affect Post-weaning Performance?

Most calves are healthy when they leave the ranch of origin. Nevertheless, the stress associated with weaning, transportation, inclement weather, nutritional deprivation, commingling and processing lowers their level of disease resistance. This lower resistance to disease comes at the same time when disease exposure is high. Vaccination, deworming and balanced nutrition are all intended to increase the level of immunocompetence. Weaning, castrating, dehorning, training the cattle to eat feed from a bunk and other management practices associated with preconditioning are designed to reduce the impact of stress during the shipping and receiving period. Nevertheless, when disease exposure is combined with extremely stressful conditions, the disease challenge may override the cattle's capacity for disease resistance. The fact that cattle have been preconditioned does not guarantee that cattle will not get sick.

Few data sets are available that include the large numbers of animals that would be required to estimate the true benefit of preconditioning. Multiple years of data are necessary to determine the variability in the benefit of preconditioning due to year-to-year weather and pasture conditions. Table 2 includes data from a study conducted with a large number of heifer calves from a single ranch.[2] The comparison included 380 preconditioned calves and 1600 "weaned and shipped" calves. Preconditioned calves received vaccinations and a dewormer at weaning. Modified-live vaccines were boostered 10 to 14 days later and calves were shipped 45 days following weaning. During the preconditioning period, calves were turned out on grass traps and fed a concentrate pellet with free-choice grass hay. Finished cattle were marketed on a live weight basis. Consequently, economic data presented in Table 2 does not reflect potential differences in carcass traits and associated carcass value.

In this study, preconditioned heifers had improved performance and feed efficiency. Preconditioning dramatically reduced medicine costs and death loss. In fact, the preconditioning program added a total of $60.72 per head to the value of the heifers or $11.04/cwt to the initial weaning weight.

A second and similar experiment[2] compared 15 lots of preconditioned cattle to 15 lots of similar, but non-preconditioned cattle (Table 3). Cattle in the non-preconditioned treatment were purchased through order buyers and were of mixed origin and backgrounds. The preconditioned calves had been certified through the Hi-Pro Producer's Edge program, which requires two rounds of a modified-live virus and Pasteurella vaccine, as well as a 45 to 50 day weaning period.

Similar to the previous experiment, animal performance was improved and medicine costs were dramatically reduced. Remember that these cattle were marketed on a live basis, so potential value differences based on carcass quality are not reflected in the budget presented in Table 3. The preconditioning program added $55.93 to the value of the cattle. In other words, the cattle feeder could have paid $9.67 per cwt more for the preconditioned calves and profited the same amount if the finished cattle were sold on a live weight basis. With this data set, the actual weight gain and costs during the preconditioning period are unknown; however, if we apply the same costs as used in the previous

Table 2. Effects of 45-day preconditioning on feedlot performance and profitability.[a]

Item	Non-preconditioned	Preconditioned
Performance		
Feedlot in wt, lb	550	640
Feedlot wt gain, lb	616	540
Days on feed	220	180
Daily gain, lb	2.80	3.00
Feed:Gain, DM basis	6.60	6.02
Medicine, $/head	34.00	4.33
Death loss, %	4.44	1.30
Feedlot COG, $/cwt	62.80	54.75
Economics		
Preconditioning costs, $/head	-	40
Feedlot COG, $/head	386.85	295.65
Fed heifer value, $/head	795.33	804.88
Value minus total costs, $/head	408.48	469.23
Difference in net value, $/head	-	60.72

[a] Source: Cravey[2]

Table 3. Effects of 45-day preconditioning on feedlot performance and profitability.[a]

Item	Non-preconditioned	Preconditioned
Performance		
No. head	1492	1685
Feedlot in wt, lb	564	579
Feedlot out wt, lb	1126	1173
Days on feed	217	205
Daily gain, lb	2.59	2.88
Feed:Gain, DM basis	6.45	5.98
Medicine, $/head	30.66	13.74
Death loss, %	2.61	.53
Cattle pulled for treatment, %	62.0	19.0
Feedlot COG, $/cwt	56.70	49.68
Economics		
Feedlot COG, $/head	318.65	295.10
Fed cattle value, $/head	771.13	803.51
Value minus total costs, $/head	452.48	508.41
Difference in net value, $/head	-	55.93

[a] Source: Cravey[2]

experiment ($40) and assume that the value of each pound of added weight is worth $0.55, the breakeven weight gain during preconditioning would be 73 lb (33 kg) or 1.6 lb (0.73 kg) per day for 45 days ($40 / $0.55 per lb = 73 lb).

Recent research conducted at OSU reveals that cattle feeders consider preconditioning and process verification to have significant value in terms of animal performance. Table 4 shows the results of a survey of Texas Cattle Feeder member feed yards regarding their perception of performance of preconditioned, process verified cattle compared to non-preconditioned cattle. Clearly, these cattle feeders expect preconditioned calves to have lower health costs, gain faster and convert feed more efficiently compared to non-preconditioned calves. On average, these cattle feeders indicated that they were willing to pay $5.25 per cwt more for preconditioned cattle.

More data is needed to identify the true value of preconditioning for various cattle types, phases of the industry (feedyard vs. stocker), time of the year, region of the country and under different management regimes. Using the data available, preconditioning does appear

to result in a substantial reduction in sickness, death loss and medicine costs. These improvements appear to result in better animal performance and lower cost of feedyard gain. There is likely more value associated with preconditioning when carcass quality is considered.

Does the Industry Currently Reward Cattlemen for Preconditioning Calves?

Several data sets are now available that have attempted to quantify the effect of value added health programs on the price paid for beef calves sold through "special" feeder cattle auctions or through video auctions.

For several years, Superior Livestock Video Auction, Inc. has encouraged the use of standardized and certified vaccination and weaning programs. Since, 1994, sale price on over 26,000 lots, representing over three million cattle have been recorded and evaluated for difference in sale price depending on vaccination and weaning status. Table 5 shows the total number of lots for each year and the percentage of lots consigned and marketed under four different categories, assigned according to weaning, vaccination and certification status. In 1994, enrollment in the two levels of certification (or process verification programs) totaled to about 10% of all of the consignments. In 2004, the enrollment in the same two certification categories had grown to over 74% of the total consignments.

These data also point out that vaccination of calves three to four weeks prior to weaning, and the practice

Table 4. Cattle performance expectations for preconditioned and non-preconditioned calves: a survey of Texas Cattle Feeders.[a]

Item	No. of Feedyards	Preconditioned	Non-preconditioned
Sick, %	17	9.2	36.4
Deads, %	16	1.5	4.3
Avg. daily gain, lb	16	2.9	2.6
Feed:gain	15	6.3	6.9
Percent Choice, %	16	50	36
Percent outs, %	15	2.5	6.9
Premium, $/cwt	17	$5.25	-

[a] Source: Avent[1]

Table 5. Number of sale lots by year and value added health program for beef calves sold through Superior Livestock Video Auctions.[a]

Year	Total number of lots in data analysis	Value added health program administered to sale lots, % of total			
		Not vaccinated-not certified	Vaccinated-not certified[b]	Not weaned-vaccinated-certified[c]	Weaned-vaccinated-certified[d]
1994	1,930	88.3	-	8.3	1.8
1995	1,576	43.7	38.6	12.4	3.2
1996	1,793	34.0	33.9	27.7	4.5
1997	1,902	29.8	33.2	23.1	4.5
1998	2,410	18.0	26.5	21.3	5.0
1999	2,600	17.7	32.8	30.3	6.9
2000	2,406	18.0	47.0	26.0	9.0
2001	2,414	14.3	28.4	44.2	13.1
2002	2,439	10.5	28.7	45.3	15.5
2003	3,150	6.3	19.1	48.6	20.9
2004	3,431	5.4	14.0	49.2	25.2

[a] Source: King[6,7,8,9,10,11,12,13,14,15,16] Average lot size was approximately 120 head each year.
[b] Calves in this category were vaccinated against one or more of the following viruses at some time between birth and the date of sale: IBR, BVD, PI3 and BRSV.
[c] Vac 34. For certification requirements see King.[12]
[d] Vac 45. For certification requirements see King.[12]

of vaccinating and weaning calves for a minimum of 45 days prior to sale and shipment has become much more common over this 11 year period.

Table 6 includes the average price paid for calves that were not vaccinated and not certified, as well as price differences (premium, $/cwt) paid for calves with varying vaccination, certification and weaning status. From these data, it is clear that price signals have grown over time within the Superior marketing system, providing a strong incentive for cow/calf producers to incorporate preconditioning and process verification into their management plan.

Intuitively, the value of preconditioning should differ between cattle shipped directly from the ranch and those that are collected and marketed at central auction facilities. Because the potential exists for greater exposure to disease and greater animal stress, the premium for preconditioned calves marketed through auction facilities should be greater compared to those shipped directly from the home ranch. Unfortunately, no data is available to determine whether this difference exists. Recent research in Oklahoma[20] has documented price premiums for cattle certified and marketed through the Oklahoma Quality Beef Network system. In this system, calves that meet certification requirements (similar to Superior's Vac 45 program) are pooled and marketed at livestock marketing facilities around the state. Between 2001 and 2003, price premiums for OQBN certified calves at any one sale ranged from $1.87 to $13.74 per cwt.

What Does Preconditioning Cost the Cow/Calf Producer?

When calves are vaccinated, weaned and retained for at least 45 days prior to shipment, preconditioning costs realistically range from $35 to $65 per head. Cattlemen often make the mistake of ignoring indirect costs, such as interest, their own labor and equipment depreciation. The nutrition program typically makes up 45 to 60% of the total budget (Table 7), and should therefore receive careful consideration. High quality pasture, such as winter annual forages, stockpiled cool season grass species (fescue, brome etc.) and stockpiled bermudagrass should result in lower cost and greater returns compared to dry-lot feeding programs.

In many farm situations and during some years, the high quality pasture alternative may not be available. In these cases, hay coupled with supplementation or concentrate-feeding programs are implemented. The number of nutrition program alternatives is virtually unlimited. Table 7 shows examples of budgets based on pasture, hay and a low level of supplement, hay and one percent of body weight feed and free-choice receiving feed. Obviously, feed prices, labor availability and buyer preferences will have an important influence on these calculations, therefore, these budgets must be viewed only as examples.

The nutrition program has a direct influence on cattle fleshiness, fill on sale day, future performance and the resulting price. Smith[12] found that cattle that were

Table 6. Effect of value added health programs on the price of beef calves sold through Superior Livestock Video Auctions.[a]

	Value added health program administered to sale lots			
	Not vaccinated-not certified	Vaccinated-not certified[b]	Not weaned-vaccinated-certified[c]	Weaned-vaccinated-certified[d]
Year	Price, $/cwt	——Premium over non-vaccinated and non-certified, $/cwt——		
1994	83.80	-	.77	.25
1995	67.79	.70	1.35	2.47
1996	61.79	.43	.99	3.35
1997	91.26	.72	1.61	3.89
1998	73.86	.74	1.38	3.35
1999	85.92	.96	1.17	3.33
2000	100.06	1.27	1.76	3.66
2001	102.83	1.23	2.21	4.06
2002	79.95	1.10	1.80	5.01
2003	93.80	1.85	3.39	6.69
2004	116.05	1.71	3.47	7.91

[a] Source: King[6,7,8,9,10,11,12,13,14,15,16] Average lot size was approximately 123 head each year.
[b] Calves in this category were vaccinated against one or more of the following viruses at some time between birth and the date of sale: IBR, BVD, PI3 and BRSV.
[c] Vac 34. For certification requirements see King.[12]
[d] Vac 45. For certification requirements see King.[12]

Table 7. Example budgets of 45-day preconditioning programs with varying feeding management.[a]

Item	Hay and Supplement[b]	Hay and 1% of body weight feed[c]	Free-choice ration with hay[d]	Pasture and supplement[c]
Costs, $/head				
Interest	6.46	6.58	6.74	6.41
Health products and medicine	8.00	8.00	8.00	8.00
Death loss	2.57	2.57	2.57	2.57
Labor	4.00	6.00	4.00	2.00
Equipment	2.00	3.00	3.00	1.00
Hay	13.50	10.13	3.38	3.38
Feed	7.88	18.23	40.78	6.75
Pasture	0	0	0	10.00
Total	44.40	54.50	68.47	40.10
ADG, lb	1.0	1.60	2.25	1.75
Sale weight, lb	545	572	601	579

[a] Hay used in each situation is bermuda, sorghum sudan or cool season species with > 10% protein and > 52% TDN.
[b] Supplement contains 20% protein and cost is $175 per ton.
[c] Feed contains 14% protein and cost is $150 per ton.
[d] Ration contains 14% protein and cost is $145 per ton.

classified as "full" were discounted $3.00 to $4.00 per cwt compared to cattle with average fill. Similarly, cattle classified as "fleshy" were discounted $1.00 to $2.00 per cwt compared to cattle considered to be in average condition.[18] Previous research has shown that a faster rate of gain during the growing period results in a slower rate of gain during the subsequent grazing or finishing phase. However, if the calves are sold after preconditioning, nutrition programs based largely on hay are seldom profitable, because hay is a very expensive energy source when evaluated on a cost per pound of weight gain basis. Slower rates of gain during preconditioning, and minimum nutritional inputs are justified when all or a percentage of ownership will be retained in the cattle. It is recommended that a moderate rate of gain (1.5 to 2 lb; 0.68 to 0.91 kg) be targeted in situations where cattle will be sold, concentrate feeds are inexpensive and labor availability is adequate.

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