Preparation Prevents Poor Performance

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The most often cited concern or question about preconditioning is how the producer will be paid for the additional expense they incur by preconditioning calves. Producers who market their calves at weaning via traditional marketing arrangements, such as auction barns, may not receive a higher price for the calves they have preconditioned. By preconditioning, producers have provided their calves with procedures which will enhance the health and performance of calves as they proceed through the beef production value chain. Producers who precondition calves and have alternative marketing arrangements such as contract sales, special calf sales, video auctions, partnership arrangements, or retained ownership through part or all the calf's future production can and should expect to receive a return for preconditioning. This additional return may consist of receiving a higher sale price when calves are sold, enhanced performance if backgrounded, or when finished through a feedlot. Cattle feeders with a record or history of producers who precondition their calves should expect to pay for the added expense and work that a producer has invested. A knowledgeable cattle feeder is aware of the added benefits of preconditioned calves. However, the economics of feeding cattle indicate one of the major determinants of cattle feeding profitability is the cost of the feeder. Cattle feeders are therefore driven to purchase cattle at least cost.

Preconditioning Program

My recommendations for preconditioning or preparing calves for future production can be summed up in a few brief statements. Vaccinate calves at two to three months of age, again two to three weeks prior to weaning, and at weaning. At weaning, control internal and external parasites, castrate all remaining intact bull calves. If a producer does elect to dehorn calves then dehorn calves either at two to three months of age or at weaning. After the calves are weaned they should be exposed to supplemental feed and retained for 30 to 45 days. If calves are properly preconditioned prior to shipment, producers have done a great deal to prepare their calves for the future.

Preconditioning programs are variable and highly dependent upon management and the production environment of the cow herd. A producer should utilize their veterinarian when developing a preconditioning health program which will be designed to match their production capabilities and goals. Recommendations should be made by the veterinarian familiar with the management of the operation, the type of cattle handled, and disease problems typically experienced.

There is concern among veterinarians and producers about vaccinating calves while on the cows, and how effective vaccination may be due to maternal antibody interference. Ridpath et. al. (2003) looked at the effect of passive immunity and the development of a protective immune response against bovine viral diarrhea (BVD) in calves. Passive immunity, acquired through colostrum for BVD, did prevent calves from developing acute disease when inoculated with the BVD virus at two to five weeks of age. The serum antibody titers for these calves did not increase following exposure to the virus and serum titers decayed at the same rate as non virus-inoculated colostrum fed calves. Calves which received colostrum and were inoculated with BVD virus again at seven to nine months of age were still protected from clinical disease after their serum antibody titers had decayed to non detectable concentrations. Calves which did not receive colostrum and were not previously exposed to the virus were not protected from developing disease when inoculated with BVD virus at either two to five weeks of age or seven to nine months of age. Calves receiving colostrum, but not exposed to BVD virus at two to five weeks were not protected against disease when exposed to the virus at seven to nine months of age. A protective immune response was mounted in calves with passive immunity exposed to BVD virus at two to five weeks of age, but the immune response was not reflected by serum antibody titers. Serum titers did not increase after exposure to the BVD virus. Cell mediated immunity appeared to be the protective mechanism in preventing post-natal disease.

Producers need to understand their calves can respond with an active immune response when vaccinating calves with colostral immunity. Calves are immunocompetent at birth and there are two components of the immune system; humoral and cell mediated immunity. Vaccination only insures that the animal has been exposed to the antigens contained in that vaccine; it does not ensure that a protective immune response has been created. Two components required for a successful immunization are efficacious vaccine and an immunocompetent animal.

General recommendations for preconditioning:

1. Vaccinate calves at two to three months of age
   a. Viral respiratory vaccines
      i. IBR, BVD, BRSV, PI3 Modified Live Virus (MLV)
   b. Clostridial (7-way)
   c. Castrate and dehorn while on cows
   d. Implant (enhances performance)
   e. ID (if not done at birth)
      i. Gender
      ii. Age
   f. Record all procedures, products, dosages, and serial numbers

2. Vaccinate calves (two to four weeks) prior to weaning
   a. Viral respiratory vaccines
      i. IBR, BVD, BRSV, PI3 (MLV)
      ii. Clostridial (7-way)
   b. Castrate and dehorn
   c. Internal and external parasite control
   d. Implant (enhances performance)
   e. Optional vaccination
   f. Pasteurella
   g. Record all procedures, products, dosages, and serial numbers

3. Weaning
   a. Separate calves from cows
   b. Vaccination options
      i. IBR, BVD, BRSV, PI3 (MLV)
      ii. 2nd Pasteurella vaccination
      iii. 2nd Clostridial vaccination
   c. ID
      i. Record weaning weight if possible
      ii. Calf ID if not performed previously
   d. Record all procedures, products, dosages, and serial numbers

A preconditioning program should be designed to enhance health welfare and performance of calves as they progress through their production cycle. It should be noted that calves vaccinated while on the cow with MLV vaccines assumes that the cow has been properly vaccinated during development and throughout her years of production.

Cattle Health

There are numerous variables that can and do have an effect on the performance of cattle. Examples of variables that are easier to manage are purchase weight, origin and type of cattle, genetic makeup, and background. Variables that are more difficult to control or are often unknown are the health liabilities cattle may experience.

To help understand animal health concerns regarding feedlot cattle, the USDA's National Animal Health Monitoring System (NAHMS) conducted a study in 1999 of feedlots with capacities of 1,000 head or more in the 12 leading cattle feeding states. The feedlots in the study represented 84.9% of feedlots in the United States with 1,000 head or more of capacity, and 96.1% of the feedlot cattle inventory contained in yards with capacities of greater than 1,000 head. In this study Bovine Respiratory Disease (BRD), also known as shipping fever or bronchopneumonia, was the leading cause of illness and death. Of the animals that became ill, 55% were identified as having respiratory disease. Table 1 provides a breakdown of the disease conditions as reported by large and small feedyards.

The NAHMS study also reported the cost to treat a sick animal which ranged from a high of $16.49 for atypical interstitial pneumonia in a large feedlot to $0.86 for a buller in a small feedlot. These data are found in Table 2 which shows the average medicine cost for cattle in the study.

The NAHMS study also looked at the placement profile for cattle weighing less than 700 lb and questioned feeders about preconditioning. Most feeders (65.8%) considered administering pre-arrival vaccinations prior to weaning as extremely or very effective in reducing sickness and death loss. If the vaccine was administered at weaning, fewer (51.2%), perceived similar levels of effectiveness. Two-thirds (67.2%) of the feeders questioned believed weaning calves at least four weeks prior to shipping was extremely or very effective in reducing adverse health outcomes. About the same percentage of feeders felt that castrating and dehorning calves at least four weeks prior to shipping (64.2%) plus introduction to feed (64.8%) was extremely or very effective in reducing adverse health outcomes. Results from the NAHMS study on pre-arrival management of cattle are provided in Table 3. The management practices are listed in the left column with the percentage response for each management practice listed in the row corresponding to the management practice. The level of effectiveness considered by feeders ranged from extremely effective to not knowing the level of effectiveness.

Other studies have also evaluated health concerns involving feedlot cattle. Edwards (1996) looked at health records for feedlot cattle over a period of 16 years and the level of morbidity was determined to be 8%. Vogel and Parrot (1994) reported the average mortality rate for feedlot cattle to range from 1 to 1.3% for the feeding period or a monthly death loss 0.267% of capacity (i.e. 27 deaths for each 10,000 head of cattle on feed). Loneragan et. al. (2001) also evaluated trends in feedlot mortality ratios over time and reported a mortality ratio of 12.6 deaths /1,000 cattle entering the feedlot.

Several studies have looked at the effect of metaphylaxis on the health of high risk calves. Metaphylaxis is defined as the timely mass medication of an entire group of animals to eliminate or minimize an expected outbreak of disease. Guthrie et. al. (2004) evaluated the effect of Tilmicosin on the health of high risk northern calves. High-risk calves can be defined as light weight, commingled, long-haul cattle with unknown health history. The results of their study suggest that metaphylactic treatment with Tilmicosin at processing decreases morbidity and increases days to first treatment in high-risk northern calves. Morbidity due to BRD was significantly reduced in the treated versus the untreated calves (25.5% versus 56.5%). Days to first pulls were significantly greater for the metaphylaxis group than the control group (13.9 versus 9.6 days). Brazle (1994), in another study utilizing Tilmicosin on long-haul Alabama calves reported that calves receiving the Tilmicosin at arrival versus calves that did not receive an antibiotic at arrival had a significant reduction in mortality of 1.2 versus 8.1% and a significant reduction in morbidity of 59.7 versus 75.5%. Coe (2002) in a similar study conducted with Missouri calves, reported similar results. Calves receiving metaphylaxis had a lower percentage of animals treated for respiratory disease (30.0 versus 68.7%) and an increase in the days to first treatment.

Understanding morbidity, mortality, and factors which aid in reducing the incidence of treated or dying cattle is important. Effective preconditioning programs are directed toward improving the health of cattle as they progress through their production cycle.

Cattle Performance

Studies which evaluate the relationship between health and animal performance are also very useful. A few of the studies which have considered the impact of disease on performance will be discussed briefly.

Wittum (1996) evaluated the relationship of treating cattle for respiratory disease and associated weight gain. He found no association between treatment for respiratory disease and effects on mean daily gain. There was an association between lung lesions at slaughter and weight gain. Pulmonary lesions at slaughter were associated with a 0.167 lb reduction in average daily gain (ADG). In these studies the percentage of cattle with lung lesions at slaughter was much greater than the percentage of cattle treated for respiratory disease. This study indicates that the number of cattle identified as sick and treated in a feedlot may be much lower than the actual number of cattle which experience respiratory disease while on feed.

A study by Gardener et. al. (1996) evaluated the economic impact of respiratory disease on fed cattle. Cattle with no lung lesions at slaughter were found to have a $20 higher net return per head when compared to cattle with inactive lung lesions. Cattle with active lung lesions noted at slaughter had a $70 lower net return per head than cattle with no lesions.

Factors known to significantly contribute to profit for fed cattle are: fed cattle sales price, feeder cattle purchase price, corn prices, feed conversions (FC), ADG, and interest rates. Price risk accounts for 85% of profit variability and animal performance accounts for 5 to 10% of profit risk (Schroeder et. al 1993).

Albright et. al. (1994) evaluated variables that impact the cost of gain (COG) for feedlot cattle. Corn prices, FC, and ADG were found to explain 92 to 94% of the variability in COG.

Analysis of pen level data from customer close out sheets from two Western Kansas feedyards provides quantative data on the effects that adverse health has on fed cattle performance. Animal health was found to have a significant effect on the performance of feedlot cattle. As the incidence of disease (measured by mortality or treatments) increased, the performance and profitability of cattle decreased. For pens of cattle in this study, percent mortality or the percent of treatments had the most impact on animal performance. Either of these animal health parameters (mortality or treatments) significantly impacted FC, ADG, and the added costs (AC) component of COG (Irsik unpublished data).

An analysis of this data provided some helpful thumb rules for correlating animal health to pen-level performance.

1. Feed Conversion: As cattle died within a pen the feed conversion ratio was found to increase by 0.27 lb for each percentage increase in death loss.

2. Average Daily Gain: Average daily gain decreased by 0.08 lb for each percentage increase in death loss.

3. Added costs (COG): Added costs increased by $1 per head for each percentage increase in cattle dying within a pen.

4. Mortality: Death loss for a pen of cattle can be estimated by multiplying the percent treated by 0.14. For every treatment administered in a pen of cattle, death loss was found to increase by 0.14%. When 10% of the cattle in a pen were treated death loss would be estimated at 1.4%.

The mortality model utilizing treatment data provides insight into the impact of treatments on FC, ADG, and the AC portion of COG. The data and models from this study suggest that if no animals are treated FC would be 6.34, ADG would be 3.32 lb, and AC would be $22.86. Conversely, using the same model with all of cattle receiving treatment, FC would be 10.24, ADG would be 2.06 lb, and AC would be $37.51. This difference in the number of cattle treated would result in COG values ranging from $50.13/cwt if no animals were treated to $85.66/cwt if all cattle were treated, a $35 cost per cwt. of gain difference. Cattle in this study gained on average 500 lb for the feeding period. At a $35 cost per cwt of gain difference there could be as much as $175 difference in the cost per head between pens where no animal were treated versus a pen in which all the cattle were treated. On a pen level basis with an average head count of 80 head, the difference in cost would be estimated at $14,000.

Conclusion

The cattle feeding industry in the United States is a capital intensive, high-risk business, which relies heavily on economies of scale to minimize costs and maximize returns. Profit margins for fed cattle are often small and variable while losses can be large. One of the tools cattle feeders utilize in managing economic risk is evaluating or estimating the performance of fed cattle and then applying that knowledge to cattle currently on feed or on future purchases of cattle to be fed. While animal performance is not the major determinant of cattle feeding profitability, it does have an affect on cattle feeding profitability. Steps taken to minimize adverse health will enhance cattle feeding profitability and animal performance. Information provided in this paper should assist producers when evaluating feeder cattle. It should encourage producers to prepare young cattle for future production, with many of these animals eventually being placed on feed.

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Table 1. Percentage of all cattle placed that developed the following disease conditions after arrival by feedlot capacity.

	Feedlot capacity (number head)					
	1,000-7,999		8,000 or more		All feedlots	
Disease	%	Std. Er.	%	Std. Er.	%	Std. Er.
Respiratory	8.7	0.7	15.5	4.7	14.4	4.0
AIP[a]	2.9	0.4	3.1	0.4	3.1	0.3
Digestive	1.1	0.1	2.0	0.3	1.9	0.3
Bullers	1.4	0.2	2.3	0.4	2.2	0.3
Lameness	1.3	0.2	2.0	0.9	1.9	0.8
CNS[b]	0.3	0.1	0.4	0.1	0.4	0.1

[a]Atypical interstitial pneumonia.
[b]Central nervous system.
Source: USDA, National Animal Health Monitoring System (1999).

Table 2. Average medicine costs to treat one sick animal for disease conditions by feedlot capacity.

	Feedlot capacity (number head)					
	1,000 – 7,999		8,000 or more		All feedlots	
Disease	Cost	Std Er.	Cost	Std Er.	Cost	Std. Er.
Respiratory	$11.09	$0.62	$16.26	$0.77	$12.59	$0.49
AIP[a]	$11.87	$0.48	$16.49	$0.86	$13.33	$0.48
Digestive	$6.14	$0.83	$6.27	$0.36	$6.19	$0.56
Bullers	$0.86	$0.18	$1.55	$0.23	$1.10	$0.14
Lameness	$7.03	$0.17	$9.24	$0.55	$7.68	$0.53
CNS[b]	$11.61	$1.02	$11.29	$0.71	$11.50	$0.72

[a]Atypical interstitial pneumonia.
[b]Central nervous system.
Source: USDA, National Animal Health Monitoring System (1999).

Table 3. Pre-arrival management.

Management Practice	% operations — Level of effectiveness: Extremely effective	Very effective	Somewhat effective	Not effective	Does not apply	Don't know	Total
	Response percentage / STD error	Response percentage / STD error	Response percentage / STD error	Response percentage / STD error	Response percentage / STD error	Response percentage / STD error	%
Introduction to feed bunk	22.6 (1.7)	42.2 (2.2)	17.4 (1.8)	3.4 (0.9)	6.1 (1.4)	8.3 (1.4)	100
Resp. vaccines give 2 wk prior to weaning	27 (2.0)	38.8 (2.2)	11.8 (1.6)	0.7 (0.9)	9.5 (1.5)	12.2 (1.6)	100
Resp. vaccines give to calves at weaning	18.7 (1.6)	32.5 (2.1)	21.7 (1.9)	1.6 (0.4)	10.4 (1.7)	15.1 (1.7)	100
Calves weaned at least 4 wk prior to shipping	32.4 (2.0)	34.8 (2.1)	9.9 (1.5)	1.0 (0.3)	11.6 (1.8)	10.3 (1.4)	100
Calves castrated and dehorned 4 wk prior to shipping	31.7 (2.1)	33.5 (2.1)	9.1 (1.2)	1.2 (0.4)	12.9 (1.7)	11.6 (1.6)	100
Calves treated for internal and external parasites	8.0 (1.0)	28.6 (2.1)	27.9 (1.9)	5.4 (0.9)	10.7 (1.6)	19.4 (2.0)	100

Source: USDA National Animal Health Monitoring System (1999).

Notes: