Preconditioning beef calves is an economic "no-brainer"

Oliver C. Schunicht, DVM
Feedlot Health Management Services Ltd., PO Box 140, Okotoks, AB T1S 2A2 Canada

Abstract

The concept of preconditioning of beef calves has been around for a long time. However, the uptake of this management method has been slow. Reported benefits of preconditioning are improved health, improved feedlot performance, and improved economic returns to both cow-calf and feedlot operators. A critical review of the literature on the benefits of preconditioning reveals mixed results. The decision to precondition calves requires careful economic modeling and may not be economically feasible for all cow-calf operations.

Key words: beef, calves, preconditioning, backgrounding

Résumé

Le concept de pré-conditionnement des veaux de boucherie existe depuis longtemps. Toutefois, l'adoption de ce type de gestion a été lente. Les bénéfices établis du pré-conditionnement incluent une meilleure santé, une meilleure performance au parc d'engraissement et un meilleur rendement économique pour les exploitants de parc d'engraissement et d'élevages allaitants. Un examen critique de la littérature concernant les bénéfices du pré-conditionnement révèle des résultats mitigés. La décision d'opter pour le pré-conditionnement des veaux demande une modélisation économique méticuleuse et peut ne pas être économiquement viable pour tous les élevages de bovins allaitants.

Introduction

The concept of "preconditioning" beef calves has been discussed, debated, tried, and tested since the late 1960's. Generally, the term preconditioning has been used to describe management practices implemented prior to and around the time of weaning to improve the calf's immune system and minimize stress to ultimately decrease morbidity and mortality associated with bovine respiratory disease (BRD), improve feedlot performance, reduce treatment costs, improve beef quality, and finally add value to the to the entire beef production system. Preconditioning may involve vaccination of calves against some of the known etiological viral and bacterial pathogens associated with BRD, temporal separation of stressful events (weaning, castrating, dehorning), and/or acclimatization of the calves to feedlot conditions (bunks, water troughs, and feedlot diets). However, the specific definition of what constitutes "preconditioning" varies greatly and is not well defined. This in part may be a contributing factor of why the debate over the benefits of preconditioning still exists today.

Literature Review

A review of the literature on this topic results in many articles and case studies estimating the potential positive economic benefits of preconditioning calves over the years:

- Cravey calculated a net economic benefit of $55.93 to $60.72 per head for preconditioned calves;[4]
- Roeber calculated a net return of $46.83 and $49.54 per head for calves enrolled in 2 certified preconditioning programs;[12]
- Dhuyvetter calculated a $14.00 per head benefit and suggested that the premiums paid for preconditioned calves will likely increase as the quality and integrity of the programs increase;[5]
- Feuz estimated a $23.50 per animal advantage;[6]
- Thrift estimated that the net profit for cow-calf producers ranged from -$89.92 to $53.71 per preconditioned calf;[15] and
- Hilton summarized a 10 year Indiana study that demonstrated that preconditioning for 60 days or more generally produced $80.17 profit.[7]

With these positive estimates of net returns, why is it then that the adoption of preconditioning by the beef industry has been so painfully slow? Accurate estimates of the percentage of calves that are preconditioned each year in the United States (US) and Canada are difficult to find. Superior Livestock estimated that in 2007 25% to 50% of their sales were preconditioned calves,[9] but this is a small subset and it is unclear whether this is representative of overall industry numbers. A United States Department of Agriculture (USDA) National Animal Health Monitoring System (NAHMS) report in 2007-08 reported that 49.8% of the cow-calf producers sold calves immediately at weaning,[16] which could lead to the assumption that 50.2% are retained after weaning and preconditioned. However, the same NAHMS report stated that 60% of beef operations did not vaccinate beef calves for respiratory disease from birth to sale, suggesting that retention of calves after weaning does not necessarily indicate that they were preconditioned. Canfax reported that in 2014 that 9% of cow-calf producers in Western Canada preconditioned their calves.[1] Taken together, the best available estimates indicate that the majority of calves in North America are not preconditioned. Why not? Does preconditioning not "work" nor "pay"?

There are many reports in the literature of the subsequent health benefits of preconditioning beef calves. In

a review by Cole in 1985, preconditioned calves had an approximately 6 percentage point reduction in morbidity associated with BRD (26.5% vs 20.4%) and a 0.7 percentage point reduction in mortality (1.44% vs 0.74%) as compared to calves that were not preconditioned.[3] A 1996 Texas study reported a lower per head treatment cost ($13.74 vs $30.66) and a lower death loss (0.5% vs 2.6%) in preconditioned calves.[4] Likewise, Roeber et al and Lalman et al reported reductions in morbidity and mortality in preconditioned calves vs non-preconditioned calves (35% vs 77% and 1.1% vs 11.4%)[13] and (7% vs 29% and 0.1% vs 3.0%), respectively.[9] Macartney et al reported on the health performance of feeder calves sold at conventional auctions vs special auctions of vaccinated and conditioned calves in Ontario, Canada.[10] In this study, subsequent feedlot morbidity in preconditioned calves, vaccinated calves, and conventional calves was 3.9%, 13.7%, and 20.2%, respectively. In contrast, Pritchard and Mendez reported that there were very little differences in morbidity between treatment groups in their study where calves from the same ranch were randomly assigned to either preconditioned or non-preconditioned (21% vs 19% Exp. 1 and 45% vs 47% Exp. 2).[11] Interpretation of studies reporting on the benefits of preconditioning is very difficult due to a number of confounding factors. Often source (ranch of origin, genetics, and management practices) may differ between preconditioned calves and non-preconditioned calves and confound the results of the study. Lack of uniformity in the definition of what constitutes "preconditioning", lack of statistical analyses or inappropriate statistical analyses, lack of blinding or masking of the individuals conducting the study, differences in how preconditioned calves (direct to feedlot) versus non-preconditioned calves (indirect - auction barn feedlot) are marketed, all need to be considered, and often confounds the results of the studies. An additional point to consider is that the reported morbidity and mortality is often subsequent to the preconditioning phase, and does not account for any sickness and death loss that had occurred at the cow-calf operation prior to and during the preconditioning phase.

The reported benefits of preconditioning on subsequent feedlot performance have been mixed. Karren et al reported that the average daily gain (ADG) of preconditioned calves was 1.10 lb (0.50 kg)/d to 1.76 lb (0.80 kg)/d more than "regular calves" in year 1 of their study, similar in year 2, and 0.46 lb (0.21 kg)/d to 0.57 lb (0.26 kg)/d more in year 3.[8] Cravey reported that feedlot ADG of preconditioned calves was 2.88 lb (1.31 kg)/d vs 2.59 lb (1.17 kg)/d for non-preconditioned calves.[4] Roeber et al reported inferior subsequent feedlot ADG in preconditioned calves (3.55 lb (1.61 kg)/d vs 3.73 lb (1.69 kg)/d).[13] Pritchard and Mendez reported similar ADG (3.02 lb (1.37 kg)/d vs 3.06 lb (1.39 kg)/d) and inferior feed:gain (6.44 vs 6.24) for preconditioned calves vs non-preconditioned calves, respectively.[11] Differences in weighing conditions or shrink in preconditioned calves vs direct-weaned calves may confound these results in addition to the factors discussed in the previous paragraph.

Premiums paid for preconditioned calves vary as well. A summary of Superior Livestock video auctions illustrated that the premium for certified weaned and vaccinated calves (preconditioned) has increased from $0.25/100 lb (45.5 kg) bodyweight (BW) in 1994 to $12.06/100 lb (45.5 kg) BW in 2012.[9] In Canada, the preconditioning premiums are lower than the US and ranged from $0.53 to $6.88/100 lb (45.5 kg) BW between the years 1980 and 1987.[14] A more current study by Carlberg et al reported a $5.88 to $7.97/100 lb (45.5 kg) BW premium for preconditioned calves at 2 auction markets in Alberta.[2] Again, there are likely confounding factors that contribute to the wide range of reported premiums.

Discussion

What conclusions can a producer and their veterinarian make about preconditioning calves when reviewing the literature? It works? It doesn't work? It pays? It doesn't pay? All studies have limitations, and thus valid conclusions are difficult to make. It is easy to criticize individual studies and point out the limitations of the reported results, but to conduct the "perfect study" is not easy. Do you randomize calves within an individual ranch to either a preconditioning program or to a conventional wean-and-market program? Do you need to block calves by management groups (mature cows vs first-calf heifers) and then randomize calves to experimental group? Can you match ranches with genetically similar calves and then randomize individual ranches to either a preconditioning program or not? Do you market both experimental groups directly to the feedlot or through auction markets? How do you accurately follow all production variables and costs through the entire preconditioning and feedlot period over a wide variety of operations? The logistics of conducting this "perfect study" can become overwhelming. Conducting this study at several large ranches may make the logistics easier, but are the results externally valid? Consider the following example: the average number of beef cows per operation in North America is approximately 50 to 60 cows. Assuming that half of the calves will be steers and half will be heifers and within each gender there will be a heavy group, a medium group, and a light group which will likely be fed separately through the feedlot phase. This means that the average group size will be 7 to 10 animals. Feedlot pen sizes in North America range from load size lots of 70 to 80 animals per pen to pens containing 300 to 400 animals, or more. To fill these pens with groups of 7 to 10 calves from "average size" cow-calf operations would imply that there will be extensive comingling of calves. Do the potential health and production benefits of preconditioning calves become overwhelmed when comingling calves to this degree? What effect does the amount of comingling have on BRD morbidity and mortality?

Feedlot Health Management Services had the opportunity to conduct a retrospective study on a population of approximately 22,000 high-risk calves that entered into a

commercial feedlot in Alberta in the fall of 2004. Individual national identification tag numbers (Canadian Cattle Identification Agency tags) were submitted to the Canadian Food Inspection Agency (CFIA) to determine the number of herds of origin. To maintain confidentiality, the herds of origin (HOO) were coded by CFIA as HOO1, HOO2, etc. Combining these data with the individual-animal mortality data, the relative risk of various factors thought to be associated with pen-level BRD mortality were calculated. It was not surprising that as comingling increased, as proxied by the number of processing groups per pen or by the number of HOOs per pen, BRD mortality increased (Table 1). Pens of calves that had greater than 6 HOOs per 100 animals in the pen had a risk of BRD mortality that was 5.2 times higher than pens with less than 6 HOOs per 100 animals in the pen. An unanswered question from this data set is "would this large increase in BRD mortality risk still be observed if all of these calves had been preconditioned?"

The ultimate decision of whether or not to precondition calves for each cow-calf operation should be based on economics. Each cow-calf operation needs to estimate the potential benefits of preconditioning and have a good idea of the costs associated with the program to determine if it would be economically advantageous for their operation. The variables that need to be considered can be divided into 2 major groups: price-risk variables and production-risk variables. Price-risk variables include market price at weaning, market price at the end of the preconditioning period, estimated precondition premiums, price slide for selling heavier calves, seasonality in market price, and overall market trends. Production risk variables include feed costs, bedding costs, yardage costs, induction and therapeutic costs, and mortality costs. Economic models that can incorporate all of these variables are needed to determine the potential profitability of preconditioning. Understanding how variables such as average daily gain (ADG), feed conversion, and length of the preconditioning program affect the production risk variables is very important. Table 2 illustrates the impact of ADG on the cost of gain and the profitability of preconditioning program.

Moderately increasing the ADG from 1 lb/d to 2 lb/d substantially increases the profitability of preconditioning. Cow-calf operators and their veterinarians need to become familiar with economic models to better understand the impact of how changes in price and production variables affect the overall profitability of the preconditioning program. Updated parameter estimates need to be incorporated into these models as they become available to ensure that the best information is used to calculate the potential profitability of preconditioning.

Summary

The decision of whether or not to precondition calves is not simple or a "no brainer". Individual variations of cow calf operations in terms of size, infrastructure, available resources (feed, labor, financial), marketing strategies, risk tolerance, and percentage contribution of the livestock enterprise to the overall farming operation need to be considered. In addition, yearly reassessment of this decision at each operation needs to conducted to ensure that the decision to precondition or not, is made with current market prices for cattle, feed, and other input costs.

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Table 1. 2004 fall calves: Multivariable model of factors associated with BRD mortality (clustering controlled for processing groups nested in lots)

		Relative Risk	95% Confidence Limits		*P*-values
Sex	Heifers vs steers	1.35	1.03	1.79	0.032
Number of processing groups in intervention group	13-27 vs 9-12	1.48	1.14	1.94	0.004
	13-27 vs 1-8	1.98	1.41	2.77	<.0001
	9-12 vs 1-8	1.33	0.94	1.89	0.108
Cattle source*	OCB vs small sources	2.61	1.41	4.83	0.002
	OCB vs other auction	2.07	1.18	3.64	0.011
	Small sources vs other auction	0.79	0.56	1.13	0.200
Is animal AF?**	Yes vs no	1.43	1.02	1.99	0.037
AF's in processing group**	Any vs none	1.66	1.19	2.30	0.003
Avg. weight of processing group (lb)	< 660 vs > 660	2.19	1.52	3.14	<.0001
Herd of origin (number per 100 in lot)	> 6 vs ≤ 6	5.20	1.56	17.31	0.007

*OCB = 1 specific cattle buyer; Small sources = sources of <1% of cattle; Other auction = other auction sources providing >1% of cattle
**AF = arrival fever

Table 2. Impact of ADG on cost of gain and profitability.

Variables	Scenario 1	Scenario 2	Scenario 3
Weaning weight, lb	500	500	500
Market price at weaning, $/lb	$2.00	$2.00	$2.00
Calf value at weaning	$1,000.00	$1,000.00	$1,000.00
End of preconditioning weight, lb	560	620	680
Market price at sale, $/lb	$1.94	$1.88	$1.82
Preconditioning premium, $/lb	$0.05	$0.05	$0.05
Market decline, $/lb	-$0.05	-$0.05	-$0.05
Price slide, $/lb	-$0.0010	-$0.0010	-$0.0010
Value of preconditioned calf	$1,086.40	$1,165.60	$1,237.60
ADG lb/d	1	2	3
Preconditioning period (days)	60	60	60
Hay, lb/d (as fed)	14.5	10.8	3.1
Barley, lb/day (as fed)	0.00	5.10	12.40
Hay price, $/ton (as fed)	$135.00	$135.00	$135.00
Barley price, $/ton (as fed)	$175.00	$175.00	$175.00
Dry matter intake:gain	12.62	6.92	4.50
Total feed costs	$58.73	$70.52	$77.66
Feed cost of gain (COG)	$0.98	$0.59	$0.43
Yardage $0.50/hd/d	$30.00	$30.00	$30.00
Vaccinations, implants, deworming	$10.00	$10.00	$10.00
Therapeutic costs	$3.00	$3.00	$3.00
Bedding	$3.00	$3.00	$3.00
Mortality cost (0.5% death loss)	$5.00	$5.00	$5.00
Total COG	$1.83	$1.01	$0.71
Total production costs	$111.55	$122.53	$129.37
Net Revenue of Preconditioning	-$25.15	$43.07	$108.23

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