Preconditioning Calves for the Feedlot

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Preconditioning of feeder calves to reduce feedlot morbidity has been highly publicized for many years. In brief, preconditioning can be described as a comprehensive management system designed to immunize calves against some major pathogens involved in the bovine respiratory disease complex and to reduce the stressors encountered by feeder calves at marketing. The term preconditioning has many definitions in the cattle industry. As defined by the American Academy of Bovine Practitioners,[1] preconditioning consists of the following elements, all done at the farm-of-origin and certified by a veterinarian:

1. Calves weaned at least 3 weeks before sale.
2. Calves trained to eat from a feed bunk and to drink from a trough.
3. Calves treated for parasites.
4. Calves vaccinated for blackleg, malignant edema, parainfluenza-3 virus (PI-3), infectious bovine rhinotracheitis virus (IBR), *Pasteurella*, and sometimes bovine viral diarrhea virus (BVD) and *Haemophilus somnus*.
5. Calves castrated and dehorned.
6. Calves identified with an ear tag.
7. Calves sold through special auctions.

Information from surveys and testimonials has suggested that preconditioning of feeder calves will do the following:

1. Increase on-farm weight gain.
2. Reduce market-transit shrink.
3. Improve feedlot performance.
4. Reduce feedlot morbidity and mortality.
5. Increase profits for producer and feeder.

The purpose of this article is to summarize the controlled research data in which preconditioned calves are compared to a controlled group of non-preconditioned calves. Owing to the known effects of farm-of-origin on calf health and performance,[15] only those experiments in which controls and preconditioned calves originated from the same farms were included in this review.

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Table 1. *Influence of Preconditioning or Preweaning Only on Weight Gains of Calves at the Farm-of-Origin (kg per Head per Day)*

REFERENCE	DAYS	TREATMENT		DIFFERENCE	DMI*
		Control	*Weaned*		
			Preconditioned		
11	45	.80	.87	.07	—
11†	45	.40	.22	−.18	—
22	20	.66	.50	−.16	5.73
14	28	.35	.35	.0	4.14
20	84	.84	.84	.0	—
9	30	.47	.56	.09	4.54
Mean	—	.59	.56	−.03	4.82
			Preweaned Only		
10‡	30	.33	.36	.03	—
2	30	.50	.67	.17	4.54
3	30	.97	1.14	.17	3.95
4	30	.90	.70	−.20	—
Mean		.67	.72	.05	4.27
Overall mean§		.69	.70	.01	4.59

*Dry matter intake (kg per head per day).
†Preconditioned calves were limit fed.
‡Preweaned calves were left on pasture.
§Mean includes only trials in which preweaned or preconditioned calves were fed a 50 per cent concentrate diet (or greater) ad libitum.

OBSERVATIONS

On-Farm Weight Gains and Marketing-Transport Weight Losses

The effects of preconditioning or preweaning on weight gain of calves at the farm-of-origin are presented in Table 1. Preweaned calves gained on the average about the same weight as calves left with their dams. Studies[12,17] indicate that calves require about 12 days to regain their initial weight after weaning. Thus, during a 28-day preconditioning period, only the last 16 days will be used by the calf to increase its weight. Preweaned calves required about 8.3 kg of feed dry matter for each kg of weight gained at the farm-of-origin (Table 2). However, if the weight gains are compared to those

Table 2. *Feed Efficiency of Preweaned Calves at the Farm-of-Origin*

REFERENCE	TOTAL GAIN (kg)		EXTRA GAIN (kg)*	
	Gain	*F/G*	*Gain*	*F/G*
22	10	11.4	−3	—
14	10	11.6	0	—
9	17	8.0	3	45.7
2	20	6.8	5	27.2
3	34	3.5	5	23.6
Mean	18.2	8.26	2.4	51.7

*Gain of preweaned calves in excess of weight gained by control calves left on their dams.

Table 3. *Weight Losses of Preconditioned, Preweaned, and Control Calves that Passed Through the Same Marketing Channels*

REFERENCE	HOURS IN TRANSIT	WEIGHT LOSS			
		Control		*Treated*	
		kg	*%*	*kg*	*%*
		Preconditioned			
23	128	24	11.4	24	11.4
14	30	21	10.0	28	12.4
14	3	6	2.7	12	5.4
20	3	7	2.9	8	3.3
8	20	—	6.7	—	6.2
9	3	—	5.7	—	4.4
Mean		14.5	6.57	18.0	7.18
		Preweaned Only			
2	26	23	10.8	25	11.4
3	26	29	13.0	27	12.5
4	26	32	14.3	29	13.7
Mean		28	12.7	27	12.5

of unweaned calves left with their dams, preweaned calves required about 52 kg of feed dry matter for each kg increase in weight gain over unweaned calves.

It has been observed that on some farms preweaned calves will significantly outgain control calves left with their dams, whereas just the opposite is true on other farms. These farm differences could be due to differences in grass conditions and/or milk production of cows. One may assume that when grass is in short supply or of poor quality and cows are milking poorly, preweaned calves would outperform calves left with their dams. However, when plenty of high-quality grass is available and cows are milking well, preweaned calves would probably perform more poorly than calves left with their dams.

The effects of preweaning and feeding on market-transit weight losses are presented in Table 3. When unweaned control calves and preweaned calves were subjected to the same marketing channels, total weight losses were similar. Trials at this station[4] indicate that preweaned calves will consume more feed at the order-buyer facility than freshly weaned calves and, thus, lose less weight during marketing (auction and order-buyer). During transit, however, preweaned calves lose more weight, probably owing to their greater gut fill.

FEEDLOT PERFORMANCE AND HEALTH

During the first 30 to 45 days in the feedlot, preweaned calves generally consume more feed and gain more weight than control calves (Table 4). By 100 days in the feedlot, however, control and preweaned calves have similar daily gains (Table 5). Few trials were available to compare the effects of preweaning or preconditioning on feedlot feed conversion (kg feed dry matter

Table 4. *Performance of Preconditioned, Preweaned, and Control Calves During the First 30 to 45 Days in the Feedlot*

REFERENCE	DAILY GAIN (kg)		DMI*	
	Control	*Treated*	*Control*	*Treated*
	Preconditioned			
11	1.07	1.31	—	—
9	0.89	0.95	—	—
25	0.50	0.84	—	—
22	0.98	0.95	—	—
20	0.67	0.92	8.3	8.1
8	1.16	1.31	6.6	7.0
Mean	0.88	1.05	7.45	7.55
	Preweaned Only			
2	1.04	1.14	5.5	6.0
3	1.12	0.95	7.0	7.6
4	1.08	1.31	6.7	8.0
Mean	1.08	1.13	6.4	7.2

*Dry matter intake (kg per head per day).

consumed per kg weight gained) (see Table 5). In all trials of longer than 100 days, preweaned calves had equal or poorer feed conversions than control calves. This could be due to compensatory gain in the control calves.

Preconditioning reduced feedlot morbidity about 6 percentage units or about 23 per cent compared to controls (Table 6) in the trials reviewed. Preweaning alone reduced morbidity about 17 per cent. Preconditioned calves had a higher morbidity rate than control calves in one of seven trials.[9] In that trial, the preconditioned calves were vaccinated at weaning.

Preconditioning reduced feedlot mortality 0.7 percentage units in the trials reviewed. Preweaning alone reduced feedlot mortality about 0.4 percentage units. Two trials have reported on-farm death losses of 1.0 to 1.9 per cent in preconditioned calves due to bloat, acidosis, and surgical infections.[14,20] Although few trials report the effects of preconditioning or pre-

Table 5. *Influence of Preweaning or Preconditioning on Performance of Calves over Entire Feeding Period*

REFERENCE	DAYS FED	DAILY GAIN (kg)		F/G	
		Control	*Treated*	*Control*	*Treated*
11	252	0.97	0.97	7.85	8.00
9	204	1.15	1.15	—	—
25	130	0.50	0.54	—	—
14	200	0.92	0.97	8.31	8.34
2	211	1.15	1.10	5.89	6.40
3	186	0.98	0.97	8.10	8.50
4	184	1.10	1.10	6.90	7.50
10	210	1.09	1.12	—	—
Mean	197	0.98	0.99	7.41	7.75
Preconditioned	196	0.88	0.91	8.08	8.17
Preweaned only	198	1.08	1.07	6.96	7.47

Table 6. *Influence of Preconditioning or Preweaning on Feedlot Morbidity and Mortality (per cent)*

REFERENCE	MORBIDITY		MORTALITY	
	Control	*Treated*	*Control*	*Treated*
		Preconditioned		
9*	16.4	20.2	2.5	0.0
9†	16.4	9.6	2.5	1.9
24	23.8	21.5	1.4	0.8
25	73.0	63.0	0.0	1.3
23	12.0	4.0	0.0	0.0
14	23.0	7.0	2.5	0.0‡
20	NR§	NR	NR	NR¶
8	20.9	17.2	1.2	1.2
Mean	26.5	20.4	1.44	.74
		Preweaned Only		
2	53.3	51.1	3.3	2.2
3	53.7	51.6	1.1	1.1
4	51.1	28.9	0.0	0.0
Mean	52.7	43.9	1.47	1.10

*Vaccinated 30 days before weaning.
†Vaccinated at weaning.
‡1 per cent death loss at farm.
§Not reported, but no significant difference.
¶1.9 per cent death loss at farm.

weaning on morbidity and mortality at the farm-of-origin, data from these trials suggest that when calves are preconditioned, the cow-calf producer may experience more health problems, especially if he is unfamiliar with feeding calves.

The results of controlled experiments and surveys on preconditioning are very contradictory (Table 7). Both controlled studies and surveys report that preconditioned calves will gain 10 to 30 kg during the last 28 days at the farm-of-origin. Many surveys, however, fail to consider that unweaned calves left with their dams will gain a similar amount of weight. Although surveys often report improved feedlot performance in preconditioned calves, these reports are often speculative, for there is no true control group with which to compare. Most surveys compare preconditioned calves that did not pass through an order-buyer facility to groups of calves that passed through an order-buyer facility (that is, normal calves). These differences in

Table 7. *Comparison of Surveys and Controlled Experiments*

ITEM	SURVEY	CONTROLLED
Farm gain	+10 to 30 kg	NE*
Shrink	−5%	NE
Feedlot gains	+	NE
Feed conversion	−	NE
Morbidity	−20 to 30%	−6%
Mortality	−0 to 1.7%	−0.7%

*No effect.

Table 8. *Estimated Cost to Precondition a Calf for 30 Days Excluding Facility Costs*

ITEM	AMOUNT/HEAD	$/UNIT	$/HEAD
Feed	127 kg	0.165 ($150/ton)	20.96
Vaccines	—	—	3.00
Wormer	1 dose	1.20	1.20
Grubacide	1 dose	0.50	0.50
Labor	2.0 hr*	4.00	8.00
Veterinarian	.05 hr*	50.00	2.50
Antibiotic	10.0%	10.00/head	1.00
Death loss	0.4%	1.54/kg	1.12
Interest	15.0%	—	.48
			38.76

*Meyer, K.B., Beeson, W.M., and Armstrong, T.H., Observations on the preconditioning of feeder cattle. Indiana Cattle Feeders Day, Purdue University, March, 1971, pp. 5–8.

length of time in the marketing channel may account for the differences in shrink, morbidity, and mortality noted between surveys and controlled studies.

ECONOMICS

A list of reasonable costs to precondition a calf is presented in Table 8. These costs, of course, will vary substantially based on ration and labor costs. These cost figures assume the producer has facilities to work cattle, to feed calves separated from the cows, and to store and handle feed. Of the total cost of $38.76, about 50 per cent is feed and about 20 per cent is labor.

When the cow-calf producer chooses to precondition calves, he must decide if he wants to wean them at the usual time and then feed them for 21 to 45 days or if he wants to wean them earlier than normal and sell them at the usual time. If he weans the calves early, he cannot always expect to sell heavier calves, for they will often gain about the same amount of weight as calves left on the cow. If he holds them an extra 28 days, he can expect to sell about an 18-kg heavier calf (see Table 1). If the producer weans his calves early, he will require a bonus price of about $21 per 100 kg ($9.69 per 100 lb) to break even (Table 9). If he holds his calves an extra 28 days, he will need a bonus price of about $5.50 per 100 kg ($2.51 per 100 lb) to break even.

Using the values shown in Table 10, the economics of using preconditioned calves in a stocker program (Table 11) or the feedlot (Table 12) were calculated assuming the feeder or stocker paid the break-even bonus required by the cow-calf producer. These values are based on testimonial data from the popular press articles and the differences between control and preconditioned calves is greater than that obtained in controlled experiments. In a 120-day stocker program (see Table 11), preconditioned calves may be heavier than non-preconditioned calves after 120 days, but their higher purchase price would result in a higher break-even cost for the stocker. In the feedlot (see Table 12), preconditioning would reduce the cost of feed

Table 9. *Economics of Preconditioning Calves: Cow-Calf Producer*

ITEM	VALUE OR COST ($)	
	Early Weaned	*Normally Weaned*
Calf (182 kg)	280.28	280.28
Preconditioning	38.76	38.76
Total cost	319.04	319.04
Sold: 182-kg calf	280.28	—
Sold: 200-kg calf*	—	308.00
Difference†	38.76	11.04
Bonus: $/kg†	0.213	0.055
$/100 lb†	9.69	2.51

*Gain of 18 kg over 28 days.
†Bonus required for cow-calf producer to break even financially.

and medicine slightly, but the higher purchase price and additional interest cost would result in a higher break-even cost to the feeder.

POTENTIAL MODIFICATIONS AND ALTERNATIVES

A total preconditioning program can be broken down into three major portions: (1) vaccination, (2) surgery, and (3) feeding. The probable effects of doing each of these procedures at the farm-of-origin rather than at the feedlot are presented in Table 13. Because numerous interactions occur, these values cannot be added together to obtain a single value.

The extensive review by Martin (1983)[9a] concluded that vaccination of calves for the major viruses and bacteria involved in bovine respiratory disease did not reduce the incidence of the disease or improve calf performance. Most of the vaccines and bacterins studied were developed prior to

Table 10. *Cost Figures and Assumptions Used in Economic Analysis*

ITEM	NONPRECONDITIONED	PRECONDITIONED
Head purchased	100.0	100.0
Purchase weight (kg)	182.0	182.0 or 200.0
Purchase price ($/kg)*	1.54	1.54
Bonus paid	none	break even
Feed cost ($/kg)†	0.165	0.165
Death loss (%)	2.0	0.0
Morbidity (%)	50.0	20.0
ADG, stocker (kg)	1.0	1.0
Pasture charge ($/head)	40.0	40.0
Supplement ($/head)	12.0	12.0
ADG, feedlot (kg)	1.4	1.4
F/G of lot‡	7.1	7.0
Interest rate (%)§	15.0	15.0
Medical ($/head treated)	20.0	20.0

*$70 per 100 lb.
†$150 per ton.
‡Feed/gain ratio.
§Based on 100 per cent of cattle and 50 per cent of feed.

Table 11. *Economics of Using 100 Head of Preconditioned Calves in a 120-Day Stocker Program**

ITEM	NONPRECONDITIONED	PRECONDITIONED	
		Early Wean	*Normal Wean*
Average weight (kg)	182	182	200
Calf cost ($)	28000	28000	30800
Bonus ($)	—	3876	1104
Total calf cost ($)	28000	31876	31904
Pasture ($)	3940	4000	4000
Supplement ($)	1176	1200	1200
Medicine ($)	1000	400	400
Interest ($)	1502	1693	1693
Total cost ($)	35618	39169	39197
Total gain per head (kg)	120	120	120
Total gain (kg)	11760	12000	12000
Sale weight (kg)	29578	30182	32000
Break even: $/kg	1.20	1.30	1.22
$/100 lb	54.74	58.99	55.68

*See Table 10 for cost figures.

Table 12. *Economics of Using 100 Head of Preconditioned Calves in a Feeding Program*

ITEM	NONPRECONDITIONED	PRECONDITIONED	
		Early Wean	*Normal Wean*
Average weight (kg)	182	182	200
Total purchase ($)	28000	31876	31904
Feed cost ($)	33442	33850	31760
Medicine ($)	1000	400	400
Interest ($)	6365	6856	6704
Total cost ($)	68807	72982	70768
Weight sold (kg)	46773	47727	47727
Break even: $/kg	1.47	1.53	1.48
$/100 lb	66.87	69.51	67.40

*See Table 10 for cost figures.

Table 13. *Effects of Various On-Farm Procedures on Probable Calf Performance and Health**

ITEM	VACCINATE	SURGERY†	PREWEANING	LIMIT CREEP
On-farm gain	−3%	−6%	+2%	+2%
Shipping shrink	NE	?	−14%	−5%
Feedlot gain	NE	+2%	−1%	+2%
Feed conversion‡	NE	−2%	+4%	−2%
Morbidity	NE	−25%	−20%	−25%

*Expected benefit of conducting procedure at the farm rather than at the feedlot (NE = no effect). The following references were used in these calculations: 2, 3, 5, 6, 10, 12–14, 20, 21.

†Castration and/or dehorning.

‡A positive value indicates that feed conversion is poorer.

Table 14. *Effect of Limited Creep Feeding and Preconditioning on Feeder Calves**

ITEM	TREATMENT		
	Control	*Limit Creep†*	*Creep and Preconditioned*
Animals	50.0	50.0	50.0
Creep fed (kg)	0.0	39.0	39.0
P.C. ration (kg)	0.0	0.0	79.0‡
Total feed fed (kg)	0.0	39.0	118.0‡
Weaning weight (kg)	231.0	233.0	226.00
Shipping shrink (kg)	26.0	15.0	26.0
Feedlot daily gain (kg)§	0.87	1.0	0.93
Morbidity (%)¶	26.0	2.0	10.0
Days treated¶	73.0	8.0	18.0
Death loss (%)¶	2.0	0.0	0.0

*Pate, F.M., and Crockett, J.R.: Feeding calves at weaning. Florida Beef Cattle Short Course. University of Florida. May 1974.

†Calves fed 0.2 to 0.5 kg of creep feed per day for the last 24 days at the farm-of-origin.

‡Does not include greenchop fed.

§Calculated from final weight at farm.

¶Due to BRD.

1981. *Pasteurella* vaccines developed since 1981 hold some promise;[19] however, controlled field tests have not always shown positive results.[3,18]

Castration and dehorning (surgery) are very stressful to calves. When conducted at the farm, the cow-calf producer must expect some reduction in performance. Conducting these procedures at the feedlot may reduce performance up to 90 days[20] and may increase the morbidity rate.[3,6] Dehorning and castration have a similar effect on performance, but when done together the adverse effects are not additive.[3,6]

Calf gains are generally not affected by preweaning and feeding. The overall effects of preweaning on feedlot performance are small. Preweaning over a 28- to 45-day period tends to reduce feedlot morbidity.

As shown in the economic analysis, preconditioning or feeding preconditioned calves may not be economically feasible for all producers and feeders. The cost of facilities alone may be prohibitive to producers with small herds, and large producers may find the labor costs prohibitive. The bonus price required for the preconditioner to break even may not be justified by some feeders. The reduced labor required for not treating sick calves may justify the added expense to some producers.

The major factors limiting the wide acceptance and use of preconditioning by cow-calf producers are the facility, labor, and capital requirements as well as the large change from normal management procedures. Modifications of preconditioning could reduce these requirements and increase the use of the procedure by producers.

Feed is the major cost in a preconditioning program. Reducing feed costs without adversely affecting performance could make preconditioning more economically feasible. Limiting the feed intake of preweaned calves has an adverse affect on weight gain of calves[10] and does not appear to be feasible. Studies in Florida[13] indicate that limited creep feeding of calves will reduce feed and labor costs, will not affect farm weight gains, but will

improve feedlot performance and reduce calf morbidity (Table 14). Although this data is limited, it justifies further research and testing. A similar program using limited creep feeding (progressive preconditioning) has been used in Kansas with success (Garry Kuhl, personal communication).

SUMMARY

Preconditioning is a theoretically sound concept; however, it has not gained wide acceptance by cow-calf producers or feeders owing to logistics and expense. Many of the claims of preconditioning are not substantiated by controlled research data. Many of the positive claims made for preconditioning may be a result of the calves moving more rapidly through the marketing channels.[16] Although preconditioning is profitable to some producers, on the average, preconditioning is difficult to justify economically. Modifications of the preconditioning concept have the potential to make it more feasible to the majority of cow-calf producers. Any producer or feeder considering a preconditioning program or feeding preconditioned calves should first calculate an economic projection.

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