Effects of Method of Vaccination on the Performance and Health of Feeder Calves

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Introduction

Bovine Respiratory Disease Complex (BRD) has caused tremendous losses in the cattle industry by increasing the number of animals lost to death, by increasing the cost of health maintenance, and by decreasing the rate of growth and conversion of feed to gain.[9] It is now known that stress plays an important role in the etiology of BRD along with the presence of bacterial and viral agents.[4,8] The stress of weaning, handling, processing and transportation reduces the endogenous immunological response and results in the establishment of the BRD complex.[3,7,14,16,24] Reducing the amount of stress imposed on feeder calves could reduce the incidence of BRD. Johnson *et al.*[10] described a non-restraint system for the administration of IBR and BVD vaccines which reduces the stress associated with administering vaccines to feeder calves. However, data on the subsequent performance of feeder calves processed by different methods is limited. The purpose of the experiments in this paper was to determine the impact of a non-restraint vaccination method on the health and performance of feeder calves processed and transported through typical marketing systems.

Materials and Methods

The system used for these experiments utilized compressed air to propel encapsulated vaccines into the calf as it walks past the operator. The vaccination process was performed without restraint and the stress associated with restraint.

Experiment 1.

A total of four hundred and twenty steer calves (average weight, 218 kg) were purchased from auction facilities in southeastern Oklahoma during April and May of 1986, taken to a central processing facility and processed the morning after purchase. Processing included vaccination for IBR, BVD, and PI3[a], leptospira pomona and clostridal [b] by conventional methods. Bulls were castrated and all horns were tipped. After processing, the calves were maintained on warm season grass pastures for an average of 10 days. When enough calves had been amassed for 1 or 2 truck loads, the calves were shipped to the Forage and Livestock Research Laboratory near El Reno, OK in three different shipments. Upon arrival at El Reno the calves were individually weighed, identified with a glued on back tag and randomly assigned to either a conventional or ballistically processed group. The conventional group (C) were revaccinated with a MLV injectable product containing IBR, BVD, PI3[c]. The ballistically processed group were revaccinated with the same product but using the ballistic system.

Following processing, the calves within each of the 3 shipments and the two processing groups were housed in dirt lots with *ad libitum* access to hay and a mixed ration consisting of 36.4% peanut hulls, 46.2% ground corn, 8.9% soybean meal, 6.6% molasses and 1.9% minerals. Calves were observed twice daily for visual symptoms of BRD by an experienced veterinarian. After 14 days in the receiving program the calves were weighed, identified with an ear tag and moved to warm season grass pastures for an average of 108 days. Each of the eleven pastures contained an equal number of calves from each of the processing treatment groups. The body weight of each calf was recorded upon arrival at El Reno, at the end of the 14-day receiving period and at the end of the summer grazing period. The later two weights were collected after a 16-hour fast without feed and water to reduce the variaton associated with gastrointestinal fill.

Experiment 2.

One hundred and eighty three crossbred steer calves (average weight 237 kg) were purchased from a single ranch in Florida to evaluate the effect of vaccination methods at the farm of origin on health and performance feeder

[a]Triangle-3, Fort Dodge Labs, Fort Dodge, IA.
[b]UtraBac-7, Beecham Laboratories, Bristol, TN.
[c]Bioceutic, St. Joseph, MO.

This paper was inadvertently omitted from a previous issue of The Bovine Practitioner.

calves. Calves were randomly assigned to one of three treatment groups. Group 1 were vaccinated for IBR, BVD, and PI3 at the farm of origin by the ballistic system. Group 2 was also vaccinated at the farm of origin with the same product but using the conventional injectable method. Group 3 was vaccinated upon arrival at El Reno using the same product and the injectable method. Group 3 were further processed with clostridal vaccine and treated for liver flukes,[d] internal and external parasites.[e]

On day 14 after arrival, all calves were weighed before the morning feeding and revaccinated with the same product and the same system as at arrival. The calves in groups 1 and 2 were then treated for internal and external parasites and vaccinated for clostridium as previously described for Group 3.

During the 28-day receiving period, the calves were housed in dirt lots (7.6 x 15.2 M). Each pen contained 6 or 8 calves processed by the same method and the same truck load. A total of 24 pens were used to give 4 replications of each load (n=2) x treatment (n=3) combination. The ration fed during the receiving period was the same as described in Experiment 1. Feed intake was limited on day 1, then increased daily until feed was refused. Feed intake was summarized by pen weekly and body weight changes were recorded at arrival, on day 14 and on day 28.

The data from Experiment 1 representing the 14-day confinement period was analyzed as a randomized complete block (RCB) design with each of the three loads used as blocks and the two vaccination methods used as treatments. The load by treatment interaction was used as the error term. The second portion of Experiment 1 encompassed the summer grazing period of 108 days (range 92-127 days) and was analyzed as a RCB design using each of the pasture groups (N=11) as a block and vaccination method (N=2) as treatments. Experiment 2 was analyzed as a split plot design with replication (N=4) and load (N=2) being tested by their interaction and the effect of treatment (N=3) being tested by the interaction of replication, load and treatment. Differences among treatment means with a significant F value were determined by the Least Significance Differences (LSD) procedure.

Results

Although the arrival dates of the 3 loads used in Experiment 1 spanned a 27-day period, the arrival weights were not significantly different between loads and averaged 218 kg (Table 1). The amount of weight lost during transit from the assembly point to El Reno (300 km) was 5.7%, 4.2%, and 3.2% for loads 1, 2, and 3, respectively. Morbidity, mortality, average daily gain (ADG) and dry matter intake during the 14-day receiving period at El Reno were similar between the conventional and ballistic groups. The calves in the conventional group in load 2 had to be mass medicated on day 4 through 6 due to a sudden number of BRD cases and a prognosis of extreme morbidity. The calves were treated with 4,000 mg of long acting oxytetracycline[f] and 25 grams of sulfadimethoxine[g]. Of the 13 calves treated for BRD in the conventional group, 8 calves came from load 2.

With each successive load, average daily gain (ADG) and dry matter intake decreased in Experiment 1 (Table 1 and 2). Hay, mixed ration and total dry matter intake were lower ($p < .05$) for the calves in load 3 as compared to the calves in loads 1 and 2. Concurrently the mean daily high and low temperature increased, while the total amount of precipitation decreased with time. Loads 1 and 2 arrived only 9 days apart and had 5 days of common weather. Load 3 arrived 18 days after load 2 and had no days in common with either load.

Table 1. The effect of conventional and ballistic vaccination on performance and health of feeder calves (Experiment 1).

	Load 1		Load 2		Load 3			
Vaccination Method;	Control	Ballistic	Control	Ballistic	Control	Ballistic	Mean*	SEM*
No. of animals	44	43	88	86	79	80		
Arrival weight, kg	219.1	216.2	216.8	219.2	214.9	220.8	217.9	1.3
Day 14 weight, kg	232.8	230.9	226.9	233.2	221.3	221.6	227.8	1.2
Gain, 14-days, kg	13.7	14.7	10.1	14.0	6.4	0.8	9.9	1.4
ADG, kg	.98	1.05	.72	1.0	.46	.06	.71	.1
Dry matter intake;								
Wheat hay, kg	2.14	2.69	1.84	1.88	.67	.66	1.65	.16
Mixed ration, kg	5.13	5.18	4.62	5.00	3.89	3.98	4.64	.05
Total, kg	7.27	7.87	6.46	6.88	4.56	4.64	6.28	.08
Feed:Gain	7.49	7.51	9.01	6.89	9.94	78.53	19.90	13.1
Morbidity, No.	1	0	8	2	4	0	2.5	2.8
Mortality, No.	1	0	0	1	0	0	.3	.5

*Mean and standard error of the mean across all 3 loads.

Table 2. Dry matter intake and climatic conditions for each load (Experiment 1).

	Load 1	Load 2	Load 3	SEM
Dry intake;				
Mixed ration, kg	5.15[a]	4.81[a]	3.95[b]	.09
Wheat hay, kg	2.37[a]	1.86[a]	.66[b]	.16
Total, kg	7.52[a]	6.67[a]	4.59[b]	.13
Temperature;				
High, C	29.4	27.9	32.0	
Low, C	15.8	16.2	19.1	
Precipitation, cm	24.8	29.6	6.3	

[a,b]Means in the same row are different, $P < .05$.

[d]Clorsulon, Merck and Co., Rahway, NJ.
[e]Ivermectin, Merck and Co., Rahway, NJ.
[f]LA-200, Pfizer Inc., New York, NY.
[g]Albon, Hoffman-LaRoche Inc., Nutley, NJ.

Previous vaccination method had no effect on the subsequent performance of calves during the summer stockering period (mean = 108 d; Table 3). Average daily gain ranged from .34 kg to .7 kg among the 11 different pastures, but within each pasture the two vaccination groups had similar ADG.

Table 3. Average daily gains of calves vaccinated by either a conventional method or the ballistic method during the summer grazing period.

Group	Source of forage[a]	No. of hd	No. of days	Conventional ADG	Ballistic ADG
				kg	
1	OWBS	44	111	.58	.54
2	OWBS	44	111	.55	.56
3	BERM	43	127	.37	.30
4	BERM	42	119	.34	.42
5	BERM	41	127	.45	.42
6	BERM	41	119	.41	.44
7	NR	32	100	.59	.54
8	NR	32	100	.64	.76
9	NR	31	92	.60	.68
10	NR	31	92	.63	.66
11	NR	28	92	.50	.54

[a]Source of forage; Old World Bluestem, BERM = Bermudagrass
NR = Native tall grass range.

Overall morbidity (1.1%) and mortality (0.5%) of the 183 calves used in Experiment 2 was low. Dry matter intake, ADG and feed:gain were not statistically different among three treatment groups (Table 4). The ADG from day 0 to day 14 and from day 15 to day 28 was .87, .91 and 1.07 and 1.26, 1.26 and 1.48 lbs/hd/day for treatments 1, 2, and 3 respectively.

Table 4. The effect of time and method of processing on performance and feed intake (Experiment 2).

Treatment	Method	Place	No. hd	Intake	ADG	Feed:Gain
				kg		
1	Ballistic	FO	60	5.72	.46	12.43
2	Convent.	FO	61	5.73	.46	12.46
3	Convent.	ARR	62	6.00	.55	10.41
	Standard error of the mean			.31	1.33	

Discussion

The morbidity and mortality observed in Experiment 1 was less than that observed by Lofgreen[11,12,13] and Cole[5] for stressed feeder calves processed at arrival. The low incidence of BDR in Experiment 1 was probably due to two factors. First, the short transportation distance (300 km) imposed less stress than a longer distance. Secondly and probably more important, the calves used in Experiment 1 had been previously vaccinated for BRD and allowed to recover from the stresses of weaning, marketing and transportation before the second transit period. Reid and Mills[22] observed that unfamiliar events are less stressful with each occurrence. The amount of shrinkage reported in this experiment was also less than that previously observed at this laboratory,[18,21] but this was a function of the distance traveled.[18]

Feed intake is usually sensitive to the amount of stress imposed on the feeder calf and to the incidence of BRD. Dry matter intake in Experiment 1 was higher than previously observed for feeder calves, and was different among loads.[13,17,20,21] Although the average weights of the 3 loads were similar, each load was made up of calves from different farms of origin. Due to the different backgrounds of the calves, the perception of an event as stressful will vary among calves. This in combination with differences in climatic conditions can explain the variation in morbidity, ADG and dry matter intake among the 3 loads of Experiment 1.[1,2,15]

Morbidity and mortality observed in Experiment 2 was lower than that observed in Experiment 1. The calves in Experiment 2 were from a single source as compared to the many different sources of calves used in Experiment 1. The farm of origin has a significant impact on the ability of the calf to resist BRD.[19,23] The calves used in Experiment 2 were also shipped directly from the farm to the receiving point which limited their exposure to unfamiliar viral and bacterial agents usually encountered during the marketing and transportation process.

Calves in treatment 1 and 2 were not treated for internal parasites until 14 days after arrival. Previous research has shown that treatment with anthelmintics at arrival can increase ADG during the receiving period.[6] Since the ADG was similar among the treatment groups in Experiment 2 during the first and second 14-day periods, it is assumed that delaying the administration of anthelmintics to day 14 did not bias the results.

In conclusion, no difference in short or long-term feeder calf performance or dry matter intake during the receiving phase was noted between the two procedures used in these experiments. The incidence of BRD was very low in all groups and no conclusive statements could be made about a reduction in the incidence of BRD. Short and long-term performance of the feeder calves in a stocker situation was not affected by the vaccination procedure when applied as the primary vaccination or as the secondary vaccination.

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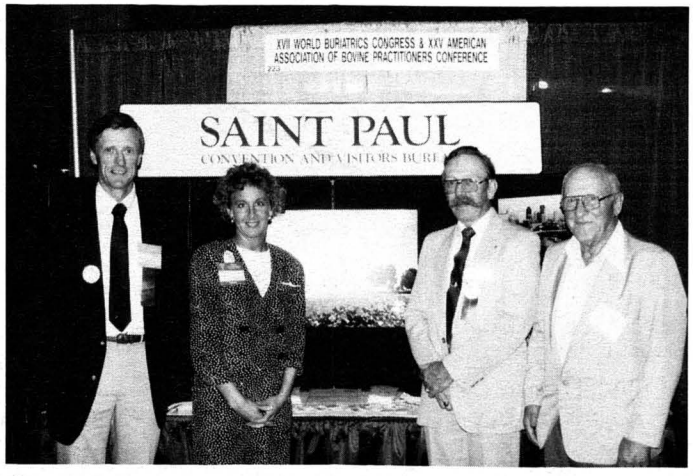

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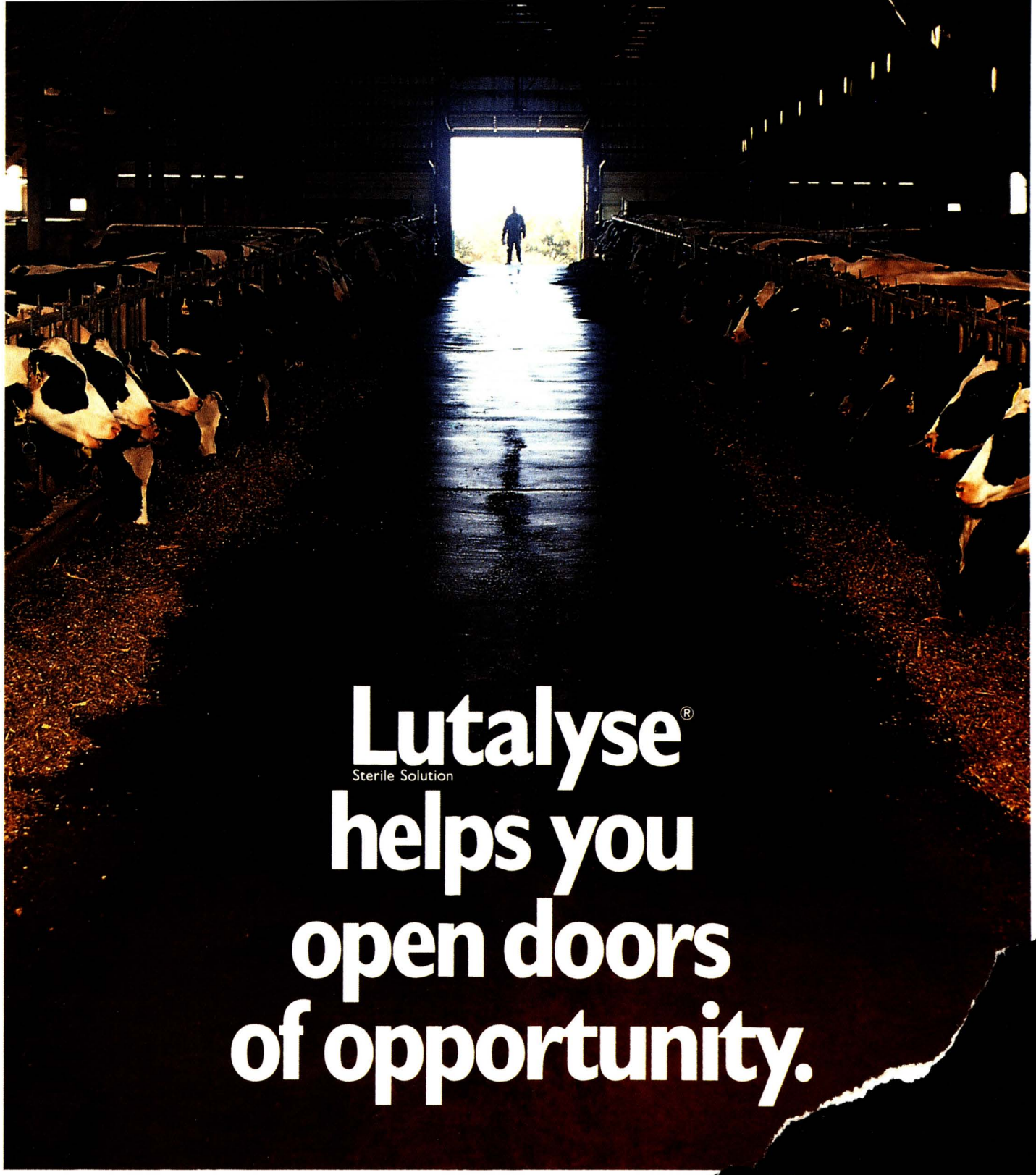

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