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Respiratory Viruses and Antibodies in Preconditioned South Dakota Feeder Calves

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RESPIRATORY VIRUSES AND ANTIBODIES IN PRECONDITIONED SOUTH DAKOTA FEEDER CALVES

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Summary

Nasal swabs and blood samples were taken from a total of 400 calves on a preconditioning evaluation program during 2 years. Fifty calves from each of four South Dakota ranches were divided into preconditioned (PC) and control (CO) groups and sampled both on the ranch and in the feedlot. The preconditioning program followed the recommendations of the South Dakota Beef Cattle Improvement Association and the Extension Service and included vaccination with live virus vaccines for infectious bovine rhinotracheitis (IBR), bovine viral diarrhea (BVD) and parainfluenza-3 virus (PI_3).

In both years, viruses were isolated from calves on the ranches before vaccination. PI_3 and IBR were readily isolated from calves that were vaccinated 2 weeks previously with a live intranasal IBR-PI_3 virus vaccine. Fifty-six virus isolations were made from the 200 calves on arrival at the feedlot in the second year in contrast to six made the first year.

Serum was tested for antibodies to IBR, BVD, respiratory syncytial virus (RSV) and PI_3. Prevaccination antibodies were present to PI_3 and BVD during the first year and to PI_3, BVD and RSV during the second year. Antibody levels varied among the ranches. Serologically, respiratory syncytial virus was present in the feedlot both years, although it was only isolated the second year. Serologic evidence from calves in the feedlot indicated that PI_3 and RSV were the most prevalent viruses. There were no significant differences between the health scores of preconditioned and control calves and this may have been influenced by the presence of other agents, i.e., respiratory syncytial virus and enteroviruses.

(Key Words: Preconditioning, IBR, PI_3, RSV, Enterovirus, Serology.)

Introduction

Respiratory disease remains a major problem in feedlot cattle. Vaccination is thought to reduce the frequency and/or severity of respiratory disease seen in the first few weeks after cattle arrive at the feedlot. Accordingly, vaccination has been incorporated into preconditioning programs formulated to help calves better endure stress caused by shipping. The calves are required to have been vaccinated, treated for parasites, weaned and bunk fed at least 30 days prior to shipping. Viral vaccines usually recommended include IBR, BVD, PI_3 and in some programs Pasteurella bacterin.

Unfortunately, bovine respiratory disease is not caused by a single etiologic agent but rather mixed infections involving several different viruses and bacterial species. Vaccination continues to be used to prevent losses due to respiratory disease in the first few weeks in the feedlot, although there is little published evidence for its efficacy. The following is a report of the etiologic agents detected by virus isolation and serologic examinations. This is part of an ongoing project to determine the effects of the preconditioning program on calf health and performance under conditions found in a South Dakota feedlot.

Experimental Procedure

At each of four western South Dakota ranches, calves were weighed, identified and randomly selected for preconditioning (PC) or controls (CO). The preconditioned calves were vaccinated and released along with the control calves back to the dams. Two weeks later, the PC calves were weaned. The controls were left with the cows approximately 30 days longer, then all the calves were shipped to the Sioux Falls Stockyards. They were weighed, rested overnight and shipped to the research feedlot in Brookings. The control calves were vaccinated on arrival at the feedlot.

Vaccination. The calves were vaccinated with modified live virus vaccines. The first year Nasalgen IBR/PI_3 was administered intranasally and BVD intramuscularly (IM). The second year, one-half of the calves (ranches A and B) were vaccinated with the same vaccines and the remainder (C and D) were vaccinated intramuscularly with Resbo-3 (IBR/BVD/PI_3). The calves were also given a bacterin containing seven species of clostridia and treated for parasites.

Virology. Nasal swabs were obtained on the ranch before vaccination, 2 weeks later at weaning and on arrival at the feedlot. Swabs were also obtained from five calves with elevated temperatures that had been culled for treatment on the fifth day after arrival because of signs of infection. Swabs were placed in transport media until processed for virus isolation at the Animal Disease Research and Diagnostic Laboratory. Cell cultures with viral cytopathic effect were examined by specific fluorescent antibody or identified by morphology using electron microscopy.

Serology. Blood samples were obtained before vaccination on the ranch, on arrival at the feedlot and 4 weeks later. The second year, blood could not be taken 4 weeks after the calves arrived at the feedlot because of the low ambient temperature, but samples were taken 6 months later. The serum was tested by standard virus neutralization tests. Twofold dilutions of serum were reacted with 100 tissue culture infective doses of IBR, BVD, PI_3 and RSV, respectively. Results are expressed as the reciprocal of the highest dilution of serum that inhibited viral replication.

Results and Discussion

Virology. The first year of the study, PI_3 virus was isolated before vaccination from five calves on one of the four ranches (table 1). Two weeks after vaccination with the intranasal vaccine, IBR and PI_3 viruses could still be isolated from both vaccinated (32%) and control (28%) calves. On their arrival

at the feedlot, IBR was isolated from two control calves and four enteroviruses were isolated from two PC and two CO calves.

The second year (table 2), a pox virus was isolated from one calf and an enterovirus from another before they were vaccinated on the ranch. IBR and PI_3 were isolated 2 weeks later but only from the calves that had been vaccinated with the intranasal vaccine. No virus was isolated from the calves that had been vaccinated with the intramuscular vaccine. However, when the calves arrived at the feedlot, PI_3 was isolated from 20 calves (20%) that had been vaccinated with the intramuscular vaccine and from 10 (10%) of the control calves, suggesting that the vaccine did not protect against infection with this virus. In contrast, in the other two groups of calves (A and B), few were shedding PI_3 virus, but three other viruses were present. Besides the IBR and PI_3, enteroviruses and respiratory syncytial virus were also detected. Most of the viruses were isolated from the control group of calves (21%, table 2).

The difference in the virus isolations on arrival at the feedlot from 6/200 the first year to 56/200 in the second year may have been influenced partially by the change from the intranasal vaccine, since 30 of the isolations were from herds using the intramuscular vaccine but also may have been influenced by the early onset and more severe winter weather that occurred in the second year.

Three of the calves swabbed 5 days after arrival were CO calves, the remainder were preconditioned. IBR was isolated from two CO calves and RSV from one CO calf. The two PC calves were negative for virus isolation.

Serology. In the first year, prevaccination antibody was present to PI_3 and BVD (table 3). The rise in antibody on ranches C and D suggested a recent infection with PI_3. The rise in antibody to RSV in the calves from arrival to 4 weeks later indicates exposure to this virus during transit or in the feedlot.

In contrast to the first year, prevaccination antibody to PI_3, BVD and RSV was present in the calves the second year (table 4). Considerable antibody was present to BVD from ranches C and D, suggesting exposure to this virus while on the ranch. One of these ranches had a previous BVD problem and a change in the herd health program that included vaccination of dams. An antibody response to the vaccines administered on the ranch was detected during the second year of the study, with the exception of PI_3 in the Resbo-3 vaccinated group. The poor response to the PI_3 component of this vaccine as well as the IM route of inoculation may account for the frequency of virus isolation from these calves on arrival at the feedlot. The high levels of antibody to RSV and PI_3 present in the serum samples taken in May suggest that both RSV and PI_3 were active in the calves while in the feedlot. Levels of antibody to these viruses were higher in the calves from ranches C and D (figure 1).

Mortality was low both years; one calf was lost in the first year and four calves the second year. Only two of the death losses in the second year could be attributed to an infectious agent. Haemophilus somnus was incriminated but not isolated in both of these cases. Isolation, however, is not always possible in animals treated with antibiotics.

There is little evidence of BVD activity in the feedlot either year. Although IBR was isolated from calves while they were in the feedlot, antibody

levels to IBR were relatively low, suggesting the calves were not exposed to a field strain or that the vaccine prevented infection. It is possible that the IBR virus circulating in the feedlot was the attenuated strain from the vaccine and not a field strain.

Of the three important respiratory viruses IBR, BVD and PI_3, only PI_3 appeared to be active in the feedlot and the vaccine did not appear to prevent infection with this virus.

The lack of significant differences between the health scores of the PC and CO calves[1] may have been influenced by the presence of other agents, i.e., bovine respiratory syncytial virus and enteroviruses.

TABLE 1. VIRUS ISOLATIONS FROM NASAL SWABS--FIRST YEAR

Item	Virus	Ranch A + B		Ranch C + D	
		PC	CO	PC	CO
Prevaccination (0 weeks)	PI_3	-	-	1	4
Weaning (2 weeks)	PI_3	9	9	9	19
	IBR	3	-	11	-
Feedlot (6 weeks)	IBR	-	1	-	1
	Enterovirus	2	2	-	-

TABLE 2. VIRUS ISOLATIONS FROM NASAL SWABS--SECOND YEAR

Item	Virus	Ranch A + B[a]		Ranch C + D[b]	
		PC	CO	PC	CO
Prevaccination (0 weeks)	Pox	-	1	-	-
	Enterovirus	-	1	-	-
Weaning (2 weeks)	PI_3	18	13	-	-
	IBR	4	-	-	-
Feedlot (6 weeks)	PI_3	1	3	20	10
	IBR	2	6	-	-
	Enterovirus	2	6	-	-
	RSV	-	6	-	-

[a] Vaccinated with Nasalgen IBR/PI_3, BVD intramuscular vaccine.
[b] Vaccinated with Resbo-3 IBR/BVD/PI_3 vaccine.

[1] Swann, J. K. and R. H. Pritchard. 1985, 1986. Effect of preconditioning on performance and health of feeder steers. S.D. Agr. Exp. Sta. CATTLE 85-4:22 and CATTLE 86-14:66.

TABLE 3. GEOMETRIC MEAN ANTIBODY TITERS TO BOVINE RESPIRATORY VIRUSES IN 200 FEEDLOT CALVES--FIRST YEAR

	Preconditioned			Controls		
	Ranch Prevacc	Arrived Feedlot		Ranch Prevacc	Arrived Feedlot	
Item	Sept 0 weeks	Nov 6 weeks	Dec 10 weeks	Sept 0 weeks	Nov 6 weeks	Dec 10 weeks
Ranches A and B						
IBR	-	7 ± 2	1 ± 2	-	-	.8 ± 2
BVD	7 ± 3	14 ± 3	7 ± 4	13 ± 2	4 ± 2	2 ± 2
PI_3	18 ± 2	33 ± 1	24 ± 2	24 ± 2	25 ± 1	38 ± 2
RSV	-	-	23 ± 2	-	-	9 ± 1
Ranches C and D						
IBR	-	4 ± 2	4 ± 2	-	-	2 ± 2
BVD	5 ± 4	13 ± 3	18 ± 4	6 ± 3	2 ± 3	7 ± 3
PI_3	9 ± 3	54 ± 2	77 ± 2	7 ± 3	52 ± 2	60 ± 1
RSV	-	-	14 ± 2	-	-	11 ± 1

TABLE 4. GEOMETRIC MEAN ANTIBODY TITERS TO BOVINE RESPIRATORY VIRUSES IN 200 FEEDLOT CALVES--SECOND YEAR

	Preconditioned			Controls		
	Ranch Prevacc	Arrived Feedlot		Ranch Prevacc	Arrived Feedlot	
Item	Oct 0 weeks	Nov 6 weeks	May 32 weeks	Oct 0 weeks	Nov 6 weeks	May 32 weeks
Ranches A and B[a]						
IBR	-	7 ± 2	2 ± 4	-	-	4 ± 3
BVD	11 ± 4	17 ± 4	5 ± 6	12 + 3	4 ± 4	6 ± 5
PI_3	34 ± 2	51 ± 2	79 ± 2	40 ± 2	25 ± 2	70 ± 2
RSV	13 ± 4	16 ± 4	54 ± 2	15 ± 2	9 ± 2	34 ± 2
Ranches C and D[b]						
IBR	-	5 ± 2	5 + 2	-	-	4 ± 2
BVD	49 ± 6	90 ± 3	59 ± 3	59 ± 3	64 ± 5	73 ± 3
PI_3	23 ± 2	18 ± 3	93 ± 2	20 ± 3	24 ± 4	106 ± 2
RSV	17 ± 2	6 ± 2	117 ± 2	21 ± 2	7 ± 2	114 ± 2

[a] Vaccinated with Nasalgen IBR/PI_3, BVD intramuscular vaccine.
[b] Vaccinated with Resbo-3 IBR/BVD/PI_3 vaccine.

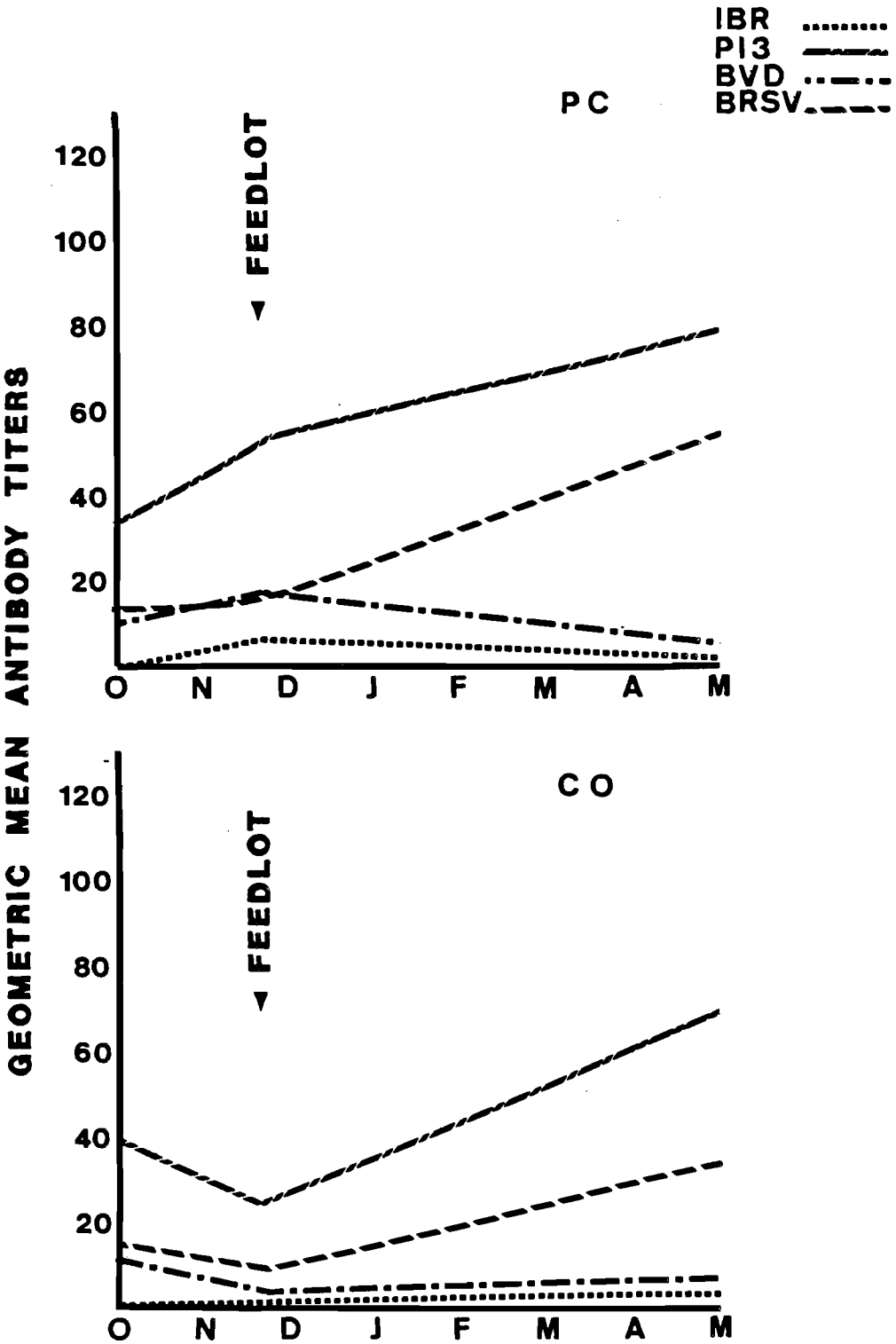

Figure 1A: Serum neutralizing antibodies tc respiratory viruses in preconditioned and control calves, second year. Ranches A and B.

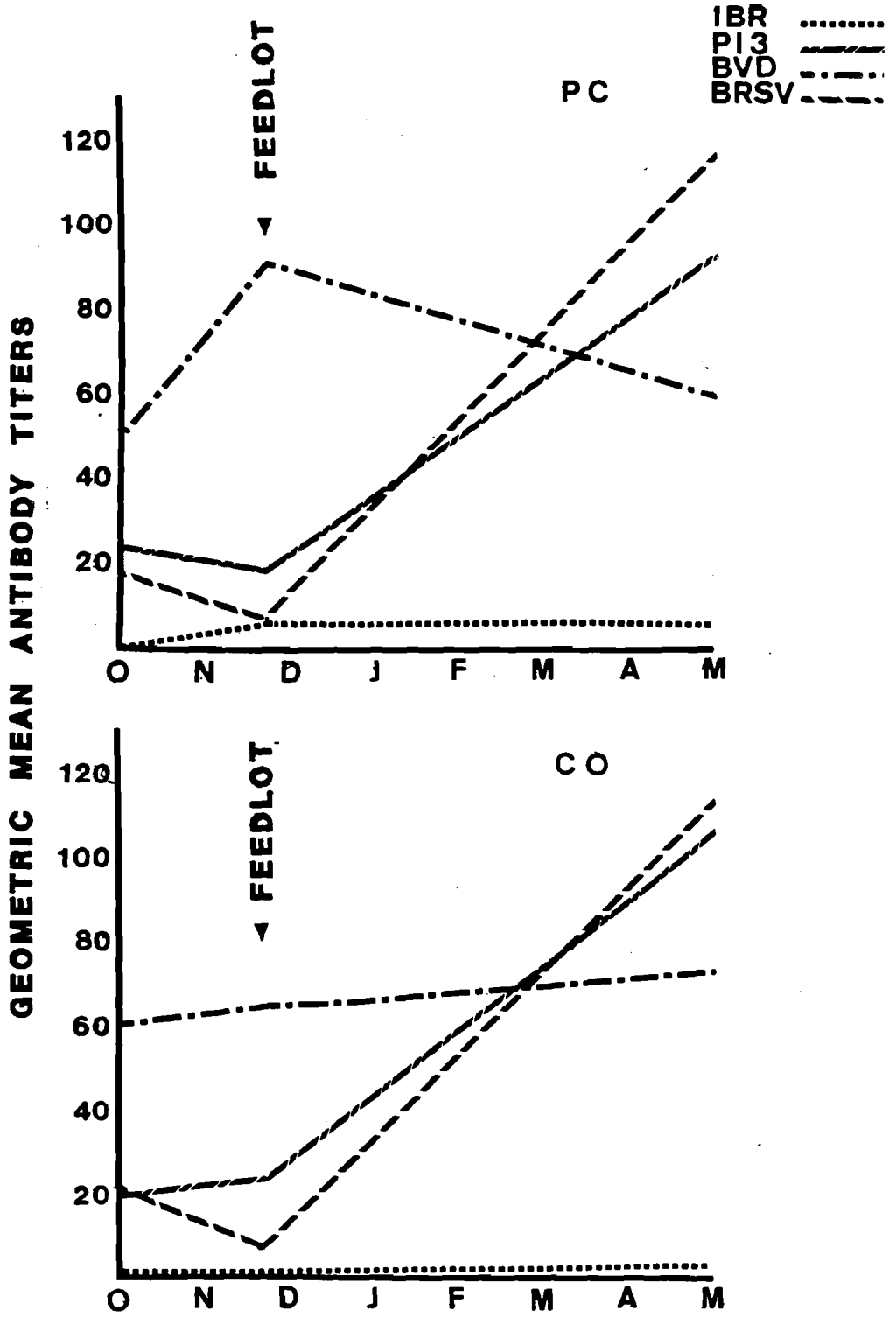

Figure 1B: Serum neutralizing antibodies to respiratory viruses in preconditioned and control calves, second year. Ranches C and D.