A Controlled Field Study Using Live Virus Vaccines and an Antiserum in a Preconditioning Program

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SUMMARY

Thirty-five vaccinates and 29 control beef calves from five farms were studied. Vaccinates in group 1 received a modified live virus vaccine against infectious bovine rhinotracheitis (IBR) and bovine virus diarrhea (BVD) 30 days after shipment; vaccinates in groups 2, 3 and 4 received live virus vaccines agains IBR and bovine parainfluenza 3 (PI3) seven to 17 days before shipment. Half of group 5 were given bovine origin antiserum containing antibodies against IBR, BVD and PI3. Three weeks later, the animals that had received serum were given a live modified vaccine containing IBR, BVD and PI3. In group 1, WBC counts were lower in the vaccinates than in the controls for two weeks after vaccination. WBC counts in groups 3 and 4 were higher in vaccinates than in controls after addition to the feedlot. Seroconversions to BVD virus occurred in all groups. Clinical disease apparently due to BVD affected one vaccinated calf in group 2 and eight calves in group 5. Combined weight gains were significantly higher in three groups of calves vaccinated before shipment compared to unvaccinated control animals after addition to the feedlot. Vaccination with IBR and PI3 live virus vaccines should be given at least 17 days before shipment to feedlots containing infected cattle. Antiserum containing antibodies against the three viruses showed no apparent advantage in preventing clinical respiratory disease over control calves not receiving the serum.

RÉSUMÉ

Les auteurs ont réalisé une expérience avec 35 veaux de boucherie vaccinés et 29 témoins, issus de cinq fermes différentes. Certains veaux du groupe 1, reçurent un vaccin atténué contre la rhinobrachéite infectieuse bovine (RIB) et la diarrhée à virus bovine (DVB), 30 jours après leur transport; d'autre part, certains veaux des groupes 2, 3 et 4 reçurent un vaccin atténué contre la RIB et l'influenza (PI3), de sept à 17 jours avant leur transport La moitié des veaux du groupe 5 reçurent un sérum d'origine bovine contenant des anticorps contre les virus RIB, DVB et PI3; trois semaines plus tard, on administra aux mêmes sujets un vaccin atténué contenant les trois mêmes virus.

Dans le groupe 1, les comptages leucocytaires des veaux vaccinés s'avérèrent moins élevés que ceux des témoins, au cours des deux semaines qui suivirent la vaccination. Dans les groupes 3 et 4, ces comptages se révélèrent plus élevés chez les veaux vaccinés que chez les témoins, après leur introduction dans un parc d'engraissement.

Une réponse immunologique à l'endroit du virus DVB se produisit dans tous les groupes, tandis qu'une maladie clinique apparemment due à ce virus affecta un veau vacciné du groupe 2 et huit veaux du groupe 5.

L'accroissement du poids fut sensiblement supérieur, dans trois groupes de veaux vaccinés avant leur transport, à celui des témoins correspondants, après leur introduction dans un parc d'engraissement.

La vaccination avec les virus RIB et PI3 atténués devrait s'effectuer au moins 17 jours avant l'introduction dans des parcs d'engraissement où il y a des animaux infectés.

Les veaux ayant reçu un antisérum polyvalent contre les trois virus ne semblaient pas mieux protégés contre les maladies correspondantes que les témoins.

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INTRODUCTION

The value of live-virus vaccines against infectious bovine rhinotracheitis (IBR), parainfluenza 3 (PI3) and bovine virus diarrhea (BVD) to aid in the prevention of acute respiratory diseases of cattle will of necessity have to be considered under a variety of field conditions. Their use must be judged in the context of numerous factors involving the host, agents, and environment. The following report describes the use of commercially available vaccines and an antiserum in feeder cattle under controlled field conditions in order to determine their value in prevention of respiratory disease after shipment. In addition, comparison of weight gains and serological response in vaccinated and unvaccinated calves are compared.

MATERIALS AND METHODS

Group 1 consisted of 17 Angus heifers eight to 12 months of age purchased in southern Illinois in November 1968. Thirty days later, one half were vaccinated with modified live IBR and BVD virus vaccine[1]. Blood samples were collected 30 days before vaccination, at the time of vaccination, and 15 days after vaccination to test for antibodies against IBR, BVD, PI3 and leptospirosis as previously described (2,3,5). Serological reactions at 1:10 for IBR and BVD and 1:20 for PI3 were recorded as positive. All cattle were weighed at the time of shipment and two to three weeks after shipment. Following shipment, WBC counts and rectal temperatures were recorded every three days for two weeks in all groups except 5.

Groups 2, 3 and 4 were bled, vaccinated against blackleg, malignant edema and *L. pomona* and half were vaccinated with modified live IBR-PI3 live virus vaccine[2].

Group 5 included one Hereford steer and 10 heifers. Fifty-five days after weaning, all calves were handled as groups 3 and 4, except one half received a preventive dose (75 ml) of bovine antiserum[3] five days before shipment to the experimental pen (1). The serum had a titer of 1:40 for IBR, 1:320 for BVD and <1:40 for PI3. These calves were mixed with the other lots. Two weeks later serum samples were collected and the group that received antiserum was vaccinated with modified live virus vaccine containing IBR, BVD and PI3.[4] Weights were not determined.

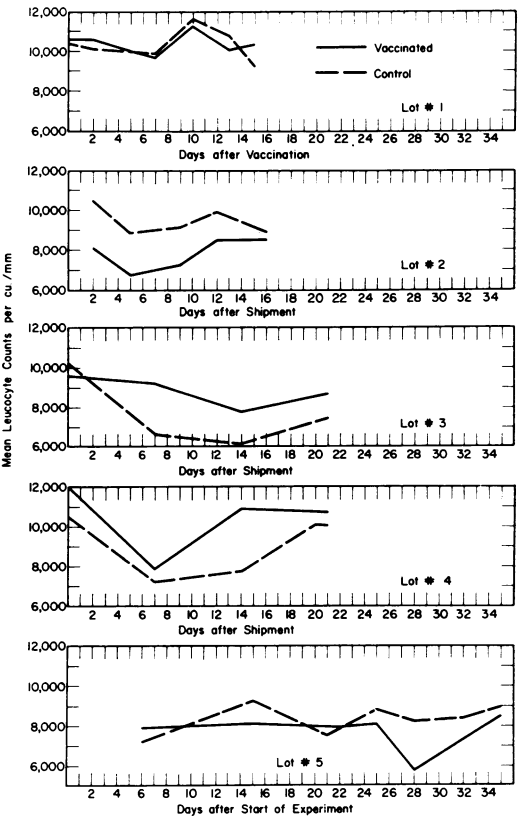

Fig. 1. Mean lecocytes counts in vaccinated and control cattle following shipment and vaccination.

[1]Mucovax 2, Modified Live Infectious Bovine Rhinotracheitis and Bovine Virus Diarrhea Virus. Pitman Moore Co., Indianapolis, Indiana.

[2]Rea Plex, Modified Live Infectious Bovine Rhinotracheitis and Bovine Parainfluenza 3 Vaccine, Fort Dodge Laboratories, Fort Dodge, Iowa.

[3]Bio. No. 591, Pitman Moore Co., Indianapolis, Indiana.

[4]Respicine 3, Diamond Laboratories, Des Moines, Iowa.

TABLE I. Summary of Serological Tests and Weight Gains in Vaccinated and Control Cattle

Lot Number	Group	Number of Cattle	Number Positive to Serologicial Tests at Indicated Time: Before Shipment IBR	BVD	PI3	Time of Shipment IBR	BVD	PI3	After Shipment IBR	BVD	PI3	Weight in Pounds: First		Second		Gained	% Gain
1	Vaccinated[a]	9	Not done			1	3	6	9	5	9	(12-26-67)	4260	(1-10-68)	4978	553	16.8
1	Controls	9	Not done			2	0	6	1	1	9	(12-26-67)	4339	(1-10-68)	4639	300	7.0
2	Vaccinated[b]	10	0	0	0	0	0	0	10	9	6	(1-12-68)	4161	(1-26-68)	4175	14	.03
2	Controls	8	0	0	0	0	0	1	0	4	8	(1-12-68)	3430	(1-26-68)	3495	65	1.9
3	Vaccinated[b]	6	0	0	0	5	1	5	4	6	6	(3-5-68)	2345	(3-26-68)	2635	290	12.4
3	Controls	2	0	0	0	0	0	1	0	0	2	(3-5-68)	745	(3-26-68)	775	30	4.0
4	Vaccinated[b]	4	0	4	4	3	4	4	1	4	4	(3-5-68)	1635	(3-26-68)	1780	145	8.9
4	Controls	5	0	1	4	1	4	5	1	4	5	(3-5-68)	1945	(3-26-68)	2115	170	8.7
5	Vaccinated[c]	6	0	0	0	0	0	0	0	3	0			Not done			
5	Controls	5	0	0	0	0	0	0	0	4	0			Not done			
	Total	64															

[a]Mucovax 2. Modified Bovine Infectious Rhinotracheitis and Bovine Virus Diarrhea Vaccine. Fitman Moore Co., Indianapolis, Indiana

[b]Rea Plex Modified Infectious Bovine Rhinotracheitis and Bovine Parainfluenza Vaccine. Fort Dodge Laboratories, Fort Dodge, Iowa

[c]Antibacterial Serum (Bovine Origin) Formula No.3 Pitman Moore Co., Indianapolis, Indiana (Given January 25, 1968) and Respicine 3 Modified Infectious Bovine Rhinotracheitis Bovine Virus Diarrhea, and Bovine Parainfluenza Vaccine, Diamond Labs, Des Moines, Iowa (Given February 15, 1968)

RESULTS

In group 1 no clinically detectable post-vaccination reaction was observed. The mean rectal temperature of the vaccinates was 0.6° F greater four days after vaccination. The mean WBC counts of the vaccinates were slightly lower from the eighth to the 13th day compared to the unvaccinated group. The vaccinated group then had a higher mean WBC count (Fig. 1).

Antibody to IBR and PI3 was present at the time this group was placed in the feed lot. Inapparent infection with IBR, PI3 and BVD occurred during the 30 days after shipment. After vaccination there were a larger number of seroconversions to IBR and BVD in the vaccinates than in the controls. The serological conversion of all vaccinated and control animals to PI3 indicates that inapparent infection occurred simultaneously with vaccination. A comparison of weight gains in vaccinated and control groups showed that the vaccinated group had significantly higher weight gains. The serological tests are summarized in Table I.

No antibody against IBR, BVD or PI3 was detected in prevaccination serum collected from group 2 calves. One vaccinated calf was treated for acute respiratory disease two days after shipment. WBC counts were lower in the vaccinated group than the controls during the two week observation in the feed lot (Fig. 1).

Group 3 had no prevaccination antibody to IBR, BVD and PI3. Two and one-half weeks after vaccination, four of six vaccinates converted to IBR, six to PI3 and one to BVD. The two control calves remained negative to the serological tests throughout the study. The mean WBC count of the vaccinated calves was higher than the controls during the three week observation in the feedlot (Fig. 1). The serological results are summarized in Table I.

In group 4 prevaccination serum samples showed antibody against BVD and PI3 but not IBR. By 19 days post-vaccination when the calves were in the feedlot, one non-vaccinated calf showed detectable antibody against IBR. However, as in group 3, the mean WBC counts were higher in the vaccinated group throughout the three week observation in the feedlot (Fig. 1). One vaccinated calf did not show seroconversion to IBR and two calves' titer to IBR dropped to less than 1:10 by 34 days post-vaccination. Serological tests are summarized in Table I.

Group 5 had no detectable antibodies to PI3, IBR or BVD. Six days after shipment to the feedlot the calves given antiserum had no detectable antibody against BVD, IBR or PI3. Only one of the vaccinated calves had detectable antibody against IBR or PI3 two weeks after vaccination. Mean WBC counts were lower in the calves getting the vaccine containing the three modified live viruses than the controls (Fig. 1). Electrophoretic patterns of serum from the last bleeding, February 29, 1968 of vaccinates and controls showed that gamma globulin levels were within the normal range.

In groups 2, 3 and 4 (all vaccinated before shipment) the combined weight gains were statistically greater in the vaccinated group when evaluated by the Chi square test. The weight gains and serological tests are summarized in Table I.

DISCUSSION

The prevalence of antibodies against BVD, IBR and PI3, before shipment to the feedlot, varied markedly in the five herds studied. The fact that the other groups were added to the feedlot in the presence of infected group 1 accounted for natural exposure of uninfected calves added from groups 2, 3 and 5. Shipment of group 2 only seven days after vaccination allowed insufficient time to permit detectable serological response to the IBR and PI3 vaccine. This is in contrast to group 3 calves that were shipped 17 days after vaccination, at which time a detectable serological response to the vaccine components was evident.

A dose of bovine serum containing antibodies against IBR, PI3 and BVD administered five days before shipment showed no advantage in preventing clinical respiratory disease compared to controls. The reason for failure of four of the five heifers in group 5 to produce detectable antibody to IBR and PI3 after vaccination is not known.

Vaccination of beef calves with the modified live virus vaccines used in groups 1, 2 and 5 showed that a decrease in WBC counts follows. Similar vaccines used in groups 3 and 4, 17 days before shipment, however, indicated that the vaccinates had higher WBC counts after shipment to the feedlot.

The low weight gains of the vaccinates in group 2 apparently resulted from the fact that shipment occurred too soon after vaccination. The small weight difference between vaccinates and controls in group 4 was probably due to presence of antibody to BVD and PI3 at the time of vaccination. Leptospirosis was not a problem in the calves in this study.

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