A Safety Trial of a Bovine Respiratory Syncytial Virus Vaccine in Feedlot Calves

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Bovine respiratory syncytial virus (BRSV) is a non-hemagglutinating pneumo virus of the paramyxovirus family. This virus was first isolated from cattle with respiratory disease in Europe in 1970 (1) and was subsequently reported from the United States in 1974 (2, 3). It is apparent that exposure of cattle to BRSV is common in the United States as indicated by the high prevalence of serum antibody to BRSV reported by several serologic surveys (4, 5, 6, 7). Recent studies from Nebraska and Minnesota have revealed BRSV to be a common and important cause of respiratory tract disease in both beef and dairy cattle (8, 9, 10, 11, 12, 13). The topic of BRSV has recently been reviewed (14).

A vaccine against BRSV has been available to Europe since 1978. There are numerous published reports of the efficacy of this vaccine in prevention of BRSV-associated respiratory tract disease (15, 16, 17, 18, 19). Bovine respiratory syncytial virus vaccines became available in the United States in 1984. A report of field trials using a modified-live BRSV vaccine (BRSV®)[a] revealed the vaccine to be safe and effective in reducing the incidence of bovine respiratory tract disease in cattle vaccinated twice prior to natural exposure to BRSV (20). Another study reported a reduction in cases of undifferentiated respiratory disease in vaccinated animals as compared to unvaccinated controls using the same BRSV vaccine (21).

The present study was undertaken to determine if a BRSV vaccine could be safely used in stressed cattle upon arrival to a feedlot.

Materials and Methods

Animals. Cattle utilized in this study were from the Michigan State University Stressed Cattle Project, a cooperative study between the Department of Animal Science, Department of Large Animal Clinical Sciences, Michigan Cattlemen's Association, and the Michigan Beef Industry Commission. The cattle used in this project were privately purchased by Michigan feedlot owners and sent to feedlot facilities at Michigan State University for processing. After 28 days in the university facility the cattle were moved to the owner's feedlot. This study consisted of 4 separate groups of steer calves (total number = 422) and was conducted from September through December of 1985.

Processing. Cattle were processed within 24 hours of arrival at the university feedlot facility. Processing consisted of weighing, ear tagging, vaccination with a modified-live IBR-PI_3 vaccine administered intramuscularly, vaccination with a clostridial bacterin, anthelminthic treatment with levamisole, treatment with a trichlorfon pour-on and implantation with a growth promotant. All cattle in this study were processed as described above.

Bovine respiratory syncytial virus vaccination. The BRSV vaccine used was a modified-live-virus vaccine (BRSV®[a]). The development of this vaccine strain has been described (20). Calves were randomly assigned to a BRSV vaccinated or nonvaccinated control group at the time of processing. Calves assigned to the vaccinated group received 2 ml of vaccine administered in the gluteal muscles. A booster vaccination was given 2 weeks later.

Clinical Observations. Calves were maintained under observation for 28 days post-processing. Calves were observed daily for the development of lameness or localized inflammation associated with the injection site used for BRSV vaccination. General appearance, attitude, and feed intake were also evaluated. Any calves showing signs of disease were pulled, given a physical examination and treated accordingly. All calves that died were given a complete postmortem examination including microbiological examination of the respiratory tract for bacterial and viral pathogens.

Statistical Analysis. Records were maintained on morbidity, duration of disease, mortality, average daily gain (ADG) and feed intake. Data were analysed using a two factor analysis of variance with mean separation by least significant difference procedures (22).

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Results

No adverse local or systemic reactions were observed following either initial or booster vaccination with BRSV vaccine.

Disease observed during the study was limited to respiratory tract disease. An antemortem etiologic diagnosis was not attempted in affected animals. A total of 6 steers died and findings from postmortem examinations were consistent with pneumonic pasteurellosis. *Pasturella haemolytica* was cultured from the lungs of 4 of the 6 steers that died. Gross and histopathologic findings were not consistent with BRSV associated pneumonia. Viruses, including IBR virus, BVD virus, PI_3 virus and BRSV, were not demonstrated either by isolation or immunofluorescence testing of respiratory tract tissues.

Results of morbidity, average sick days, mortality and ADG for controls and BRSV vaccinates are presented in Table 1. No statistical difference ($p<0.05$) was observed between the controls and vaccinates for these parameters.

TABLE 1. Results of morbidity, average sick days (ASD), mortality and average daily gain (ADG) for control and BRSV vaccinated calves for first 28 days in the feedlot.

	Control	BRSV Vaccinated
No. of steers	209	213
Morbidity, %	32.5	29.1
ASD	1.39	1.29
Mortality, %	0.96	1.89
ADG, lbs/day	1.52	1.61

* There was no statistical significance ($p < 0.05$) for any of the parameters measured between control or BRSV vaccinated groups.

Discussion

An increase in mortality and treatment costs has been reported in groups of cattle vaccinated against respiratory disease within 2 weeks of arrival to feedlots (23). The results of this research dictate a need to establish the safety of modified-live-virus vaccines administered to stress cattle upon entrance to the feedlot. In the present study, administration of a modified-live BRSV vaccine to cattle upon arrival to a feedlot did not appear to elicit any adverse reactions or negative effects. Although a more appropriate use for BRSV vaccination may reside in a preconditioning program for beef cattle, the results of this study indicate this vaccine can be safely used in stressed cattle.

Results of the present study indicated no positive effects or benefits in cattle vaccinated for BRSV as compared to controls. The animals were only followed for a 28 day period after arrival, which may have not been sufficient time to ascertain any positive effects associated with vaccination. Although an antemortem etiologic diagnosis of cattle affected with respiratory tract disease was not attempted, the results of postmortem examinations did not incriminate BRSV as an etiologic agent. In the absence of BRSV infection, a positive benefit of vaccination may not be expected.

With the use of a modified-live vaccine there is a possibility that the vaccinal strain of virus may have replicated and been transmitted to unvaccinated controls, thereby, establishing immunity to BRSV in those animals. However, this appears to be unlikely on the basis of previous field trials in which this BRSV vaccine was not shed or transmitted to unvaccinated controls (20). One other factor must be considered in the failure to demonstrate a positive benefit of BRSV vaccination in this study. This is the possibility that vaccination of half of the animals in a group may have raised the level of herd immunity such that infection with, or transmission of BRSV was prevented.

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