A FIELD TRIAL TO EVALUATE AN INTRANASAL INFECTIOUS BOVINE RHINOTRACHEITIS VACCINE

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In 1960, evidence for the presence of infectious bovine rhinotracheitis (IBR) in Canadian cattle was confirmed by virological techniques (4). Since that time the disease has been reported in many clinical forms from most cattle raising areas in Canada (1).

Modified live virus IBR vaccines for intramuscular administration have been available in Canada since 1961. However, it has been suggested that intramuscular IBR vaccines may not be efficacious for the respiratory form of IBR under many feedlot conditions (1). When a modified live virus vaccine[1] for intranasal administration became available in Canada, the present studies were undertaken to test the efficacy of this intranasal IBR vaccine under feedlot conditions.

Material and Methods

The trial was conducted in a feedlot with a capacity of 1200 cattle and in which the respiratory form of IBR was known to be present prior to the onset of the trial. The diagnosis had been confirmed by clinical, pathological and virological findings.

Source of Cattle

Two hundred and thirty-one cattle weighing between 600 and 800 pounds were purchased from five different sale barns in southern Ontario and delivered to the feedlot during a one month period in the fall of 1972. The cattle were trucked for distances ranging from ten to 50 miles to reach the feedlot. A clinical history on these animals with respect to previous illness or vaccinations was not available.

Feeding

All cattle were self-fed on corn silage plus a protein, vitamin and mineral supplement.

Handling on Arrival and Identification

On arrival cattle were identified by ear-tag, examined for evidence of clinical disease and housed in isolation pens for from six to 24 hours until they were vaccinated.

Vaccination and Subsequent Handling

Approximately two-thirds of the cattle were selected randomly to be vaccinated and one-third left as nonvaccinates. They were vaccinated with two ml of vaccine intranasally according to the vaccine manufacturer's directions. From 12 to 24 hours after vaccination, the vaccinated cattle were placed in one yard in which cattle clinically affected with IBR were present. The control, nonvaccinated cattle were placed in a separate yard in which cattle clinically affected with IBR were present. All management and feeding procedures were identical in the two yards. The vaccinated cattle were kept separate from nonvaccinated cattle to prevent the possible transfer of vaccine virus to in-contact, nonvaccinated animals as has been reported (3).

Clinical Observation and Treatment

Cattle were observed daily for clinical evidence of IBR as described previously (1). Severely affected animals were placed in a hospital pen for a more complete clinical examination and treatment. Standard treatments (1) for the secondary bacterial infections following IBR were utilised.

Pathology Examination

All cattle which died in the feedlot during this trial were necropsied.

Virus Isolation

During the course of the trial, virus isolation attempts were made from 14 animals showing clinical signs of IBR. Ten of these cattle had been vaccinated ten to 14 days previously and four were nonvaccinated animals. Nasal swabs were collected and attempts to isolate IBR virus were made using standard methodology (2).

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[1]Connaught Bovine Rhinotracheitis Vaccine Intranasal. Produced for Connaught Laboratories Ltd., Willowdale, Ontario. Manufactured by: Jensen-Salsbery Laboratories, Division of Richardson-Merrell Inc., Kansas City, Missouri 64141. Sold by Rogar/STB, London, Ontario.

TABLE I

NUMBER OF CATTLE REQUIRING TREATMENT FOR COMPLICATIONS OF IBR AND NUMBER OF DEATHS DUE TO IBR IN VACCINATED AND NONVACCINATED CATTLE

Date of Arrival and Vaccination	V	NV	Vaccinates		Nonvaccinates	
			Number Treated for IBR Complications	Number of Deaths Attributed to IBR	Number Treated for IBR Complications	Number of Deaths Attributed to IBR
October 26	28	10	1	1	0	0
October 28	36	12	12	4	0	0
November 1	20	8	3	0	1	0
November 3	23	8	0	0	0	0
November 8	28	7	11	5	3	2
November 17	22	10	3	0	1	0
November 23	12	7	0	0	0	0
Total	169	62	30 (17.7%)	10 (5.9%)	5 (8.0%)	2 (3.2%)

V–Number of Vaccinates.
NV–Number of Nonvaccinates.

Serological Procedures

Approximately 10% of all cattle on the trial were selected randomly and bled at the time of arrival and the same animals were bled again four weeks after introduction to the feedlot. The serum neutralization test (2) was carried out in cell culture tubes (100 $TCID_{50}$ of IBR virus) for the detection of antibodies against IBR virus.

RESULTS

From ten to 14 days after introduction to the feedlot, the respiratory form of IBR was clinically apparent in both vaccinated and nonvaccinated animals. The morbidity rate, based on clinical findings, ranged from 25 to 50% in both vaccinates and nonvaccinates. The majority of affected cattle did not become completely anorexic and were not treated.

Table I outlines the dates of vaccination, introduction to the feedlot and the number of cattle requiring treatment for complications of IBR and deaths from complications of IBR in both vaccinated and nonvaccinated cattle.

Thirty (17.7%) of the vaccinated cattle and five (8.0%) of the nonvaccinates became anorexic, developed severe respiratory distress and required treatment.

Ten (5.9%) of the vaccinated cattle and two (3.2%) of the nonvaccinated cattle died. Death occurred in the vaccinates between 14 and 39 days (average 21.8 days) postvaccination. One nonvaccinated animal died 24 days after entering the feedlot and the second 39 days later. In all cases, necropsy findings, including histopathological studies, were consistent with those considered as pathognomonic for IBR and its concomitant bacterial complications.

The IBR virus was isolated in all 14 virus isolation attempts.

Table II represents the IBR serum neutralizing antibodies in the vaccinated and nonvaccinated cattle on arrival at the feedlot and four weeks later.

DISCUSSION

Under the conditions of the trial cattle which were vaccinated with an intranasal IBR vaccine were not protected against the respiratory form of the disease. Further trials are planned to determine the necessary length of time between vaccination and introduction, and in fact, to determine if protection can be provided to natural challenge under feedlot conditions. Subsequent trials are particularly important in view of the finding that IBR virus is not particularly sensitive to the antiviral activity induced by interferon (Angulo, A., paper in preparation, 1974).

This trial illustrates the difficulty for a veterinarian to evaluate an IBR vaccination program without having some unvaccinated control animals and a knowledge of prevaccination titers. Apart from the two groups of cattle which arrived on October 28 and November 8, there was no serious problem with IBR in either the vaccinated or nonvaccinated cattle. There was no clinical or serological evidence to explain why animals in these two groups should have been more severely affected than animals in the other groups.

The precise reasons for the failure of the vaccine to protect cattle in this trial are not known. There was some serological evidence of previous exposure to IBR virus in these cattle but in all clinical cases, the incubation

TABLE II

IBR SERUM NEUTRALIZING ANTIBODY TITERS IN VACCINATED AND NONVACCINATED CATTLE ON ARRIVAL AT FEEDLOT AND FOUR WEEKS LATER

Animal Number	Vaccinates		Nonvaccinates	
	On Arrival	Four Weeks Later	On Arrival	Four Weeks Later
29[a]			0	1:8
32			1:1	1:8
38			1:1	1:5
83			0	1:8
112			0	1:1
1	0	1:16		
4	1:5	1:16		
7[a]	0	1:16		
10	0	1:8		
13	1:1	1:8		
16	1:1	1:16		
19	0	0		
25	0	1:16		
28[a]	0	1:8		
40	0	1:8		
42	0	1:5		
90	1:1	1:8		
107	0	1:8		
130	1:1	1:16		
138	1:1	1:8		
150	0	1:32		
170[a]	0	1:32		
186	0	1:5		

[a]Clinical evidence of IBR during test period.

period was consistent with exposure to the IBR virus from cattle in the trial feedlot. It should be mentioned that some of the vaccinated cattle were exposed to the virus before the 40 to 72 hours which has been suggested necessary in order to provide protection (5). However, the cattle in this trial were vaccinated and introduced in this manner because these procedures are very commonly practised by feedlot operators and veterinarians.

The reasons for the higher mortality rate in the vaccinated cattle are not known. It has been noted in one experiment that an intranasal vaccine caused a lower total white blood cell count than in either the parenterally vaccinated animals or the controls, even though the lowered count was still within normal limits (3). It seems possible that a lowering of normal body defense mechanisms following vaccination combined with the stress of introduction to the feedlot could have made these animals more susceptible to secondary bacterial invaders.

SUMMARY

The efficacy of a modified live virus vaccine for intranasal administration was tested in a field trial using 231 cattle. In ten to 14 days after introduction to the feedlot, there was clinical evidence of the respiratory form of IBR in both vaccinated and nonvaccinated animals with a morbidity rate of 25%–50% in both groups. The number of cattle showing anorexia and severe respiratory distress which required treatment was 30 (17.7%) of the vaccinated cattle and five (8.0%) of the nonvaccinated cattle. Ten (5.9%) of the vaccinated cattle and two (3.2%) of the nonvaccinated cattle died and post mortem examinations indicated respiratory IBR and its bacterial complications as the cause of death. Under the conditions of the trial, vaccination with an intranasal IBR vaccine did not confer protection to the cattle against the respiratory form of the disease.

RÉSUMÉ

Cette expérience visait à éprouver l'efficacité de la vaccination intra-nasale de 231 sujets, à l'aide d'un vaccin atténué contre la rhinotrachéite infectieuse bovine. De dix à 14 jours après leur arrivée dans un parc d'engraissement, on observa des signes cliniques de la forme respiratoire de la maladie aussi bien chez des sujets vaccinés que chez des non vaccinés; le taux de morbidité varia de 25 à 50% au sein des deux groupes. Trente (17.7%) des sujets vaccinés et cinq (8%) des non vaccinés manifestèrent une anorexie complète et des diffi-

cultés respiratoires graves qui nécessitèrent un traitement. Dix (5.9%) des animaux vaccinés et deux (3.2%) des non vaccinés moururent; la nécropsie de ces sujets permit d'attribuer leur mort à la forme respiratoire de la rhinotrachéite infectieuse bovine et à ses complications bactériennes. Dans les conditions de l'expérience, l'emploi d'un vaccin intra-nasal contre la rhino-trachéite infectieuse bovine ne protégea pas les animaux contre la forme respiratoire de la maladie.

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ABSTRACT

"Allergic" pneumonias of cattle: new approaches and new drugs. P. Eyre (Ont. Vet. Coll., Guelph, Ontario).

Immediate hypersensitivity may contribute not only to so-called acute atypical pneumonias (emphysema, fog-fever) but in certain viral and bacterial pneumonias also. Anaphylactic hypersensitivity of cattle is accompanied by liberation of kinins and certain vasoactive lipids: prostaglandins and slow-reacting substance, in addition to histamine and serotonin. It is accepted that antihistaminics are of limited clinical value in this context. We have now shown that certain non-steroidal anti-inflammatory drugs, e.g. aspirin, meclofenamate and indomethacin are between 75 and 100% protective against cardiopulmonary hypersensitivity in calves. Phenylbutazone was 30% protective. All these agents owe their potency to inhibition of kinins and inflammatory lipids. The anthelmintic, diethylcarbamazine (Franocid) also strongly suppresses anaphylaxis (60%). The work has shown not only that lipids may be more important than amines in anaphylaxis, but has also suggested a number of promising drugs for control of diseases of cattle in which hypersensitivity may play a role.

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