EFFECTS OF PASSIVE IMMUNITY ON IMMUNE RESPONSE IN CALVES FOLLOWING VACCINATION FOR IBR

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Thirty-three per cent of the calves nursing cows with titers to IBR when vaccinated at one to six weeks of age exhibited no immunological response but an anamnestic response was observed on a second vaccination in approximately 67% of the vaccinated animals. The latter vaccination was made at least one month following the first vaccination.

INTRODUCTION

It is well established that either antigen or antibody may interfere with immunological responses in a "normal" young animal (5, 8, 9). Natural passive immunity (antibody interference) has received attention in the livestock industry as a possible explanation for disease outbreaks even though the animals received a specific vaccine that was correctly administered, when they were young (1, 2, 3, 4, 6, 7).

This investigation was initiated to determine the degree of immunosuppression following vaccination of young animals with IBR attenuated vaccines.

Materials and Methods

Experimental Animals

All animals used were of Holstein breeding. All animals were obtained as pregnant adult animals and vaccinated at least twice before parturition with attenuated intramuscular IBR vaccine. A total of 19 calves were utilized from cows of the above described status.

Blood and Milk Samples

All cows were bled and colostrum collected from all lactating quarters before nursing occurred. All calves were bled before initial nursing, at 24-36 hours post-nursing, at one week of age and at monthly intervals thereafter up to 36 weeks post-partum and a pre-vaccination and 3 weeks post-vaccination intervals after 36 weeks post-partum. Blood serum and milk whey were obtained by centrifugation. All evaluations were made within 36 hours of sample collection. Surplus blood serum and milk whey were frozen at a −20° and stored.

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Antibody Determination

All serum and whey titers to IBR were determined by the conventional tube serum, neutralizing (SN) test employing the Colorado strain IBR virus. Detection of titer variation was made by employment of the bovine blood serum having a known titer to IBR with each group of serums titered. When a titer variation of 1 log was detected in the serum or whey, samples were rerun in duplicate. Serum and whey titers are expressed as the reciprocal of the greatest twofold serological dilution completely inhibiting the production of CPE. The IBR virus suspension contained 10_2 to 10_3 $TCID_{50}$/0.1 ml with 0.1 ml employed per tube.

Vaccines

Three commercially prepared attenuated IBR vaccines were each intermittently utilized according to the manufacturer's instructions throughout this investigation.

The blood serum titers and colostral whey titers of cows employed in this investigation are presented in Table 1. The mean average colostral titer was 1:120 with a high of 1:256 and a low titer of 1:4.

Ten nursing calves possessing a passive titer were vaccinated initially at 1-6 weeks of age. The average mean titer four weeks following vaccination was 1:7 with a high of 1:64 and a low of no demonstrable titer. An increased titer was detected in 27%, no change in titer in 36.4% and a decrease in titer in 27.3% of these calves. One calf (9.0%) died following vaccination. Nine calves nursing vaccinated cows were vaccinated initially when they were 4-12 months of age. The mean average IBR titer was 1:6 with a peak titer of 1:32 and a low of no demonstrable titer at 4 weeks following vaccination. An increased titer was detected in 66.7% with no change in 33.3% of the calves so vaccinated. Revaccination of 15 of

the above two groups of calves was made when the calves were 18 to 24 months old. Four weeks following vaccination the average mean titer was 1:3.6 with a peak titer of 1:8 and a low of no demonstrable titer. An increased titer was observed in 73.3%, no change in 20% and a decrease in titer in 6.7% (Table 1).

Discussion

When apparently immunocompetent young animals fail to respond to a recognized vaccine one should be cognizant of possible contributing factors other than natural passive immunity.

As recorded in Table 1 approximately ⅓ of all the calves failed to respond upon initial vaccination and a decrease in titer was also observed. Similar results have previously been reported (48). An anamnestic response was observed in appoximately ¾ of the calves receiving a second vaccination. Explanation for an unobserved anamnestic response and an occasional decrease in post-vaccination titer is not offered. This work would indicate that calves having a colostral titer will respond to IBR vaccines at a younger age than previously described (18).

SUMMARY

Calves nursing cows possessing an average colostral titer to IBR of 1:160 were vaccinated intramuscularly with an attenuated IBR vaccine at various post-partum ages.

An increase in blood serum titer was observed in 27.3% of the calves initially vaccinated at 1 to 6 weeks of age while 66.7% of the calves initially vaccinated at 4-12 months of age exhibited an increase titer. Calves receiving a second administration of vaccine when 18 to 24 months of age exhibited 73.3% increase in blood serum titer.

Table 1. Average Mean Blood Serum Titers for IBR of Calves of IBR Immune Dams

	Dam (24)		Age of Calf Vaccination		
	Serum	Colostrum	1-6 weeks (10)	4-12 mo. (9)	2nd Vaccination 18-24 mo. (15)
Post-Vaccination					
Titer					
High	512	256	64	32	8
Mean	92	120	7	6	3.6
Low	2	4	0	0	0
Titer Change (Per Cent)					
Increased	NA	NA	27.3	66.7	73.3
No Change	NA	NA	36.4	33.3	20.0
Decreased	NA	NA	27.3	0	6.7
Death	NA	NA	9.0	0	0

(24) = Number of animals
Titers presented as reciprocals of dilutions
NA — Not Applicable

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