SHORT COMMUNICATIONS

Natural Transmission of Bovine Leukemia Virus in Dairy Calves by Dehorning

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ABSTRACT

Gouge dehorning was evaluated as a mode of transmitting bovine leukemia virus in Holstein calves at a commercial dairy. Significantly ($p < 0.05$) more calves dehorned by the gouge method developed antibodies to bovine leukemia virus, as measured by agar-gel immunodiffusion, three months after dehorning, than calves not dehorned. The field use of a blood-contaminated dehorning device resulted in transmission of bovine leukemia virus.

Key words: Bovine, leukemia, transmission, dehorning.

RÉSUMÉ

Cette expérience consistait à déterminer si le décornage à l'aide de la gouge de Barnes pourrait contribuer à disséminer le virus de la leucémie bovine. Les auteurs utilisèrent donc l'instrument précité pour décorner les veaux d'un troupeau Holstein. Trois mois après l'intervention, un nombre sensiblement plus élevé ($p < 0,05$) de veaux décornés que des témoins possédaient des anticorps contre le virus précité, comme le démontra l'épreuve de précipitation en milieu gélifié. L'emploi d'une gouge de Barnes, souillée de sang, contribua donc à propager le virus de la leucémie bovine.

Mots clés: bovins, leucémie, transmission, décornage.

Several studies have shown that *in utero* transmission of bovine leukemia virus (BLV) from infected cows occurs in less than 20% of calves (1-7). Hence, vertical transmission occurs infrequently. Horizontal transmission is generally considered the major mode of transmission of BLV (1,3,8). Since the only cell known to be infected by BLV is the lymphocyte (9-10), infection can result only from transfer of infected lymphocytes. Experimentally, cattle can be infected by many routes (11-12), indicating a relatively high susceptibility to infection. However, natural modes of horizontal transmission, in the field, have not been demonstrated. This report describes the transmission of BLV by dehorning in Holstein calves at a commercial dairy.

The commercial dairy of Holstein cattle was located 30 miles north of Seattle, Washington. Initial testing of a sample of the herd for antibodies to BLV revealed that only four of 45 (9%) heifers less than one year old had antibodies while 44 of 54 (81%) cows greater than one year old had antibodies. This difference in prevalence, which was statistically ($p < 0.001$) significant, suggested considerable transmission of BLV in calves six to 12 months old. Calves six to 12 months old were maintained in a covered outdoor pen, 20 feet by 180 feet. They were fed hay, silage and two to three pounds of grain daily. Water was provided in metal troughs. Evaluation of management practices of the dairy revealed that the following procedures were performed in calves six to 12 months old: intramuscular vaccination with an multidose syringe against several infections and dehorning by the gouge method. Description of the practice of gouge dehorning suggested that it might be involved in the transmission of BLV.

Seventy-one calves, six to 12 months old, were randomly divided into three groups: 1) 21 were not dehorned (control), 2) 30 were dehorned by the gouge method and 3) 20 were dehorned by the gouge method followed by cautery. Dehorning by the gouge method was performed by the dairyman with a Barnes dehorner. Bleeding vessels were removed with hemostats. Instruments were neither cleaned nor disinfected between calves. This practice had been in existence on the farm for several years. The group dehorned by the gouge method followed by cautery was done by a veterinarian. The Barnes dehorner was cleaned and soaked in a virucidal disinfectant, chlorhexidine diacetate (Fort Dodge Laboratories Inc., Fort Dodge, Iowa), between calves. The dehorned areas were cauterized by the application of an electri-

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cal dehorner for 30 seconds. Further bleeding was arrested by application of ferrous sulfate powder (Styptic powder, Bio-ceutic Laboratories Inc., St. Joseph, Missouri). Calves were bled at the time of dehorning, three and six months later. No other parenteral inoculations were administered.

Blood was collected from the jugular vein in a syringe and was transferred to evacuated tubes without anticoagulant. Needles and syringes were used once and discarded. Serum was obtained after centrifugation of blood and assayed for BLV antibodies, using the agar-gel immunodiffusion test (13). The antigen preparation contained glycoprotein and internal virion antigens. Immunodiffusion plates were evaluated after 48, 72 and 96 hours and results were recorded as positive or negative. The prevalence of reactors between groups was compared by Fisher's exact test. The prevalence of reactors within groups was compared by the sign test.

At the time of dehorning no significant difference in prevalence of BLV antibodies was detected between calves not dehorned (control) and calves dehorned by the gouge method or calves dehorned by the gouge method followed by cautery (Table I). Three months after dehorning, one of 19 control calves had seroconverted, while seven of 22 calves dehorned by the gouge method had seroconverted. The prevalence of BLV antibodies was significantly ($p < 0.05$) greater in the gouge dehorned group than the control group. Calves dehorned by the gouge method followed by cautery had no seroconversions. Comparison of the acquisition of antibodies to BLV within groups also revealed that calves dehorned by the gouge method had a significant ($p < 0.05$) number of seroconversions (Table II). Testing at six months after dehorning detected one further seroconversion in a calf dehorned by the gouge method followed by cautery.

The results of this study indicate that BLV was transmitted by dehorning in Holstein calves at a commercial dairy. The mechanism of transmission was considered to be blood or tissue, remaining on the dehorning device from BLV infected calves, inoculated into susceptible calves when dehorned. Transmission of BLV was suspected following routine blood sampling of herds (14) and premunization against babesiosis using whole blood (15). Cattle have been infected by intradermal inoculation of as few as 2,500 lymphocytes, the number of lymphocytes present in 0.0005 mL of blood (11).

Assay for BLV antibodies three months after dehorning was based on experimental studies which detected antibodies to BLV in one to three months after inoculation (11,12,16). Calves infected by dehorning also developed antibodies within three months after exposure. This study also demonstrated that cleaning and disinfecting the dehorning device between calves prevented transmission of BLV. However, the hemostasis achieved by cautery in this group may have contributed to prevention of infection. This indicates that calves that have to be dehorned by the gouge method because of their age, can be dehorned with minimal risk of transmitting BLV.

With the demonstration of this mode of transmission of BLV in the herd, the practice of gouge dehorning was discontinued and electrical dehorning at six to 12 weeks of age instituted. The entire herd is presently being followed to determine whether BLV infection will be delayed in time or eliminated.

TABLE I. Prevalence of Antibodies to Bovine Leukemia Virus in Holstein Calves by Dehorning Method

		Months after Dehorning			
		0		3	
Dehorning Method	Number Tested	Number Positive	Percent Positive	Number Positive	Percent Positive
None	21	2	10	3	14
Gouge	30	8	27	15	50[a]
Gouge and cautery	20	6	30	6	30

[a]Prevalence significantly ($p < 0.05$) greater than in calves not dehorned

TABLE II. Comparison of Antibodies to Bovine Leukemia Virus in Holstein Calves Before and After Dehorning

Dehorning Method	Before Dehorning	After Dehorning		
		BLV-	BLV+	Total
None	BLV-	18	1	19
	BLV+	0	2	2
				21
Gouge	BLV-	15	7[a]	22
	BLV+	0	8	8
				30
Gouge and cautery	BLV-	14	0	14
	BLV+	0	6	6
				20

[a]Significant ($p < 0.05$) number of seroconversions

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