

Presence of Antibodies to Bovine Viral Diarrhea-Mucosal Disease Virus (Border Disease) in Sheep and Goat Flocks in Quebec

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ABSTRACT

A seroepidemiological study of border disease was conducted in sheep and goats in various areas of Quebec. Sera of 10% of animals of selected flocks were collected and specific antibodies against bovine viral diarrhea-mucosal disease were tested by seroneutralization. Results show that 10.9% and 16% of sheep and goats respectively gave a positive reaction. The lower serological prevalence was found in sheep flocks of the Sherbrooke area (5.4%) while the highest percentage of positive sera was observed in the Quebec area (24.7%). The prevalence in goats varied according to areas (2.6 to 45.5%). No relation was observed in seropositive animals between age, sex, breed and the presence of abortions in the flocks. Our serological results indicate that border disease is probably present in Quebec sheep and goat flocks but that the clinical diagnosis of this disease is not well established.

Key words: Sheep, goats, border disease, bovine viral diarrhea, prevalence.

RÉSUMÉ

Les auteurs ont effectué un relevé sérologique relatif à la maladie: "Border disease", chez les moutons et les chèvres de diverses régions du Québec. Ils utilisèrent à cette fin des échantillons prélevés chez 10% des sujets de troupeaux choisis préalablement et ils y recherchèrent, par l'épreuve de séroneutralisation, des anticorps contre le virus du complexe de la maladie des muqueuses bovine. Leurs résultats révélèrent la présence

de tels anticorps, chez 10,9% des moutons et 16% des chèvres. Ils constatèrent aussi que seulement 5,4% des troupeaux de moutons de la région de Sherbrooke comptaient des sujets séropositifs, comparativement à 24,7% de ceux de la région de Québec. La proportion de chèvres séropositives varia par ailleurs de 2,6% à 45,5%, selon les régions. Les sujets séropositifs ne présentaient aucune relation relative à leur âge, leur sexe et leur race, ou à la présence d'avortements dans le troupeau. Les résultats de cette étude révèlent que la "Border disease" existe probablement au sein des cheptels ovin et caprin du Québec, mais que son diagnostic clinique demeure difficile à préciser.

Mots clés: moutons, chèvres, "Border disease", diarrhée à virus bovine, prédominance.

Border disease (BD) is a clinical entity which is characterized by: i) abnormally hairy, sometimes pigmented birth coat in lambs or normally smooth coated breeds; ii) a flock history of poor growth and viability of lambs, a proportion of which shows rhythmic shaking movements; iii) the occurrence in lambs under six months of age of myelin defects (hypomyelination) and clusters of abnormal swollen interfascicular glia in the central nervous system (1).

This disease has been described in many countries: Great Britain (2), New Zealand (3), United States (4) and Australia (5). One case of BD-like syndrome only has been described in Canada in a sheep flock (6) and no such clinical manifestations have been reported in goats. The study reported

herein shows the occurrence of antibodies against bovine viral diarrhea-mucosal disease (BVD-MD) virus in sheep and goat sera collected in flocks from various areas in Quebec.

A total of 699 sheep and 100 goats were sampled on the field among a number of unselected animals corresponding to 10% of the total population of each flock. Flocks tested (222) were chosen according to the number of herds of each agricultural area. Areas studied have been grouped according to the regional Laboratories of Animal Pathology of the Government of Quebec. Data concerning age, sex, breed and clinical signs in the flock were collected for each animal tested. Sera samples were stored at -20°C until testing. Antibodies were titrated in heat-inactivated (56°C, 30 min) sera by microneutralization test with NADL strain of BVD-MD virus (100 TCID₅₀) used as antigen. A reciprocal titer higher than eight was considered as positive. The statistical analysis of results was performed on proportions in a two-way classification. This process is similar to the analysis of variance with continuous data (7).

Out of 699 sheep sera tested, neutralizing-antibodies were found in 73 sera (10.9%). In goats, 16 animals out of 100 displayed an antibody titer positive to BVD-MD virus (16%). Figure 1 shows the distribution of positive titers in sheep and goat sera. Mean positive titers in sheep and goats were respectively, 64 and 256. Various prevalences were observed according to areas (Table I). These differences observed in areas were significant ($p \leq 0.001$). Results indicated that serological prevalence was lower in sheep flocks in the Sherbrooke area (5.4%) while the highest percentage of

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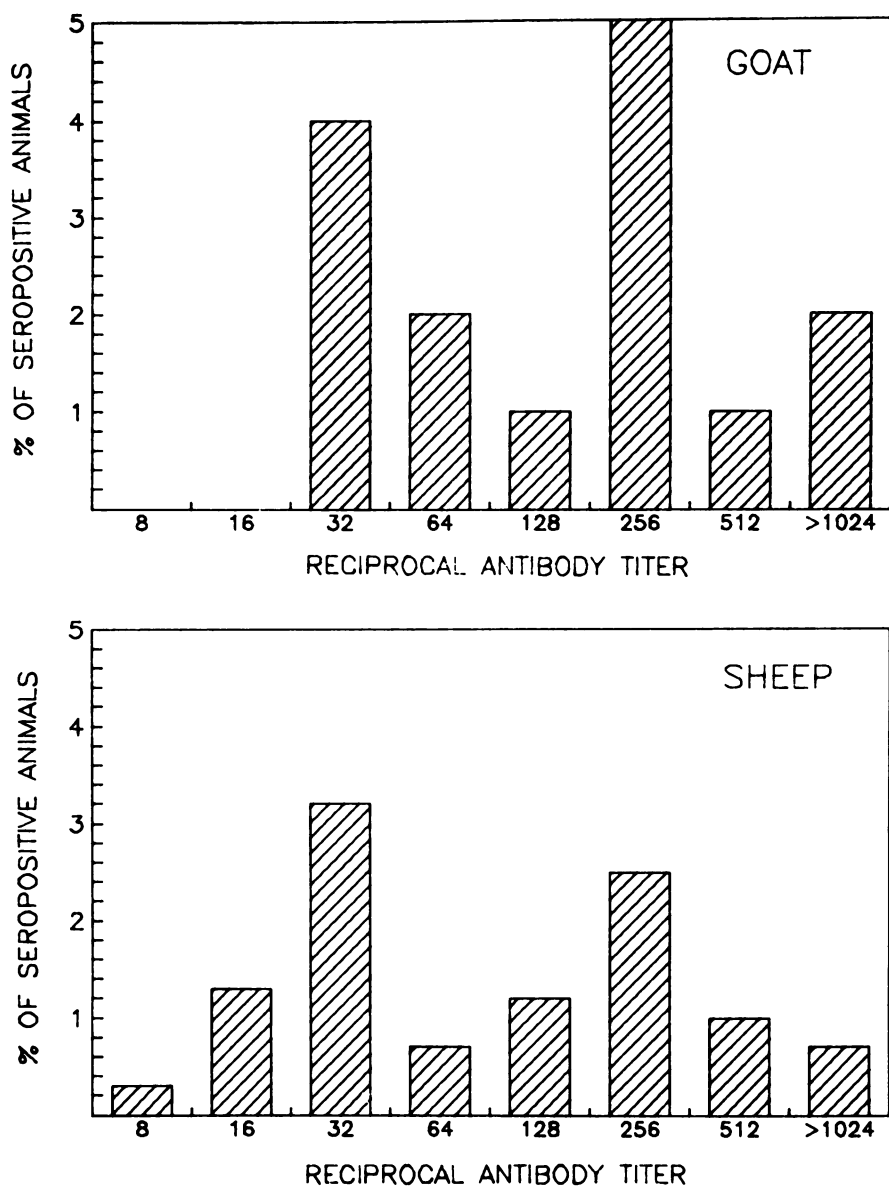


Fig. 1. Distribution of positive neutralizing antibody titers to BVD-MD virus in the total sampling of sheep and goats tested.

positive animals was found in the Quebec area (24.7%). In contrast, in goat flocks, l'Assomption area showed a small number of seropositive goats (2.6%) whereas the prevalence in these animals reached 45.5% in the Rimouski area.

No significant difference was observed in the susceptibility to BD according to age, sex and breed of sheep and goats tested (Table II). In addition, no relation was found between mean antibody titers and presence of abortion in flocks. This is at variance with what was observed with maedi-visna virus infection (8).

This seroepidemiological study shows the presence of BD virus in sheep and goat flocks in Quebec in spite of the absence of clinical manifestations of this disease. A similar prevalence rate to BD was observed in England where the clinical disease is well recognized (9). This situation may be explained by the fact that clinical diagnosis of BD raises some problems. As indicated by Barlow and co-workers, the clinical signs associated with BD are unclear (1). Pathogenic properties of the BD viruses varied according to the strain (10) and to the immune status of the ewe (10,11). In addition, a small number of lambs showed typical clinical signs during the BD outbreaks (12) and affected ewes became resistant to a subsequent challenge with the same strain of virus (13).

A regional distribution of the prevalence rate of BD antibodies in adult sheeps and goats was observed in Quebec. Similar results have been described for England and Wales (9), but

TABLE I. Prevalence of Seropositive Sheep and Goats to BVD-MD Virus According to Agricultural Areas

Agricultural Areas	Laboratory	Number of Sheep		%	Number of Goats		%
		Positive	Tested		Positive	Tested	
Cantons de l'Est	Sherbrooke	4	74	5.4	n.t.	n.t.	—
Région de Québec	Québec	21	85	24.7	1	11	9.1
Région de la Beauce							
S-O. Montréal	St-Hyacinthe	7	76	9.2	3	18	16.7
Richelieu							
Région de Nicolet	Nicolet	4	66	6.1	1	11	9.1
Mauricie							
Nord de Montréal	L'Assomption	17	192	8.9	1	38	2.6
Outaouais N-O. du Québec							
Gaspésie	Rimouski	20	183	10.1	10	22	45.5
Bas St-Laurent							

n.t. = not tested

TABLE II. Prevalence of Seropositive Sheep and Goats to BVD-MD Virus According to Breed

Breed	Number of Sheep		%	Breed	Number of Goats		%
	Positive	Tested			Positive	Tested	
Cheviot	5	33	13.2	Nubien	3	7	42.9
Hampshire	1	25	4.0	Toffenburg	2	25	8.0
Oxford	5	12	29.4	Alpine	2	9	22.2
Leicester	3	65	4.6	Half-breed	2	21	9.5
Suffolk	20	162	12.3				
Dorset	5	51	9.8				
Half-breed	25	222	11.3				

in such studies, age, sex or breed factors were not associated with geographical variations. The mode of transmission of BD virus is not well-defined but seems to occur during the first years of life since no increase of prevalence of BD antibodies was detected in animals of three years of age or older. Immunologically tolerant infected lambs may constitute a reservoir of virus, allowing spreading of infection to susceptible animals (14,15).

In conclusion, BD virus must be taken into consideration as an aetiological agent for abortions or birth of weak lambs or goats in Quebec flocks. In consequence, specific virological and serological analysis should allow isolation of this virus in affected flocks.

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