Incidence, epidemiology and control of bovine virus diarrhoea virus in South America


Summary: Outbreaks of diarrhoea associated with mucosal erosions of the mouth, tongue and digestive tract, clinically diagnosed as bovine virus diarrhoea-mucosal disease (BVD-MD), have been reported in Argentina and Brazil since the 1960’s. However, primary isolation of the virus of BVD-MD is fairly recent, occurring in 1974 for Brazil, 1984 for Argentina, 1985 for Chile and 1981 for Colombia.

In Argentina both cytopathogenic and non-cytopathogenic BVD virus strains have been identified. Elsewhere in South America this differentiation does not seem to have been carried out.

Serological surveys have confirmed the existence of BVD virus infection in six countries (Argentina, Brazil, Chile, Colombia, Peru and Uruguay), with an incidence rate ranging between 37 and 77% of cattle in the areas surveyed.

Diarrhoea in calves between 3 and 18 months of age, often associated with mucosal erosions, has been the most commonly observed syndrome. In some cases an upper respiratory tract involvement was described. In one epizootic, in the Sabana de Bogota plateau of Colombia, reproductive failure associated with abortions or birth of weak calves was the main clinical syndrome.

KEYWORDS: Argentina - Bovine virus diarrhoea-mucosal disease - Bovine virus diarrhoea virus - Brazil - Chile - Colombia - Control - Epidemiology - Incidence - Peru - Uruguay.

INCIDENCE AND EPIDEMIOLOGY

The incidence of bovine virus diarrhoea-mucosal disease (BVD-MD) is only scantly recorded in South America. Investigations on BVD-MD in the region have been sporadic, relating either to localised serological surveys or to abnormal outbreaks of diarrhoea in young cattle. The FAO/WHO/OIE Animal Health Yearbooks

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(1985-87) list BVD-MD as sporadic in four countries of South America (Argentina, Chile, Colombia and Uruguay). The paucity of specific data on BVD-MD had led to a common assumption within South America that BVD-MD was an exotic disease for the region. However, an examination of the published and unpublished data from several South American countries leads to the conclusion that the virus is endemic in the region. As shown in Table I, the virus has been isolated in four countries and serological evidence of infection exists for six countries. The situation in each of these six countries is described below.

**Table I**

**Diagnosis of BVD virus in South America**

<table>
<thead>
<tr>
<th>Country</th>
<th>Virus isolation</th>
<th>Antibody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Brazil</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Chile</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Colombia</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Peru</td>
<td>—</td>
<td>+</td>
</tr>
<tr>
<td>Uruguay</td>
<td>—</td>
<td>+</td>
</tr>
</tbody>
</table>

+ reported
- not reported

**Argentina**

The first description of a clinical syndrome in young cattle resembling the bovine diarrhoea-mucosal disease complex in Argentina was provided by Gallo *et al.* in 1964 (9). They described an outbreak of diarrhoea associated with stomatitis in yearling cattle in the Provinces of Buenos Aires and Cordoba. During the next eight years the same authors described two similar outbreaks in the provinces of La Pampa, Santa Fe and Santiago del Estero (10). Outbreaks were encountered in the winter-spring months with a morbidity of 14-89% and a mortality rate of 3-25%.

In 1979 Tarabla *et al.* (18) provided the first laboratory evidence of the existence of BVD virus infection in Argentina. They investigated two outbreaks in the Province of Santa Fe, in which they studied specific BVD virus seroconversion by means of indirect immunofluorescence. The two outbreaks were on properties with a good standard of husbandry including regular vaccination against foot and mouth disease, anthrax and blackleg. Disease was encountered in the months of January and September 1979 (i.e. summer and spring respectively) and was characterised by a low morbidity (2.4 and 3.3%) but a high mortality rate (72.7 and 53.3%). The disease was confined to heifers of 18 to 24 months of age of *Bos taurus* and *Bos taurus × indicus* crosses. The clinical signs consisted of elevated temperature (41.5°C), intense diarrhoea, depression, anorexia and weight loss. A proportion of cases showed conjunctivitis, corneal opacity and ocular discharge, while others showed upper respiratory signs characterised by coughing, dyspnea, sero-haemorrhagic and purulent nasal discharge. A few animals demonstrated nervous signs of locomotive incoordination. Upon post-mortem examination, the most striking lesions were necrotic, ulcerative lesions of the tongue and the entire digestive tract. In some cases
there were also respiratory lesions consisting of congestion and petechial haemorrhages of the upper respiratory tract. In the majority of paired serum samples, the authors demonstrated a significant antibody rise between the first serum samples (titre negative to 1:20) and the second serum samples (titre 1:2 to 1:200). They concluded from this that BVD virus infection had been the principal cause of the outbreaks.

Between 1979 and 1987 serological surveys in various provinces demonstrated an incidence rate of 37 to 62% (16; A.A. Schudel and C. Pianovi, unpublished findings). Thus in 1979, of the 1,500 serum samples from the Mesopotamica and Pampeana regions (North-east and North-west Argentina) 61.9% were positive for antibody to BVD virus. In 1985, of the 2,490 serum samples from 70 different farms in the Province of Corrientes (North-east Argentina), 41.6% were positive. In 1986-87 the National Diagnostic Centre detected BVD virus antibody in 37% of 1,494 samples from throughout the country.

Virus isolation has been achieved since 1984 (1). Table II summarises the latest situation regarding BVD virus isolation. It will be observed that both cytopathogenic and non-cytopathogenic BVD virus strains have been isolated in Argentina.

### Table II

**Summary of BVD virus isolation in Argentina**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of samples</th>
<th>Origin</th>
<th>Material</th>
<th>CP virus (a)</th>
<th>NCP virus (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>3</td>
<td>Buenos Aires</td>
<td>Organs</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>La Pampa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cordoba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>1</td>
<td>Buenos Aires</td>
<td>Organs</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>1986</td>
<td>3</td>
<td>Santa Fe</td>
<td>Organs</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cordoba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>2</td>
<td>Buenos Aires</td>
<td>Organs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cordoba</td>
<td>Blood</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1988</td>
<td>10</td>
<td>Buenos Aires</td>
<td>Fetal calf serum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Senemen</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Organs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Organ swabs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>2</td>
<td>Buenos Aires</td>
<td>Fetal organs</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>to April</td>
<td></td>
<td>La Pampa</td>
<td>Organs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) CP: cytopathogenic BVD virus strain
(b) NCP: non-cytopathogenic BVD virus strain

**Brazil**

Between 1966 and 1971, Correa and his colleagues (2, 3) from the University of Botucatu, São Paulo, investigated and described various outbreaks of a disease resembling bovine virus diarrhoea-mucosal disease complex in the western districts of the State of São Paulo. The outbreaks, occurring during the winter and spring months (July to October), involved young cattle up to 18 months of age and were most prevalent in calves three to twelve months old. Anorexia, lassitude and erosions
of oral and nasal mucosae accompanied by diarrhoea were the main signs of the disease. Morbidity was generally between 10 and 100% but mortality was 4 to 20%. Diarrhoea was not always the prominent feature. In some of the outbreaks investigated by the authors during 1966 and 1967 the farmers or farm workers had merely noted that the animals had been anorexic for 1-2 weeks before dying. Only upon examination of some of the herds were the authors able to isolate sick animals which had an elevated temperature (40-40.5°C), erosions of the buccal and nasal mucosae and in some cases developed profuse diarrhoea after 3-4 days. About 20% of these animals died 10-15 days later. Again, not all affected animals had diarrhoea but all had mucosal erosions. Correa et al. (3) observed that no new cases occurred on farms where infection had persisted for two or three years.

In 1972 Soares and Pereira (17) studied outbreaks of profuse diarrhoea on thirteen farms in the same area of western São Paulo State. Of the 2,646 animals examined, 465 (17.5%) were sick and, of the latter, 113 (24.3%) subsequently died. The authors were unable to isolate cytopathogenic or non-cytopathogenic BVD virus from spleen, blood, mesenteric lymph nodes, faeces or intestinal mucus. BVD virus neutralising antibody (against Oregon strain C24V) was detected in both sick and healthy cattle. However, both the incidence rate and titre of BVD virus antibody were higher in sera from sick animals than from healthy cattle: only 2 of 59 (3.4%) sera from healthy cattle were positive (titre 1:5 and 1:25) while 12 of 31 (38.7%) sick animals were positive with titres ranging between 1:25 and 1:625. Nevertheless, the authors were non-committal as to whether BVD virus had been the primary cause of diarrhoea or whether there were other, unspecified agents involved. In 1981 Mueller and Ikuno (12) were similarly cautious in referring to their unpublished data, in spite of having detected a 35% incidence rate of BVD virus antibody in cattle serum samples from São Paulo State.

Virus isolation in Brazil was first achieved by Vidor in 1974 (19) from abattoir serum in Rio Grande do Sul. The virus demonstrated typical BVD virus cytopathology in primary bovine testis cells which was neutralised by specific antiserum (Oregon C24V and Denmark Ug-59). More recently, in 1988, Mueller et al. (13) reported what seems to be the first isolation of BVD virus in Brazil (and certainly in the State of São Paulo) from clinical cases of bovine diarrhoea. The virus was isolated from faecal samples of 11 sick animals with clinical manifestations of bloody diarrhoea, nasal and vulval discharge. The isolated virus was neutralised by two reference antisera (against Oregon and Singer strains). These were preliminary results of a current project, financed by the Brazilian National Research Council (CNPQ), which hopes to develop diagnostic techniques and to survey the incidence of cytopathogenic and non-cytopathogenic BVD virus strains in São Paulo State.

Chile

In 1983-84, the Pathology Department of the Austral University apparently encountered typical lesions of BVD-MD in various routine post-mortem examinations. However, the first reported outbreak of BVD-MD in Chile was described in 1985 by Fiedler et al. (6). They reported an outbreak of intermittent diarrhoea associated with stomatitis and nasal discharge in 40 calves aged 6-7 months within a herd of 350 cattle; five calves died one week after the onset of diarrhoea. Necropsy examination of four affected calves revealed dehydration, conjunctivitis and lymphadenitis; but the most prominent feature was superficial erosion of the buccal, palate, rumen and abomasal mucosae. Three of four carcasses also presented haemorrhagic catarrhal enteritis.
Virus antigen was detected by immunofluorescent staining of tissues from three of the four carcasses (14). Virus was also isolated and the strain was designated Volcan 85. Interestingly, the affected farm had not introduced any animals into the herd. This suggested that the virus infection was endemic.

Two serological surveys subsequently demonstrated a high antibody incidence in different regions of the country. In 1986 Enriquez (5) detected BVD antibody in 69% of 423 serum samples examined. Later Gallardo (7) detected antibody in 77% of 525 serum samples studied.

**Colombia**

The first outbreak in Colombia was diagnosed in 1976 in a group of Friesian calves imported from Holland which developed diarrhoea with a high mortality rate (11). The BVD virus was first isolated in 1981 from a dead calf with respiratory complications and parasitism (8). In 1983 there were several reports of reproductive failure in the Sabana de Bogota region: these included abortions at different stages of gestation, birth of weak calves and mastitis in the dams. A serological study revealed that cows which were BVD virus seronegative before abortion all (100%) developed high titres (≥ 1:2048) following abortion. No other infectious or non-infectious cause could be related to the abortions in Sabana de Bogota. BVD virus infection was, therefore, regarded as the primary cause of the reproductive failure. In two subsequent serological studies, an antibody prevalence of 42 to 47% was demonstrated in eight different regions of Colombia (8, 11).

**Peru**

We have been able to identify only one report relating to the occurrence of BVD virus infection in Peru. In the study reported by Rosadio et al. (15), 34 serum samples from sheep in Peru were tested for antibody against a variety of viruses including BVD virus (Singer strain). Only one sample from the Central Region was BVD virus antibody positive. We are not aware of any study in cattle.

**Uruguay**

BVD-MD has been diagnosed clinically in Uruguay but to date there has been no report of virus isolation. A limited serological survey detected BVD virus antibodies in some herds but no data were published on prevalence levels (J. Saizar, personal communication).

**CONTROL OF BVD-MD IN SOUTH AMERICA**

There are no specific, official control programmes against BVD virus in any of the South American countries. Only in Colombia is there specific legislation for BVD virus. This requires that semen from only BVD virus seronegative bulls may be used in artificial insemination. BVD virus vaccination has not been authorised in any country in South America.

It should be remembered that the dominant disease in South America has been foot and mouth disease (FMD) and most resources are used for its control (4).
Consequently, cases of cattle presenting mouth lesions tend to be suspected as FMD, irrespective of other clinical signs. Similarly, within the official laboratories, samples are tested for the vesicular disease viruses of FMD and vesicular stomatitis. With the success of the FMD control programme in South American countries, resulting in total eradication in Chile and Southern Argentina and a markedly reduced incidence elsewhere on the continent where official FMD campaigns are conducted (4), attention is beginning to focus on the so-called “FMD-like” diseases. In this context, the Pan American Foot and Mouth Disease Center in Rio de Janeiro has recently started a project to evaluate the relative significance of BVD, IBR and bluetongue viruses in the differential diagnosis of FMD. This project hopes to link with the various national laboratories. It should be noted that as a result of the success of the FMD campaigns in South America, foot and mouth disease has tended to become a disease of yearling cattle, especially in the immediate post-weaning period (6-15 months of age). This is the same age group generally affected by IBR and BVD-MD.

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En Argentine, on a identifié des souches cytopathogènes et des souches non cytopathogènes du virus BVD. Il ne semble pas que cette différenciation ait été faite dans les autres pays d’Amérique du Sud.

Les enquêtes sérologiques ont confirmé la présence de l’infection par le virus BVD dans six pays (Argentine, Brésil, Chili, Colombie, Pérou et Uruguay). Le taux d’incidence, dans le cheptel bovin des zones étudiées, variait entre 37 % et 77 %.

Le syndrome le plus fréquemment observé est la diarrhée chez les veaux âgés de trois à dix-huit mois, souvent associée à des érosions des muqueuses. Dans certains cas, des lésions des voies respiratoires supérieures ont été décrites. Au cours d’une épidémie survenue sur le plateau de la Savane de Bogota, en Colombie, les troubles de la reproduction, se traduisant par des avortements ou la naissance de veaux chétifs, ont été le syndrome principal.
MOTS-CLÉS : Argentine - Brésil - Chili - Colombie - Diarrhée virale bovine-
maladie des muqueuses - Épidémiologie - Incidence - Pérou - Prophylaxie -
Uruguay - Virus de la diarrhée virale bovine.

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