



Seroprevalence of Antibodies to Bovine Herpes Virus Type-1 (BoHV-1) in Ruminants of Grenada, West Indies

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ABSTRACT

This cross-sectional study was carried out to determine the seroprevalence of Bovine herpes virus-1 (BoHV-1) in Cattle, and small ruminant from Grenada, West Indies. The prevalence was determined by an Enzyme-Linked Immunosorbent Assay (ELISA) test. A total of 920 sera samples, consisting of 132 cattle, 476 sheep and 312 goats were tested. An overall seroprevalence was 7/920 (0.76 %; 95% confidence interval (CI) 0.2% to 1.32%). The bovine 5/132 (3.8%) showed highest Seroprevalence followed ovine 2/476 (0.42%). None of goat samples were seropositive. There was statistically no significant difference in prevalence ($p > 0.05$) of antibodies to BoHV-1 in cattle, sheep and goats. This is the first report on seroprevalence of BoHV-1 in ruminants in Grenada, West Indies.

Keywords: Bovine Herpes virus-1, Grenada, Ruminants, Seroprevalence

Bovine herpesvirus-1 (BoHV-1), classified as a member of the herpesvirus family, is the causative agent of infectious bovine rhinotracheitis (IBR), a disease of the upper respiratory tract in cattle (Mweene *et al.*, 2003; OIE, 2010). It can also cause abortion in cattle (Muylkens *et al.*, 2007). Latent infection may occur in closed herds and latent virus can be reactivated by different stressful conditions such as infections, corticosteroid applications or transportation (Radostits *et al.*, 2000; Muylkens *et al.*, 2007). The BoHV-1 virus is transmitted through aerosol pollutant and breeding practices. The virus enters and replicates in the mucous membranes of the upper respiratory tract, vagina or prepuce and in the tonsils (Parsonson and Snowdon, 1975).

BoHV-1 leads to significant economic losses on the farming industry due to abortion and reproductive problems (Mweene *et al.*, 2003). It has been reported that BoHV-1 primarily infects cattle, but also can infect sheep and goats (Goyal *et al.*, 1988). Furthermore, cross-species

infections between bovine and caprine herpes viruses have been demonstrated in previous studies (Lehmkuhl *et al.*, 1985; Wafula *et al.*, 1985; Yesilbag *et al.*, 2003).

A variety of diagnostic laboratory methods can be used for the diagnosis of BoHV-1 infection. These include virus isolation in cell culture (Mahmoud and Ahmed, 2009), immunoperoxidase (Smith, 1997), immunofluorescent antibody (OIE, 2010), enzyme-linked immunosorbent assay (ELISA) (Parreno *et al.*, 2010; Raaperi *et al.*, 2010). As an alternative to these methods, several PCR techniques were developed for the rapid and specific detection of BoHV-1 (Mylissa *et al.*, 2008; Mahmoud and Ahmed, 2009).

Seroprevalance of bovine herpes virus has been extensively studied worldwide with a wide variety of exposure measured. Amongst the Caribbean islands, South America, and the United States of America reports of high prevalence are from Costa Rica (Raizman *et al.*, 2011), Venezuela (Obando *et al.*, 1999), Uruguay (Joaquin, 2005),



Mexico (Romero-Salas *et al.*, 2013), Brazil (De Sousa *et al.*, 2009; Dias *et al.*, 2013) and Equador (Carbonero *et al.*, 2011).

Seroprevalence of BoHV-1 in small ruminants has been studied much less extensively. It has been tested positive in goats and sheep in Turkey (Yesilbag *et al.*, 2003), and in Egypt (Mahmoud and Ahmed, 2009). In a recent study conducted in sheep in Brazil no one animal tested positive (Goncalves *et al.*, 2011). In 1985, no antibodies were detected in sheep and goats tested for the disease in Quebec (Lamontagne *et al.*, 1985).

Presence of many respiratory viruses in cattle, sheep and goats has been reported from Caribbean countries situated near South America. Since no report on the prevalence of BoHV-1 in these species of animals is available for Grenada, the current study was planned to detect antibodies to Bovine herpes virus 1 in cattle, sheep and goats in Grenada.

MATERIALS AND METHODS

Study area

Grenada is the southern most island country in the southeastern Caribbean Sea, with an area of approximately 348.5 Km² and a population estimated at 100,000. The country consists of 6 parishes. The country with low hills, small trees and shrubs, and tropical climate is most suitable for small ruminant production. Sheep and goats are kept for meat and milk. Cattle are kept for meat purpose. Estimated population size is 3000 sheep, 2500 goats and 1500 cattle in Grenada (Dr. Bowen Louison, Chief Veterinary Officer, Ministry of Agriculture , Land, Forestry and Fisheries; personal communication).

Sample Collection and Methodology

Peripheral blood from a total of 920 ruminants; 132 cattle, 312 goats and 476 sheep were collected randomly from all six parishes of the country in 2014. Sera were separated by centrifugation at 1500g for 15 minutes and stored at -80°C until it was analyzed using ELISA. Commercial ELISA kit was used to screen sera samples for glycoprotein B antibodies to Infectious Bovine Rhinotracheitis (IDEXX Infectious Bovine Rhinotracheitis Virus (BoHV-1) gB antibody Test Kit, IDEXX Laboratories, Inc. Westbrook,

Maine, USA) according to the manufacturer’s instruction. This assay is reported to have a specificity of 99.8% and a sensitivity of 100%.

Statistical Analysis

The data were analyzed by the statistical methods: Fisher’s exact test, using a graphpad statistical software (<http://www.graphpad.com/quickcalcs/contingency2>).

RESULTS AND DISCUSSION

In this cross sectional study over all seroprevalence of BoHV-1 virus antibodies in ruminants of Grenada is 7/920 (0.76 %; 95% confidence interval (CI) 0.2% to 1.32%). The cattle 5/132 (3.8%) showed highest Seroprevalence followed by sheep 2/476 (0.42%). None of goat samples were positive for BoHV-1virus antibodies. The results are summarized in Table 1.

Table 1: Seroprevalence of Bovine herpes virus-1 (BoHV-1) virus antibodies in ruminants from Grenada

| Species | Tested samples | Positive | Percentages |
|---------|----------------|----------|-------------|
| Cattle | 132 | 5 | 3.8 % |
| Sheep | 476 | 2 | 0.42 % |
| Goat | 312 | 0 | 0.00 % |
| Total | 920 | 7 | 0.76 % |

*The prevalence of antibodies between ruminants (cattle, sheep and goats) is not statistically significant ($p > 0.05$).

BoHV-1 infects both domestic and wild cattle and other Artiodactyla (e.g. sheep, goats, water buffaloes and Camelids). Other ruminant species may also be infected with BoHV-1 but no other reservoir of BoHV-1, apart from ruminants, are known. BoHV-1 is one of the major pathogens involved in respiratory and reproductive problems of ruminants. It is a type of latent infection, where the latency follows primary infection (Lemaire *et al.*, 2000). Our result confirms the presence of Bovine Herpes virus type 1 (BoHV-1) in ruminants of Grenada. Since the animals used in the study were not vaccinated, the presence of BoHV-1 antibodies indicates that these animals were exposed to natural infection, providing evidence of virus activity in the area.

A great variation in seroprevalence of antibodies for

BoHV-1 has been reported in cattle from various countries of the world. Amongst the Caribbean islands, South America, and the United States of America seroprevalence ranged medium (44%) to high (75%) in cattle. Reports are available from Costa Rica 48% (Raizman *et al.*, 2011), Venezuela 67 % (Obando *et al.*, 1999), Uruguay 75% (Joaquin, 2005), Mexico of 64.5% (Romero-Salas *et al.*, 2013) and Brazil 67.5% (De Sousa *et al.*, 2009). Recently in the Panara state region of Brazil 59% exposure (Dias *et al.*, 2013), and in Equador 43.2% (Carbonero *et al.*, 2011) was reported. Europe dairy herds of Ireland had 73.2% (O'Grady *et al.*, 2008) and in UK in south-west England 83.2 % (Woodbine *et al.*, 2009). Reports of low prevalence of antibodies to BoHV-1 in bovine are scanty. However, similar to our findings of low seroprevalence, Rypuła *et al.*, (2012) found 11.1% seropositivity in cattle of Poland. The lowest rate of antibodies against BoHV-1 in our results could be attributed to good climatic weather, management condition, animal distribution and low population of cattle.

BoHV-1 infections of small ruminants have an increasing interest in veterinary virology. Our research result showed 2 of 476 (0.42%) sheep seropositive and no serological evidence in goat. The results obtained from this study indicate that BoHV-1 infection in sheep is circulating at a low level in Grenada. In the previous studies, low incidence of BoHV-1 in sheep had been indicated by Harun, *et al.*, (2007) in Turkey (1.74) and by Lehmkühl *et al.*, (1985) and Goyal *et al.*, (1988) 0.4 to 5.4% in the USA. Previous reports are consistent with our finding of negative seroprevalence for BHV-1 in goats (Bechmann, 1997; Brako *et al.*, 1984), Lamontagne, *et al.*, 1985) and Gonçalves *et al.*, (2011). In Grenada cattle, sheep and goats are kept in small groups of a few individuals. This may be one of the factors for low transmission of BoHV-1 infection from cattle to sheep and goats and vice versa. However, the absence of antibodies in goats is not well understood. More research is warranted to elucidate this feature.

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