

Peste des Petits Ruminants (PPR) virus antibodies in goats and cattle of the Saint Martin's Island in Bangladesh

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Abstract

Peste des petits ruminants (PPR) is a highly contagious acute viral disease of domestic and wild ruminants particularly goats and sheep, which causes severe economic losses. Since 1993 PPR has been endemic in goats in Bangladesh. The present study was a seroprevalence study of PPR antibodies in goats and cattle at St. Martin's Island in Bangladesh from July 2012 to June 2013. There was no previous history of Rinderpest or PPR outbreak, and no Rinderpest vaccination. Blood samples were collected from 192 goats and 132 cattle randomly. All animals were apparently healthy, and were not vaccinated against Rinderpest or PPR. Serum antibody titre (competition percentage; CP value) was determined by a commercially available c-ELISA kit. The overall seroprevalence of PPR in goats was 37.5%. No serum samples from cattle were positive. In view of the high risk of PPR, a control strategy is proposed. (*Bangl. vet.* 2014. Vol. 31, No. 2, 55 - 59)

Introduction

St. Martin's Island is a small island of 8 sq.km. in the north east of the Bay of Bengal, about 9 km south of the tip of the Cox's Bazar - Teknaf peninsula, and forming the southernmost part of Bangladesh. Approximately 7000 inhabitants live primarily from fishing. Total animal population is about 1000 of which around 600 are goats, 25 sheep and 375 cattle. Map of Saint Martin's Island is shown in Fig. 1.

PPR is an acute, highly contagious viral disease of sheep and goats and is characterized by fever, anorexia, ulcerative necrotic stomatitis, diarrhoea, purulent ocular and nasal discharges and respiratory distress (Lefevre and Diallo, 1990; Chowdhury *et al.*, 2014), which may be associated with coughing, pneumonia and death. In non-endemic areas mortality and morbidity can reach 90 and 100%, respectively (Hussain *et al.*, 2003). Concurrent bacterial, viral or parasitic infections may aggravate the condition, and mortality may rise to 100% (Kitching, 1988). The causative agent of this economically important disease is a Morbillivirus, the *Peste des petits ruminant's virus* (PPRV), under the family Paramyxoviridae of order Mononegavirales (Murphy *et al.*, 1999). The virus is closely related to Rinderpest virus (RPV), another member of Morbillivirus genus, which causes similar disease in large ruminants (Couacy-Hyman *et al.*, 1995). The virus is serologically related to Measles

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(MV) and Canine distemper viruses (CDV) (Gibbs *et al.*, 1979). A varying degree of cross-protection *in vivo* and serological relationship exists between PPR and RPV (Hamdy *et al.*, 1976; Taylor and Abegunde, 1979). PPR infection in sheep and goats protects in-contact bovines from natural infection, and may interfere in tissue culture Rinderpest virus (TCRPV) vaccination response (Sudharshan *et al.*, 1995). The disease has been reported from many countries of the world including most parts of Africa, Middle East (Lefevre *et al.*, 1991), the Arabian Peninsula (Abu-Elzein *et al.*, 1990), southern Asia (Shaila *et al.*, 1996) and Europe. The virus has been circulating in most African countries (Dhar *et al.*, 2002). In Middle East and Arabian Peninsula; Iraq, Saudi Arabia, United Arab Emirates, Kuwait, Israel, Yemen and Oman are known to harbour infection. In Asia, the disease has been reported in India, Nepal, Bangladesh, Pakistan, Afghanistan and Iran, and in Europe. The disease now appears endemic throughout south Asia and beyond including Iran and Afghanistan. In Bangladesh, PPR has been endemic in goats since 1993. St. Martin's Island has no direct communication with the mainland. There is no history of vaccination against PPR in this island, but occasional outbreaks of PPR in goats are evident. The present study was carried out to detect PPRV-specific antibodies in the serum of cattle and goats using the monoclonal antibody-based c-ELISA.

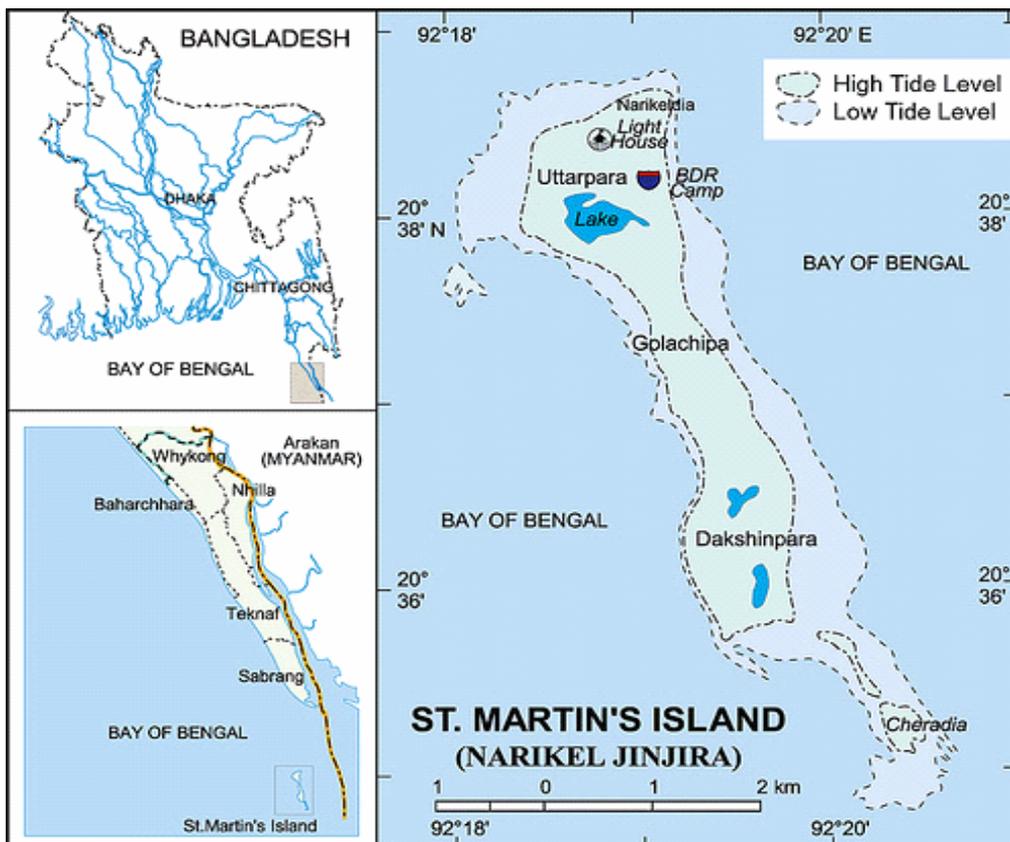


Fig. 1. Map of Saint Martin's Island in Bangladesh

Materials and Methods

A total of 324 serum samples from 192 goats and 132 cattle (irrespective of age and sex) were collected from different locations of St. Martin's Island. Blood samples (10 mL) were collected by jugular venipuncture without anticoagulant, kept for an hour at room temperature, and then serum was separated and stored at -20°C until use. Competitive ELISA kit was used for the detection of antibodies against PPR virus by competitive screening ELISA (ID screen PPR competition- ID. Vet. Innovative Diagnostics). Briefly, 40 µL of dilution buffer -13 (supplied kit) was added to each well. Positive control (10 µL) was poured to wells A1 and B1 and negative control in C1 and D1 and 10 µL samples were poured into the remaining wells. ELISA plate was then incubated at 37°C for 45 minutes. Each well was washed manually 3 times with approximately 300 µL of wash solution, prepared by diluting the wash concentrate (20X) with double distilled water (supplied kit). About 100 µL previously prepared single strength conjugate was added to each well and incubated at room temperature for 30 minutes. Further wash was done and 100 µL substrate solutions were added to each well and incubated for 15 minutes in a dark room. Stop solution (100 µL) was added to stop the reaction. Optical density (OD) values were recorded at 450 nm with ELISA plate reader (BIOTEK, INC.). The absorbance was converted to competition percentage (CP) using following formula.

Competition percentage (CP) = $OD_{\text{sample}} / OD_{\text{NC}} \times 100$

Where, NC = negative control, PC = positive control

Test serum samples showing a CP value less than or equal to 35% were considered positive, greater than 35% and less than or equal to 45% were considered doubtful, and greater than 45% were considered negative.

The test was validated if the mean value of the negative control OD was greater than 0.7 and the mean value of the positive control (OD_{pc}) was less than 30% of the OD_{NC}.

Results and Discussion

Despite no history of PPR vaccination or Rinderpest outbreak, the overall seroprevalence was 37.5%. In sheep and goats in Bangladesh an overall seroprevalence of PPR in goats of 21% has been reported, but varied greatly in different districts. Prevalence was highest in Jessore (49.4%) south-west district and lowest (6.3%) in Chittagong south-east district. Sero-prevalence was 26.7% in Rajshahi (North West), 20.0% in Sylhet (North East), 12.5% in Mymensingh (North East), and 10.5% in Dhaka (Central) (Bhuiyan *et al.*, 2012). In mainland Bangladesh seroprevalence of PPR in cattle, buffalo and sheep was 3.7%, 42.4% and 16.0%, respectively (unpublished data). Razzaque *et al.* (2004) found seroprevalence of 49.2% in goats, 36.0% in sheep and 19.1% in cattle. The presence of seropositive antibodies against PPRV in sheep, goats and cattle indicate that PPR viruses were circulating in these animals in Bangladesh. The seroprevalence was much higher in St. Martin's

Island than in the closest area, Chittagong. The reason is not clear. The virus might be circulated to the Island from India, where Singh *et al.* (2004) reported the prevalence of antibodies to PPRV in goats of 2.1, 51.8, 40.1, 47.5, 62.7 and 41.5%, respectively, at Meghalaya, Tamilnadu, Andhra Pradesh, Karnataka, Maharashtra and Gujarat of India. In another study, PPR antibody was in 41.7% of goats in a few northern states (Bhanuprakash *et al.*, 2008) and 15.1% of goats in Kerala state in India (Janus *et al.*, 2009). Balamurugan *et al.* (2014) reported seroprevalence of 21.8% against PPRV in five states (Andhra Pradesh, Gujarat, Jammu and Kashmir, Maharashtra and Rajasthan) of India. In the present study, no serum samples from cattle and 37.5% serum samples from goats were positive in PPR c-ELISA yielding a greater difference in seroprevalence of PPR. These differences may be due to easier transport of goats in comparison to cattle to the Island. In this study, the presence of PPRV antibodies indicated that PPR virus was circulating in the population, therefore, considering the geography of the Island, its lack of border security and the lack of PPR vaccination, it is suggested that as part of PPR control strategy the goat population should be vaccinated, and incoming goats should be kept in quarantine.

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