



Sero-epidemiology of *peste-des-petits-ruminants* in Goats of Tripura State of North-East India

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Abstract | *Peste-des-petits-ruminants* (PPR) is a highly contagious and devastating disease of goats and sheep, and is endemic in several countries of Asia and Africa. In the present study, seroepidemiology of PPR from goats was carried out covering the entire state of Tripura during 2012 and 2015. The analysis of sera samples (n= 3454) revealed seroprevalence rate between 0 and 16.83 with an overall rate of 2.11%. The highest prevalence rate (16.83%) was observed in the West Tripura district whereas antibodies against PPRV could not be detected from four districts *viz.*, Khowai, Gomati, Unokoti, and Sepahijala. The present study indicates that the disease incidence is sporadic in the state and in some places the animals are naive for PPR infection, which warrants immediate vaccination against PPRV.

Keywords | Peste-des-petits-ruminants, PPR, Seroprevalence, goat, Tripura

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Peste-des-petits-ruminants (PPR) is an economically devastating disease of sheep and goats. The disease can cause up to 100% morbidity and 90% mortality in a susceptible population (Munir, 2013) and recently, the FAO and the World Organization for Animal Health (OIE) launched the global campaign to eradicate PPR by 2030 (<http://www.fao.org/ppr/en/>). The typical symptoms of the disease are pyrexia, oculonasal discharges, necrotising and erosive stomatitis, enteritis and pneumonia followed by recovery or death (Muthuchelvan et al., 2015).

The severity of the disease is more in goats than sheep, while cattle may experience subclinical infection (Sen et al., 2014). The causative agent of the disease is PPR virus (PPRV) which belongs to the genus *Morbillivirus* of the family *Paramyxoviridae* in the order *Mononegavirales* (International Committee on Taxonomy of Viruses, 2012). The virus exists as single serotype and four distinct line-

ages *viz.*, I, II, III and IV have been reported (Kwiatk et al., 2007; Shaila et al., 1996). However, only lineage IV is reported so far from the Indian subcontinent (Munir, 2013; Muthuchelvan et al., 2015; Sen et al., 2010). In India, PPR was first reported in 1987 (Shaila et al., 1989), and since then several outbreaks have been frequently reported from different parts of the country (Muthuchelvan et al., 2015) with very few reports from North Eastern India. The present study reports the seroprevalence of PPR in the Tripura state.

The present study was carried out from serum samples of goats collected between 2012 and 2015 in the state of Tripura. A total of 3454 goat serum samples were collected from all the eight districts. Although Govt. of India has launched the control program in 2010, some states have yet to start the mass vaccination including the Tripura state. At the time of sampling, the farmers confirmed that

Table 1: Seroprevalence of PPRV in goats of Tripura state between 2012 and 2015

Name of the District	Number of samples Screened	Number of positive in Competitive ELISA	Percent Prevalence	Age-wise prevalence	
				Number of positive samples/ total number of samples (percentage of positive samples)	
				<6 months	>6 months
West Tripura	202	34	16.83	10/94 (10.64)	24/108 (22.22)
South Tripura	1140	19	1.67	2/348 (0.57)	6/274 (2.19)
North Tripura	622	8	1.27	8/546 (1.47)	11/594 (1.85)
Dhalai	636	12	1.89	4/222 (1.80)	8/414 (1.93)
Khowai	319	0	0	0/138	0/181
Gomati	149	0	0	0/46	0/103
Unokoti	240	0	0	0/112	0/128
Sipahijala	146	0	0	0/64	0/82
Total	3454	73	2.11± 1.92 (C.I: -1.65 to 5.87)	24/1570 (1.53) 1.53 ± 1.21 (CI: -0.84 to 3.9)	49/1390 (2.60) 2.60 ± 2.54 (CI: -2.38 to 7.58)

their animals were not vaccinated for PPR or any other disease. The samples were analyzed using competitive ELISA (cELISA) kit as per the method described elsewhere (Singh et al., 2004). Samples with percentage inhibition (PI) of ≥40% were considered positive for PPR-specific antibodies. The apparent and true prevalence were calculated as described elsewhere (Balamurugan et al., 2014). The confidence interval (95% CI), Mean ± SE and χ^2 test were estimated using statistical analysis system (SAS) software version 9.3 package (SAS India Ltd., Mumbai).

The state of Tripura has sheep and goat population of about 7 lakh, mostly held as backyard farming. PPR is considered as emerging/re-emerging disease in the state. The state shares a porous international border with Bangladesh, which is also an endemic country for PPR. Recently, we reported a confirmed outbreak of PPR in Tripura (Muthuchelvan et al., 2014), wherein the outbreak strain is more closely related to Bangladeshi strains that emphasized the continuous surveillance of the disease in the endemic regions.

Goat serum samples (n= 3454) collected from unvaccinated animals were screened for the presence of antibodies against PPRV and their percentage seropositivity with the prevalence, are presented for each district in Table 1. Overall prevalence from the state was 2.11%, which is very low to the earlier report of 61.11% with a limited number of samples (n=18) and also lower to the whole of North East (11.63%) (Balamurugan et al., 2014). This result indicates that the state of Tripura experiences sporadic outbreaks of PPR. In addition, antibodies against PPRV could not be detected from four districts viz., Khowai, Gomati, Unokoti, and Sepahijala. This may be due to their geographical location especially in the case of Khowai and Unokoti

districts as they are located in the valleys between two hills, which probably have restricted migration of animals from adjacent districts. Further, animals in these four districts appear to be naive and warrant immediate vaccination. The age-wise prevalence was 2.81 and 3.53% for age group < 6 and > 6 months, respectively. This also supports sporadic nature of the disease in the state. In summary, the present study provides baseline data on seroprevalence of PPR in the state of Tripura, which will help to formulate better control strategies during the time of implementing the on going national control program on PPR.

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CONFLICT OF INTEREST

AD, BD, TKD and SS collected samples. SB, DC, KKR and RP analyzed the samples. MAR & DM design of experiment, interpretation of results and writing of MS.

AUTHORS' CONTRIBUTION

Authors declare no conflicts of interest.

REFERENCES

- Balamurugan V, Das S, Raju DSN, Chakravarty I, Nagalingam M, Hemadri D, Govindaraj G, Ibotombi Singh N, Ltu K, Devi M, Sharma K, Gajendragad MR, Rahman H (2014). Prevalence of peste des petits ruminants in goats in

- North-East India. *Virusdisease*. 25: 488–492. <http://dx.doi.org/10.1007/s13337-014-0237-5>
- International Committee on Taxonomy of Viruses (2012). *Virus taxonomy: Classification and nomenclature of viruses*. Ninth Report of the International Committee on Taxonomy of Viruses. Academic Press, London ; Waltham, MA.
 - Kwiatek O, Minet C, Grillet C, Hurard C, Carlsson E, Karimov B, Albina E, Diallo A, Libeau G (2007). Peste des petits ruminants (PPR) outbreak in Tajikistan. *J. Comp. Pathol.* 136: 111–119. <http://dx.doi.org/10.1016/j.jcpa.2006.12.002>
 - Munir M (2013). Peste des petits ruminants virus., in: Munir, M. (Ed.), *Mononegaviruses of Veterinary Importance*. Volume I: Pathobiology and Molecular Diagnosis. CABI, Wallingford. Pp. 65–98. <http://dx.doi.org/10.1007/978-3-642-31451-3>
 - Muthuchelvan D, De A, Debnath B, Choudhary D, Venkatesan G, Rajak KK, Sudhakar SB, Himadri D, Pandey AB, Parida S (2014). Molecular characterization of peste-des-petits ruminants virus (PPRV) isolated from an outbreak in the Indo-Bangladesh border of Tripura state of North-East India. *Vet. Microbiol.* 174: 591–595. <http://dx.doi.org/10.1016/j.vetmic.2014.10.027>
 - Muthuchelvan D, Rajak KK, Ramakrishnan MA, Choudhary D, Bhadouriya S, Saravanan P, Pandey AB, Singh RK (2015). Peste-Des-Petits-Ruminants: An Indian perspective. *Adv. Anim. Vet. Sci.* 3: 422–429. <http://dx.doi.org/10.14737/journal.aavs/2015/3.8.422.429>
 - Sen A, Saravanan P, Balamurugan V, Bhanuprakash V, Venkatesan G, Sarkar J, Rajak KK, Ahuja A, Yadav V, Sudhakar SB, Parida S, Singh RK (2014). Detection of subclinical peste des petits ruminants virus infection in experimental cattle. *Virusdisease*. 25: 408–411. <http://dx.doi.org/10.1007/s13337-014-0213-0>
 - Sen A, Saravanan P, Balamurugan V, Rajak KK, Sudhakar SB, Bhanuprakash V, Parida S, Singh RK (2010). Vaccines against peste des petits ruminants virus. *Expert Rev. Vaccines*. 9: 785–796. <http://dx.doi.org/10.1586/erv.10.74>
 - Shaila MS, Purushothaman V, Bhavasar D, Venugopal K, Venkatesan RA (1989). Peste des petits ruminants of sheep in India. *Vet. Rec.* 125: 602.
 - Shaila MS, Shamaki D, Forsyth MA, Diallo A, Goatley L, Kitching RP, Barrett T (1996). Geographic distribution and epidemiology of peste des petits ruminants virus. *Virus Res.* 43: 149–153. [http://dx.doi.org/10.1016/0168-1702\(96\)01312-3](http://dx.doi.org/10.1016/0168-1702(96)01312-3)
 - Singh RP, Sreenivasa BP, Dhar P, Shah LC, Bandyopadhyay SK (2004). Development of a monoclonal antibody based competitive-ELISA for detection and titration of antibodies to peste des petits ruminants (PPR) virus. *Vet. Microbiol.* 98: 3–15. <http://dx.doi.org/10.1016/j.vetmic.2003.07.007>