

SEROEPIDEMIOLOGY OF BLUETONGUE IN SHEEP AND GOATS OF MADHYA PRADESH, CENTRAL INDIA

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ABSTRACT

This study presents the seroepidemiological investigation profile of bluetongue virus (BTV) in randomly collected serum samples from indigenous sheep and goats of Kymore plateau and Satpura Hills of Madhya Pradesh. The World Organization for Animal Health recommended competitive ELISA test was employed to screen a total of 705 serum samples from sheep (n=248) and goats (n=457) for BTV antibodies. The results revealed that 64.9% sheep and 61.5% goats were positive for bluetongue antibodies with an overall seroprevalence of 62.7%. The prevalence of BTV antibodies varied from 61.6% to 65.5% in different age groups with the least prevalence in 1 to 3 years age group (61.6%) and the highest prevalence (65.5%) in animals of above 3 years of age. Overall seroprevalence was higher in males of sheep (75.4%) than goats (60.4%). While in females, goats were more seropositive (62.5%) than sheep (54%). The results emphasized for regular monitoring of the susceptible indigenous sheep and goat population for BTV.

Key words: Bluetongue, seroepidemiology, cELISA, Madhya Pradesh

Bluetongue (BT) is an infectious, non-contagious, arthropod-borne viral disease of domestic and wild ruminants, though it is more prominently seen in sheep and goats. The disease is caused by bluetongue virus (BTV) belonging to the genus *Orbivirus* and family *Reoviridae*. Till today, 26 serotypes have been described with considerable variations within the individual virus serotype (Ritter and Roy, 1988; Gould and Prichard, 1990; de Mattos *et al.*, 1994; Maan *et al.*, 2011). In India, the disease was first reported in 1964 from Maharashtra by Sapre (1964). During the last few decades, a significant change has been recorded in the epidemiological situation of BT in India (Prasad *et al.*, 1992; Sreenivasulu *et al.*, 1995). Madhya Pradesh (MP) bordered by six other states is having huge goat population and agro-climatic conditions viz. temperature, rainfall, humidity pattern etc. conducive for propagation of *Culicoides* midges. However, till date, no outbreak of BT or isolation of virus has been reported in small ruminants in the state. The study was thus undertaken to determine the seroprevalence of BTV in the state using OIE recommended competitive

ELISA (cELISA) assay, which has been used as a highly specific and sensitive test for the detection of BTV group specific antibodies (OIE, 2004).

MATERIALS AND METHODS

Collection of Serum Samples: A total of 705 serum samples were randomly collected from the indigenous sheep and goats reared in Jabalpur, Katni, Satna, Rewa, Panna, Sidhi and Seoni districts under the agro-climatic zone IV (Kymore plateau and Satpura Hills) of Madhya Pradesh (Table 1). Of these serum samples, 248 were of sheep and the remaining 457 were of goats. After inactivation at 56°C for 30 min, all the serum samples were stored at -20°C.

cELISA: The OIE recommended cELISA was used for the seroepidemiology. The cELISA bluetongue virus antibody test kit, VMRD (USA) was used in the present study following manufacturer's instructions. The results of the test sera were determined by expressing them as inhibition percentage (IP) values as given below. Inhibition percentage value >60% was counted as negative, 50-60% considered to be suspicious, while

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< 50% was positive.

Inhibition percentage (IP)= Mean absorbance of test serum sample/ Mean absorbance of negative control serum.

RESULTS AND DISCUSSION

Of the 705 serum samples tested by cELISA, 62.7% (442/705) were positive for antibodies against BTV (Table 1). Of the 248 serum samples of sheep, 161 (64.9%) were positive for BTV antibodies. While 281 (61.5%) out of 457 goat serum samples were positive for BTV antibodies (Table 1).

The seropositive animals were detected in all seven districts under agro-climatic zone IV. The highest proportion of seropositive sheep and goats were from Katni district followed by Jabalpur and Panna districts (Table 1). This may be attributed to the unrestricted movement of relatively large numbers of cattle, sheep and goats from Maharashtra, Rajasthan and Uttar Pradesh, where BTV is considered endemic (Shringi and Shringi, 2005). Similar endemicity has been reported in Kerala (Ravishanker *et al.*, 2005) and Andhra Pradesh (Sreenivasulu *et al.*, 1999).

It is apparent from the results that prevalence of BTV was slightly higher in sheep than in goats. However, Afshar and Kayavanfar (1994) recorded higher seroprevalence for BTV antibodies in goats (13.6%) than in sheep (7.6%). A recent study from central India also showed higher prevalence of antibodies in goats (31.72%) than sheep (25.7%) (Sikrodia *et al.*, 2012). Mehrotra (1991) reported almost similar prevalence of 18% and 21% of BTV

antibodies in sheep and goats, respectively. The findings of higher prevalence of BTV antibodies in sheep are similar to the findings of Eisa *et al.* (1979) who showed higher prevalence of BTV antibodies in sheep (28%) than in goats (11.2%). Similarly, Ravishanker *et al.* (2005) reported that 8.3% sheep were positive for BTV antibodies in comparison to 5.3% goats in Kerala.

Based on the age of the animals, the serum samples in this study were distributed into three groups i.e. up to 1 year, 1 to 3 years and above 3 years. The prevalence of BTV antibodies varied from 61.6% to 65.5% in different age groups with the least prevalence in 1 to 3 years age group (61.6%) and the highest prevalence (65.5%) in animals of above 3 years of age. In animals upto 1 year of age, 188 (63.1%) out of 298 samples were positive for BTV antibodies. Species wise prevalence of antibodies in different age groups of sheep was 63.4% (52/82), 66.9% (87/130) and 61.1% (22/36), while in goats, the prevalence was 62.9% (136/216), 57.9% (110/190) and 68.6% (35/57) in upto 1 year, 1 to 3 years and above 3 years age groups, respectively. These findings indicated higher prevalence of BTV antibodies in sheep of 1 to 3 years of age (66.9%), while, it was higher in goats of more than 3 years of age (68.6%). Sharma *et al.* (1985) reported that sheep around one year of age were more susceptible to BT. Similarly, Doddamani and Haribabu (2006) reported 4.6% incidence of BTV in age group of 6-12 months of sheep and 6.45% in goats while it was 1.26 % and 3.77 % in sheep and goats of 12 months and above age group. However, the observations of Harbola *et al.* (1982) and Mullick (1988) are in contrast to our findings as they reported less seropositivity in adult sheep than weaned sheep to BT.

Based on sex, out of 343 samples from males of both species, 226 (65.9%) were positive. In females, out of 362 samples tested, 216 (59.7%) were positive for antibodies to BTV. Overall seroprevalence was higher in males of sheep (75.4%) than goats (60.4%). While in females, goats were more seropositive (62.5%) than sheep (54%).

In conclusion, high prevalence of BTV antibodies in sheep and goats in Kymore plateau and

Table 1

Prevalence of bluetongue virus antibodies in sheep and goats of Kymore plateau and Satpura Hills of MP

District	Total samples tested		No. of samples positive (%)		No. of samples negative	
	Sheep	Goat	Sheep	Goat	Sheep	Goat
Jabalpur	72	109	53 (73.6)	86 (78.9)	19	23
Katni	36	72	28 (77.8)	62 (86.1)	08	10
Seoni	20	84	14 (70.0)	32 (38.0)	06	52
Rewa	30	48	14 (46.7)	24 (50.0)	16	24
Sidhi	20	54	12 (60.0)	29 (53.7)	08	25
Satna	49	32	25 (51.0)	13 (40.6)	24	19
Panna	21	58	15 (71.4)	35 (60.3)	06	23
Total	248	457	161 (64.9)	281 (61.5)	87	176
Overall	705		442 (62.7%)		263 (%)	

Satpura Hills of MP suggest of constant circulation of virus and competent vector in the area. There is an urgent need to study other areas of the state for BTV antibodies so as to understand the epidemiology of disease in a better way. Further studies are also warranted to understand the source of BTV infection and vector species/competence for disease transmission.

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