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Prevalence of Bovine Herpes Virus-1 (BoHV-I) in Cattle: A review

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Abstract
This article disseminates information on the overall prevalence of BoHV -1 virus, the epidemiology of BoHV -1 virus, the development of BoHV -1 infection among Cattle population, the latency property of BoHV -1 virus and the prevalence of BoHV -1 virus by various molecular diagnostics tools. Though many molecular test; detection of BoHV -1 antigen and detection of BoHV -1 antibody tests are available, some of the tests are well defined. This article summarizes the prevalence of Bovine Herpes Virus -1 infection in India by detection of antigen by Polymerase Chain Reaction and detection of antibody by Enzyme Linked Immuno Assay among infected cattle

Keywords: Prevalence, BoHV-I, epidemiology, cattle

Introduction
Bovine Herpes Virus-I is known to cause severe respiratory form of infection known as Infectious Bovine Rhinotracheitis (IBR) in high producing animals and Infectious Pustular Vulvo-Vaginitis (IPV) in cows and Infectious Pustular Balanoposthitis (IPB) among bulls. Bovine herpes virus-1 infection has significant variation in the incidence and prevalence at the regional level. The disease poses an economical loss to the livestock farmers by affecting the productivity among dairy cattle, reduced feed efficiency and reproductive disorders. Young calves with reduction in cloistral level are highly susceptible for Bovine Herpes Virus-I infection.In India Mehrotra *et al.* (1976) [19] first reported the disease, later. Kiran *et al.* (2005) [12] described the disease as one of the most prevalent respiratory and reproductive viral disease of cattle in India. Different sero-survey, antigen and antibody detection tests are available to identify the sero-positivity for BHV-1 infection but only some of them are well defined. Testing of bulk milk by ELISA gives a clue to the prior spread of infection in the herd (Frankena *et al.*, 1997) [5]. Presently, Polymerase Chain Reaction is becoming an inevitable molecular technique, used in the diagnosis of various diseases as it is more sensitive and more rapid than virus isolation technique Moore *et al.* (2000) [23]. Despite the presence of colostral immunity, the virus maintains latency in trigeminal ganglion of the affected cattle and as and when the cattle are stressed out due to various reasons, they shed the virus in the environment and become the source for infecting the other susceptible cattle.

Prevalence of BoHV-1 infection
Mehrotra *et al.* (1976) [19] reported Bovine Herpes Virus-I for the first time in India, from naturally infected cross bred calves in Uttar Pradesh. Prevalence of Bovine Herpes Virus-I in certain states like Kerala, Gujarat, Tamil Nadu, Andhra Pradesh, and Karnataka has been reported by (Sulochana *et al.*, 1982;Manickam and Mohan, 1987; Satyanarayan and Babu, 1987; Mohan Kumar *et al.*, 1994 and Ganguly *et al.*, 2008) [33, 18, 29, 21, 6] respectively. Ever since Mehrotra reported Bovine Herpes Virus-I-IBR for the first time in India in 1976, it has been an endemic in the country. Rahman *et al.* (2011) reported 36 percent positive serum for IBR antibody by AB-ELISA in India. In Maharashtra, Chinchkar *et al.* (2002) [3] reported higher percent positive in cattle as compared to buffaloes, similarly Sontakke *et al.* (2002) [31] also detected more sero-prevalence percentage among cattle population. Random Amplified Polymorphic DNA (RAPD) can be used as an effective tool to study the relationship that exists between the samples isolated from bovine with different clinical symptoms (Afonso *et al.* 2007) [1]. Ganguly *et al.* (2008) [6] reported 85.29 percent sero-positive in cattle population using virus neutralisation test in Nadia district in West Bengal. Trangadia *et al.* (2010) [37]

also reported a sero-prevalence positive of 60.84 percent from organized farms, (Trangadia *et al*. (2012) [38] reported a sero-prevalence of 23.94 percent and 26.49 percent in cattle and buffalo from Gujarat and Andhra Pradesh state. (Rahman *et al.*, 2011) recorded a high sero-positivity in Tamil Nadu (67 percent) and lower (34 percent) in Meghalaya among the states in India, in a survey done across the Country.

Epidemiology

Transmission

The main mode of transmission occurs between the infected to susceptible cattle is droplet infection through nasal to nasal transmission (Muylkens *et al*., 2007) [24], Aerosols contaminated from the exhaled, sneezed, and coughed up materials shed by the infected animals aids in the transmission of the disease (Mars *et al*., 1999) [16]. Transmission depends mainly on the rich viral sources of the infected materials. Some of the potential viral materials for the transmission include nasal exudates, coughed out droplets, genital secretions, semen, foetal fluids and tissues. Nandi *et al*., (2009) [25] reported that Bovine Herpes Virus-1 can survive for up to 1 year in semen frozen in liquid nitrogen. Venereal transmission becomes the method of spread for genital diseases as it can be transmitted through natural service and artificial insemination. Bovine Herpes Virus-1 can also be spread through mechanical vectors (Straub, 1990) [32].Transmission of Bovine Herpes Virus-I through from vaginal and prenuptial secretion is rare or less. Latently infected cattle serve as carriers for other susceptible cattle (Thiry *et al*., 1987) [36] and make very difficult for any control program.

Development of the Disease

The virus enters through nasal inhalation, makes entry into the mucous membrane of the upper respiratory tract and tonsils, whereby virus multiplication takes place in high titres; later through conjunctivae it reaches the trigeminal ganglion. After 2-4 days of incubation period, sero-nasal discharge followed by mucopurulent, salivation, fever, inappetance, and depression are the most important clinical signs exhibited by the infected cattle (OIE, 2008) [26]. Animals which are affected with Bovine Herpes Virus-I infection can clinically be identified by the development of signs and symptoms in ocular, respiratory, reproductive, alimentary and central nervous system, there may be a generalized new borne infection in young calves (Gibbs and Rweyemam, 1977) [8]. Acute BHV-1 respiratory infections may predispose cattle to potentially fatal bacterial pneumonia which is a major cause of death and economic losses to the beef lot cattle industry (Yates, 1982) [42]. Introduction of animals into a farm often leads to an outbreak of IBR. In reproductive tract infection the virus multiplies in mucous membranes of the vagina, prepuce and become latent in the sacral ganglia and remains in the neuron of the ganglia probably for the life time (OIE, 2008) [26].

Latency of BHV-1

Cattle infected with BHV-1 with a condition of bronchopneumonia normally develops latency following recovery from the infection and become permanent carriers. Bovine Herpes Virus-1 resides in the peripheral sensory ganglia; trigeminal, sacral, lumbar or thoracic and when stressed out, shed the virus to other animals, causing the disease among cattle with immune-compromised state (OIE, 2008) [26]. Winkler *et al*., (1999) reported that during an acute stage, the viral particles enter the oral, nasal or ocular route and causes an infection in the sensory neuron of trigeminal ganglion. Latency of BHV-1 is due to the presence of related (LR) gene and gE gene coding for glycoprotein E, cattle infected lately becomes a carrier lifelong.

Diagnostic tests

Detection of antibody against bhv-1 by enzyme linked sorbent assay (Elisa)

Milk has lower concentration of immunoglobulin as compared to serum. gE ELISA is highly sensitive for the detection of antibody against BHV-1 in milk (Mach and Pahud, 1971) [14], later gE Milk ELISA was identified as a highly sensitive and specific test than serum gE ELISA (Wellenberg, 1998) [40]. AB-ELISA detected 89 percent as positive for antibody to IBR in cattle (Shome *et al*. (1997) [30], similarly Suresh *et al*. (1999) reported 38.01 percent positive in cattle screened for the presence of IBR antibody and declared AB-ELISA as the best method among the five techniques performed in the research study. Chinchkar *et al*. (2002) [3] using Dot ELISA found 58.13 percent in cross bred cattle with IBR antibody in Maharashtra. Viral Neutralisation test is now replaced by Enzyme Linked immune Sorbent Assay methods, though ELISAs are normally used for the detection of antibody in serum samples, Kramps *et al*. (2004) [13] using AB- antibody ELISA detected 45.01 percent antibody to BHV1-IBR in milk, Jain *et al*., (2009) [10] using Infectious Bovine Rhinotracheitis monoclonal antibody-based blocking ELISA detected 30 percent positive in bulls for BHV-1 infection while Gb gene PCR showed 42 percent as positive. Jain *et al*. (2009) [10] therefore suggested the use of both serological and PCR diagnostic tests as some of the samples which were positive by ELISA were negative by PCR and vice versa, Mahmoud *et al*. (2009) [17] concluded that ELISA was the most rapid, reliable, inexpensive and simplest test and could be the most suitable technique for screening of large animals in herds. Indirect ELISAs are the most sensitive tests used in the detection of BHV-1 antibodies in milk samples (OIE, 2010) [27], Trangadia *et al*., (2010) [37] reported 362 positive out of 595 cattle and buffalo screened by ELISA, with the highest prevalence observed in central region of India followed by southern, western, and lowest prevalence reported in northern region of India.

Molecular Detection of Bhv-1 DNA by Polymerase Chain Reaction (PCR)

Vilcek *et al*. (1994) [39] successfully detected Bovine herpes virus DNA from samples of reindeer, red deer and goats by PCR assay, later they also succeeded in the detection of BHV-1 from semen and serum samples. In BHV-1 endemic countries, the used PCR for screening the animals can be very cost effective, and used to reduce the spread of BHV-1 virus through semen (Gee *et al*., 1996) [7]. Moakhar *et al*. (2003) [20] suggested that PCR can be used for screening of BHV-1 infected from aborted foetuses. Deka *et al*. (2005) [4] subjected a total of 24 semen samples for PCR and virus isolation technique and recorded 14 samples positive by PCR-gI gene specific and 11 samples positive using virus isolation technique, similarly Grom *et al*., (2006) [9] successfully detected Bovine Herpes Virus-1 from semen samples of naturally infected bulls using PCR gb and gE gene specific.

Jhala *et al*. (2007) [11] also suggested that PCR based assay can be used for screening of bulls in semen collection centres. Jain *et al*. (2009) [10] reported 46.53 percent and 42.57 percent semen samples from bulls in Gujarat as positive for BHV-1 infection by Gb gene and GC gene based PCR. Chandranaik *et al*. (2010) [2] did an extensive screening work on semen samples, collected from Karnataka, Tamil Nadu, Andhra Pradesh and Kerala state and recorded 40.81 percent in cattle bull and 38.46 percent among buffalo bulls. Teresa Scicluna *et al*., (2010) [35] suggested that Real Time PCR can successfully detect buffaloes experimentally inoculated with field cattle strain of BHV-1.

Conclusions

The prevalence of BHV-1 Infection increases with the advancement of age in older animals than the younger animals, due to heavy milk production stress, a higher prevalence is found in older female cattle and pluriparous animal, a higher prevalence of BoHV-1 infection can be found in intensive farming due to the maintenance of close contact of animals with parturition and milk production attributing the other factors. In younger animals the prevalence of BoHV-1 is low, which could be attributed due to the fact of presence of maternal antibody or immunity. Enzyme Linked Immune Assay (ELISA) is a rapid and highly specific test for detecting antibody titre in serum and milk, and due the property of the virus of latent infection, it is there important to screen and detect latent virus carriers in control programme and other in other sero epidemiological studies. Polymerase Chain Reaction (PCR) is now an inevitable molecular technique used for the diagnosis of various diseases as it is more rapid and sensitive technique tool.

Competing Interests

The author declare that they have no competing Interests

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