Infectious Bovine Rhinotracheitis

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A number of emerging diseases of livestock have been introduced, diagnosed and established in India during the last four decades. Infectious bovine rhinotracheitis (IBR) is one of the viral diseases of significant economic importance. Considering the wide range of distribution, seriousness and risk of spread and latency of infection, the disease occupies an important position among the sexually transmitted diseases of bovines as has been classified by the World Organization for Animal Health (OIE). Like other herpes viruses, BHV-1 causing IBR, remains latently associated with recovered animals for the rest of their life and hence virus continues to circulate in the population, despite stringent control measures.

Etiology

BHV-1 is a member of the genus Varicellovirus in the sub-family Alphaherpesvirinae of the family Herpesviridae. The virus has icosahedral nucleocapsid with envelope. Its genome is double-stranded DNA, which encodes for about 70 proteins. The viral glycoproteins, which are located in the envelope, play an important role in pathogenesis and immunity. Three subtypes of BHV-1 are recognised worldwide: BHV-1.1, BHV-1.2a and BHV-1.2b. Viruses from the BHV-1.1 subtype cause severe respiratory disease and can be associated with abortion.

History

The bovine herpes virus infection was originally identified as a respiratory disease of feedlot cattle in the Western United States in the early 1950s. Schroeder and Moys were the first to publish a report on respiratory infection by BHV-1 in 1954. After 1954, the disease was recorded in dairy cattle and all ages of beef cattle both in feedlots and occasionally in cattle raised on pasture. The etiological agent was first isolated by Madin and colleagues in 1956 and classified as a herpesvirus and termed as Bovine herpesvirus-1 (BHV-1). Subsequently, Canada, South Africa and many European countries like New Zealand and Germany have widely reported the occurrence in 1960s. In India the disease was first reported as respiratory form in crossbred calves in 1976 by Mehrotra. Since then almost all the states in India have reported the prevalence of BHV-1 infection in cattle, buffalo and also in Mithun and Yaks.

DISEASE SYMPTOMS AND LESIONS

Respiratory infection

After incubation period of 2-7 days, disease is exhibited by severe nasal discharge and mild to severe rise in body temperature with depression, increased respiratory rate, salivation, conjunctivitis and clear ocular discharge, reddening of nasal and oral mucosa with erosions and drop in milk production. In conjunctivitis, there is involvement of the cornea with panophthalmitis.

Genital infection

Vulvovaginitis: It is observed within a few days of mating. Frequent micturition and raising of the tail, hyperaemia/oedema of the vulva and the posterior third of the vagina, small red to white ulcers develop into pustules and thick yellow or white mucopurulent exudate in cases of secondary bacterial infection.

Balanoposthitis: After an incubation period of 2–3 days, pustules appear on penis and prepuce progressing to ulcers with a mucopurulent discharge. Virus is excreted by some infected bulls in their semen, which becomes source of infection for susceptible females, by natural or artificial insemination.

Diagnosis

BHV-1 infection may be diagnosed on the basis of clinical, pathological and epidemiological findings. However, for confirmatory diagnosis, laboratory examinations (serology and/or virus/antigen

Infectious Bovine Rhinotracheitis is a highly contagious infectious disease that is caused by bovine herpesvirus 1 (BHV1). Apart from respiratory disease (IBR), which may lead to bovine respiratory disease complex or shipping fever after secondary bacterial infection, other clinical syndromes such as infectious pustular vulvovaginitis (IPV) or infectious pustular balanoposthitis (IPB), abortion, conjunctivitis, infertility, arthritis, mastitis, enteritis among young calves and dermatitis are also caused by this virus.
isolation and identification and/or genome detection) are required. A complete diagnostic procedure in the laboratory is aimed at detecting the causative virus or its components and/or the specific antibodies they induce. Nevertheless, because of latent infection induced by BHV-1, detection of antibodies could be sufficient for the determination of the BHV-1 status of individual animals.

Pathogenesis and Latency
Replication of BHV-1 takes place in the mucosa of the upper respiratory and genital tract with virus shedding in nasal and genital secretions. Local nerve cell endings are infected and the virus is transported to trigeminal and sacral ganglia where it establishes a lifelong latent infection. Once infected, animals become lifelong carriers of the virus. The latent infection may be reactivated periodically following stress or corticosteroid treatment, with or without clinical signs; the virus is transported back to the site of entry and is shed with potential transmission to other animals.

IBR Vaccines
During past two decades, various types of vaccines were developed to reduce economic loss due to outbreaks. These include, inactivated, live modified, subunit, DNA vaccines and gene deleted marker vaccines. Live modified vaccine can cause disease in young calves and abortions in pregnant cows while killed vaccines are unsuccessful because of short lived immunity. Vaccines are used to reduce the severity of disease, but cannot always prevent infection due to the endemic nature of BHV-1 infection. DNA based vaccines were able to reduce the severity of disease but failed to confer complete protection. The gD based subunit vaccine are considered most efficacious in reducing the clinical disease after they are combined with effective adjuvants like chitosans and CpG oligonucleotides. The latest vaccine approaches are plasmid DNA vaccines containing three major BHV-1 glycoproteins gC, gB and gD. However, none of the presently available vaccines can prevent establishment of latency of wild type virus infection. Because of this countries with vaccination programmes aiming at eradication are unsuccessful while the countries with programs of culling seropositive animals are able to achieve disease free status.

Way Forward
Genetically modified (GM) vaccines offer a promising approach for a vast majority of viral diseases. In this line, construction of mutant viruses by deleting genes involved in virulence and reactivation has become a popular approach for BHV-1. A gE negative marker vaccine was constructed that could not perpetuate in cattle population. A similar gE deletion mutant of the Indian BHV-1 strain has also been developed at IVRI. A BHV-1 double deletion mutant of glycoprotein G and thymidine kinase genes was adequately attenuated and offered good protection on challenge with virulent virus), but these GM vaccines have to clear the long list of quality control tests to establish their safety on one hand and the efficacy on the other before they can hit the market.

SUMMARY
The Infectious Bovine Rhinotracheitis disease occupies an important position among the sexually transmitted diseases of bovines. The disease is caused by bovine herpes virus which has three subtypes. Viruses from the BHV-1.1 subtype cause severe respiratory disease and may cause abortion. Some vaccines developed against the virus have been found to be promising.

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