THE SCIENCE WORLD
A Monthly e Magazine
July 2022; 2(7), 1174-1178

Popular Article

An overview: Food and Mouth Disease (FMD)

Jyoti choudhary[1]*, Nareshi Meena[2]
[1*]Department of Veterinary Microbiology and Biotechnology, RAJUVAS, Bikaner
[2]Department of Veterinary Epidemiology and Preventive Medicine, RAJUVAS, Bikaner

Abstract

Foot and mouth disease (FMD) is a one of the extremely contagious, viral diseases of domestic livestock population of India. It is belonging the genus Apthovirus (RNA Virus) with in the family picornaviridae and mainly affects cattle, buffaloes, pig population of the country producing specific symptoms. FMD cause severe economic losses to the owners. It has been recorded that about 85% of the outbreaks of FMD in India are caused by serotype 'O', followed by 'A'. Transmission of virus is facilitated by shedding from ruptured vesicles and in bodily excretions and secretions, including breath and semen. The typical clinical sign is the hypersalivation, occurrence of blisters (or vesicles) on the nose, tongue or lips, inside the oral cavity, between the toes, above the hooves, on the teats and at pressure points on the skin. The Government of India has been carrying out intensive Foot-and-mouth disease control programme (FMDCP) in a phase wise manner since 2003–2004. The FMDCP is intending to vaccinate all the susceptible livestock population of the country such as cattle, buffalo, sheep, goats and pigs. That exercise was adopted to make the country free of the disease till 2025–2030. Good biosecurity measures should be practiced on uninfected farms to prevent entry of the virus.

Introduction

One of the major obstacles in achieving the targeted growth rates in sector of livestock is prevalence and outbreaks of diseases, particularly List A OIE diseases like Foot and mouth disease. FMD is considered as one of the highly contagious, viral diseases of cloven-hoofed animals. It mainly affects cattle, buffaloes, and pig population of the country producing sever symptoms. It can also infect the sheep, goats, and wild-life species. Intensively reared animals are more susceptible to the disease than tradition breeds. It is rarely fatal in adult animals (mortality- 1–5%), but there is often high mortality (20% or higher) in young animals due to myocarditis or, when the dam is infected by the disease, reduced milk production. However, due to its high contagiousness, has a great potential for causing enormous economic losses. The disease has been present in almost every part of the world where livestock are kept. Unrestricted animal movements in the country play a major role in the spread of FMD. The more developed countries have eradicated the disease. As diagnosis and slaughter policy cannot be practiced in India (due to ethical and socio-economical reason), routine vaccination is the best way to achieve protective antibody response against FMD.

Etiology

The disease is caused by RNA virus, Foot-and-mouth disease virus (FMDV), belonging to the genus *Aphthovirus* within the family *Picornaviridae*. These virions are non-enveloped, icosahedral, replicate in the cytoplasm and consisting of single stranded RNA which is 7.2-8.4 kb in size. The capsid of FMDV is thin-walled (mean thickness capsid 33 Å), and has an unusually smooth surface. The particles of FMDV are unstable below pH 6.8 and acid labile. Aerosoles of *Apthovirus* are less stable but under condition of high humidity they may remain viable for several hours. The incubation period is 2–14 days.

Epidemiology

Out of the known seven FMDV serotypes (O, A, C, Asia1, SAT1, SAT2, SAT3), four serotypes viz., 'O', 'A', 'C' and Asia 1 were recorded in India livestock population. From 1995 onwards, serotype 'C' was not recorded in India probably due to the quadrivalent vaccination against FMD and for unexplained reason. It has been recorded that about 85% of the outbreaks of FMD in India are caused by serotype 'O', followed by 'A', which account for about 8 to 10% and the rest due to Asia 1. The temporal distribution of FMD cases with different serotypes over a period of 10 years in India indicates a gradual decrease in the number of FMD outbreaks associated with the progressive improvement in herd immunity due to continuous vaccination under FMDCP since 2007. The total incidence of FMD and individual serotype specific incidences from 2006 to 2020 indicate a decreasing trend with occasional spikes in the number of outbreaks at different time points. The undulating trend could be ascribed to the infection immunity, which determines the occurrence of an outbreak in subsequent years. Introduction of replacement stock could be one of the factors behind the resurrection of the disease.

Routes and transmission of disease

FMD virus transmission is facilitated by virus shedding from ruptured vesicles and in bodily excretions and secretions, including breath and semen. It is also, introduced into a herd by saliva, milk, contaminated pens/buildings, animal transport vehicles, materials, clothing, footwear, or equipment, virus-infected meat or other contaminated animal products (Fig.1). Animals that have recovered from infection may sometimes carry the virus and initiate new outbreaks of the disease.

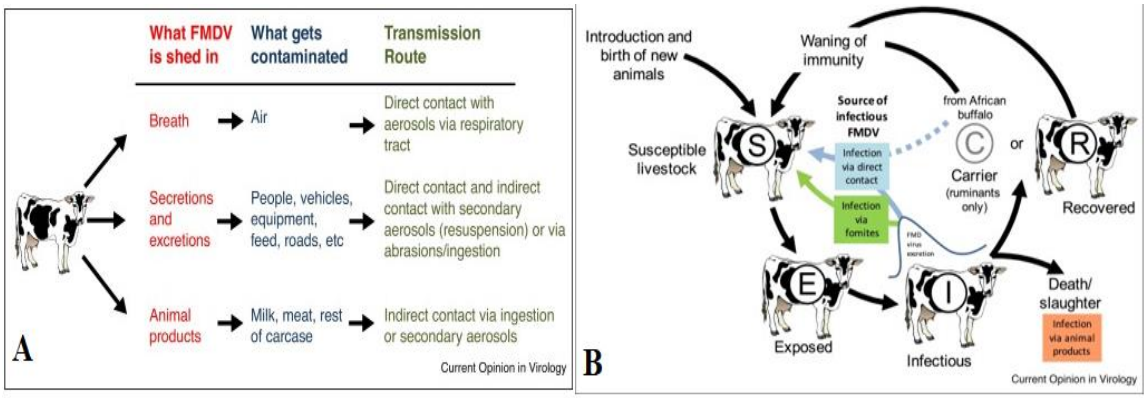

Fig.1 (A) Principal routes by which infectious FMD virus can be spread between susceptible animals. (B) A simple S (susceptible), E (exposed) I (infected) and R (recovered) model describing cycles of FMDV replication and transmission in livestock.

Clinical sign of disease

The typical clinical sign is the hypersalivation, occurrence of blisters (or vesicles) on the nose, tongue or lips, inside the oral cavity, between the toes, above the hooves, on the teats and at pressure points on the skin (Fig.2). Ruptured blisters can result in extreme lameness and reluctance to move or eat, complications, such as secondary bacterial infection of open blisters, can also occur.

Fig.2 Clinical sign of FMD – tongue lesion, blister formation between toes, on the udder and excessive salivation

Other frequent symptoms are fever, depression, loss of appetite, weight loss, growth retardation and a drop in milk production. The health of young calves, lambs, and piglets may be compromised by lack of milk if dams are infected. Death can occur before development of blisters due to a multifocal myocarditis.

Diagnosis of FMD

On the basis of clinical pictures, isolation of virus from vesicular fluid, and animal inoculation test. The post-mortem findings in which includes vesicles and erosions of the mucous membranes of the mouth, rumen, teats, interdigital spaces, ulcers and lesions on the dental pad. The most advanced techniques such as different nucleic acid identification and serological diagnostics *viz.* reverse transcription-polymerase chain reaction (RT-PCR), Reverse transcription loop-mediated isothermal amplification (RT-LAMP), Monoclonal antibody (MAb)-based ELISAs, chromatographic strip test, and differentiation between infected and vaccinated animals (DIVA) are used. Virus neutralization test (VNT) is currently considered as the "gold standard" for detection of antibodies to structural proteins of FMDV and is a prescribed test for import/export certification of animals/animal products.

Treatment

There is no specific treatment, however symptomatic treatment can be done to speed up recovery and to avoid complications. 1 % KMnO4 or 2 % sodium bicarbonate solution is used for washing of mouth and apply boroglycerine paste on mouth lesions. Washing of foot lesion with 2% Copper sulphate or 2-4 % Sodium carbonate solution and mixture of coal-tar and copper sulphate (5:1) is apply on foot lesions. Broad spectrum antibiotics should be given to check the secondary bacterial infection.

Prevention and control

FMD is one of the most difficult animal infections to control. Protection of free zones by export restrictions are imposed on countries with known outbreaks. These outbreaks are usually controlled by quarantines and movement restrictions. Other prevention measures are euthanasia of affected and in-contact animals, cleansing and disinfection of affected premises, equipment and vehicles. Infected carcasses must be disposed of safely by incineration, rendering, burial or other techniques. Milk from infected cows can be inactivated by heating to 100°C (212°F) for more than 20 minutes. Slurry can be heated to 67°C (153°F) for three minutes. Good biosecurity measures should be practiced on uninfected farms to prevent entry of the virus.

Food and mouth disease control programme (FMDCP) in India

Due to heavy morbidity in susceptible livestock population and negative social and economic impact of the FMD, Indian government has started progressive control pathway for FMD according to the protocols given by Office Internationale-des-Epizootics (OIE) to minimise losses. Vaccines are

used to cover all the susceptible livestock populations. This is expected to minimise economic losses to the livestock owners due to the disease. The Government of India has been carrying out intensive FMDCP in a phase wise manner since 2003–2004; it has covered all the districts of the country. The FMDCP is intending to vaccinate all the susceptible livestock population of the country such as cattle, buffalo, sheep, goats and pigs. That exercise was adopted to make the country free of the disease till 2025–2030.

The nine major activities that are being undertaken in the FMDCP are :- vaccinate cattle and buffaloes at six monthly intervals, publicity and mass awareness campaigns, identification of target animals, sero-survillance and monitoring of animal population on random basis, mass vaccination, procurement of cold cabinets and vaccine, quality assessment of randomly collected samples from vaccine preparations, typing of FMDV in case of outbreaks and regulation of animal movement from unvaccinated areas.

- Raksha FMD vaccine (Hoechst/BAIF)- 3 ml SC or FMD vaccine and 5 ml SC every six months
- Clovax (Intervet) - 3 ml SC in bovines and 2 ml SC in small ruminants
- Raksha-OVAC (Indian Immunologicals) - 2 ml I/M (deep) (cattle, buffaloes, calves) and 1 ml deep I/M Sheep and goats