

DOI: 10.21767/2576-1412.100028

## Foot and Mouth Disease: A Highly Infectious Viral Zoonosis of Global Importance

**Mahendra Pal**

Narayan Consultancy on Veterinary Public Health and Microbiology, Gujarat, India

**Received:** September 10, 2018; **Accepted:** September 12, 2018; **Published:** September 17, 2018

**\*Corresponding author:** Dr. Mahendra Pal

### Editorial

Foot and mouth disease (FMD) is a highly contagious trans-boundary and economically devastating viral disease of global importance; and poses a major danger to food security of the world. The global production losses due to FMD is estimated US Dollar 7.6 million. The disease is highly communicable and reported from many species of animals besides humans. FMD is a greater threat to animal industry throughout the world. The disease is endemic in Africa, Asia, the Middle East, and South America. A serious outbreak of foot and mouth disease, which occurred in the United Kingdom during 2001, caused an economic loss of US Dollar 12 billion due to slaughter of many animals. After the introduction of FMD in 2001 in UK, it spread to France, Ireland, and The Netherlands. The disease in Ethiopia was estimated to have cost US Dollar 14 million in 2005-2006 as it hampered the export of livestock and livestock products to Middle East and African countries. The financial losses due to FMD in India is estimated Rs.18, 000 crores every year. There is reduction of milk yield in dairy animals by 80% because of FMD. Due to loss of milk, children of poor farmer's family may be deprived of milk resulting into malnutrition. In India, the loss of milk due to FMD was recorded 3508 million kg.

The credit goes to Hieronymus Fracatorius of Italy who gave first description of FMD in cattle in 1514. Later the disease was reported from Germany, Great Britain, and USA in 1754, 1839 and 1970, respectively. In India, FMD was first time recorded in 1864. Many countries, such as Australia, Brunei, Canada, Japan, Indonesia, New Zealand, Singapore, and USA are considered free of FMD by regular mass vaccination, culling/slaughter of animals in infected farms, control of animal movements, and strict zoo sanitary measures. Outbreaks of disease in cattle, goat, and sheep were recorded from Tripoli, Libya during 2011 -2012. It is a major infectious disease of livestock that affects the economy and gross domestic products (GDP) of a nation. It is a direct viral zoonosis and the persons, who are occupationally exposed to virus during handling of diseased animals, infected discharges, and carcasses, may acquire the infection.

Disease is caused by FMD virus, which belongs to genus *Aphthovirus*, family *Picornaviridae*. It is a single stranded positive sense RNA genome enclosed within icosahedral protein capsid. There are seven serotypes, such as Asia 1, O, A, C, and SAT (South

✉ palmahendra2@gmail.com

Founder of Narayan Consultancy on Veterinary Public Health and Microbiology, 4 Aangan, Jagnath Ganesh Dairy Road, Anand-388001, Gujarat, India.

**Tel:** 091 942 608 532 8

**Citation:** Pal M (2018) Foot and Mouth Disease: A Highly Infectious Viral Zoonosis of Global Importance. J Appl Microbiol Biochem. Vol.2 No.3:12

African Territories) 1, 2, 3. Each serotype of virus has multiple subtypes with varying antigenicity and degree of virulence. There is no cross immunity between serotypes. Serotypes, such as SAT 1, SAT 2, and SAT 3 were recognized in 1940 in Africa, where as serotype Asia 1 was identified for the first time from India in 1950. It is interesting to mention all seven serotypes are prevalent in Africa. Serotypes namely O, A, C, and Asia 1, are described from Asia and Europe. The virus may persist for days or weeks in organic matter under moist and cold conditions. It can survive in frozen bone marrow, lymph nodes, and also in cheese during its processing. FMD virus can be inactivated by acetic acid (2%), citric acid (0.2%), sodium carbonate (4%), sodium chloride (2%), sodium hydroxide (2%), and sodium hypochlorite (3%). It is destroyed in muscles at pH above 6. The virus in milk and meat can be inactivated by heating at the temperature of 70°C for at least 30 minutes. It is stated that African buffaloes may harbor the virus up to 5 years.

Natural infection has been recorded in a wide variety of animal, such as, alpaca, antelope, bison, buffalo, camel, cattle, chamois, coypu, deer, elephant, elk, giraffe, goat, llama, moose, pig, reindeer, sheep, and yak. Among the animals, cattle are particularly susceptible. The recovery in animals may occur within 15 days. Rarely, the infection is documented in human beings. The author has observed many cases of FMD in cattle and buffaloes. One veterinary assistant who examined the oral cavity of FMD affected cow without using gloves, developed vesicles on

his right palm. However, no attempt was made to confirm the clinical diagnosis by employing laboratory techniques (M. Pal Personal observation).

Humans can acquire the infection by direct contact with diseased animals. Infection can also occur by ingestion of raw milk, unpasteurized dairy products or uncooked meat from affected animals. Accidentally, laboratory workers may also contract infection during handling of virus. The virus can enter the body through traumatized skin, wound or mucous membrane. The human may spread the infection by carrying the virus on their clothes and bodies. There is no person to person transmission of FMD. The dairy farmers, animal handlers, cattle owners, veterinarians, and laboratory workers are at risk of getting the disease. Rodents, wild birds, and flies act as mechanical vector, and thus may disseminate the virus in environment. In animals, transmission of infection can occur via direct contact, ingestion, and inhalation. In addition, the semen of sick animal contains the virus and can be the source of infection.

The incubation period of disease in humans is 2 to 6 days. Clinical manifestations of FMD in humans include fever, headache, malaise, listlessness, sore throat, pharyngitis, anorexia, vomiting, tachycardia, red ulcerative lesions in oral cavity, and tingling blisters on the hands, and feet. Oral lesions are recorded in a 5 year old child following the ingestion of raw milk from diseased cow. Vesicles are observed on the volar surface of finger of the veterinarian who was attending an outbreak of FMD in cattle.

In animals, the incubation period is 2 to 14 days. The disease is characterized by fever, vesicles in the mouth, muzzle, teats, and feet, salivation, stomatitis, grinding of teeth, anorexia, lameness, kicking of feet, and weight loss. Complications, such as myocarditis, pneumonia, abortion, mastitis, infertility, hoof deformation and permanent impairment of milk production are recorded. The morbidity in cattle is 100% but mortality is very low (2%). However, fatality in calves may reach up to 20%. The death in young animals may be due to myocarditis. The rate of carriers in cattle varies from 15 to 50%.

The clinical diagnosis should be confirmed by employing standard laboratory techniques, such as isolation of virus from clinical materials in primary bovine thyroid cell culture or suckling mice, complement fixation test (CFT), serum neutralization test, enzyme linked sorbent assay and real time polymerase chain reaction. Reverse transcriptase polymerase chain reaction (RT-PCR), nucleotide sequence analysis and enzyme linked sorbent assay (ELISA) are employed to identify serotypes of FMD virus. The disease in animals should be differentiated from bluetongue,

bovine popular stomatitis, bovine viral diarrhoea, contagious ecthyma, infectious bovine rhinotracheitis, malignant catarrhal fever, mucosal disease, vesicular exanthema, and vesicular stomatitis.

Currently, there is no specific drug, which can be recommended to treat this viral disease. In humans, disease is mild, self-limiting and recovery usually occurs within a week. In order to prevent secondary bacterial infection of the lesions, antiseptic or antibiotic skin ointment should be applied. The recovery in animals may take around 15 days.

Certain measures such as use of gloves during the examination of vesicles of diseased animals, avoiding direct close contact with diseased animals at the height of infection, avoiding to visit livestock farms in FMD affected areas, avoiding consumption of unprocessed milk, dairy products and meat from sick animals, disinfection of clothes, premises, equipments, materials and vehicles, restriction on animal movement, regular immunization of animals, proper disposal of carcass by incineration or deep burial, surveillance, and health education to dairy farmers about the source of infection, mode of transmission and importance of consuming boiled milk and cooked meat, will certainly help in the control of disease. An outbreak of FMD in non-endemic countries should be immediately reported so that strategies for its control can be instituted. It is suggested that regular immunization should be carried out in endemic countries to protect the high yielding dairy cattle as slaughter of all risk animals may be economically unfeasible, and can result food scarcity.

Further studies should be planned to determine indirect losses caused by FMD in endemic countries of the world. Since the present vaccines offer short term protection, sincere attempts should be made to develop a multivalent safe, potent and low cost vaccine, which can be easily afforded by poor farmers to vaccinate their animals for lifelong immunity against this economically devastating viral disease.

## Acknowledgement

The author is highly grateful to Prof. Dr. R. K. Narayan for going through the manuscript and giving his suggestions. Sincere thanks are also due to Anubha for helping in computer work.

The paper is dedicated to Dr. Prakash Ampte and Dr. Mandakini Amte who are well known as Philanthropist Doctor Couple. They are doing a great service for the welfare of tribal people in India. Both are recipient of Ramon Magsaysay Award for community leadership.