FOOT AND MOUTH DISEASE (FMD)

Pathology description

Figure 2 Vesicle on upper gum, sheep

Foot-and-mouth disease (FMD) is a highly infectious viral disease of cattle, pigs, sheep, goats, buffalo and artiodactyl wildlife species. It is characterized by fever and vesicles in the mouth and on the muzzle, teats and feet. In a susceptible population, morbidity approaches 100%. The disease is rarely fatal except in young animals. *FMD* is caused by an *aphthovirus* of the family *Picornaviridae*. There are 7 immunologically distinct serotypes: A, O, C, Asia 1 and SAT (Southern African Territories) 1, 2 and 3. Within each serotype, there are a large number of strains that exhibit a spectrum of antigenic characteristics; therefore, more than one vaccine strain for each serotype, particularly O and A, is required to cover the antigenic diversity. Strains are characterized by their genomic relationships and their antigenic similarities with established vaccine strains. (Previous classification into subtypes became untenable as the number of subtypes rapidly increased.)

Figure 1 coronary band vesicles, pig

The incubation period for *FMD* is 2-14 days, depending on the infecting dose, susceptibility of the host and strain of virus—in pigs, it may be as short as 18 hr with some strains of *FMD* virus. The clinical signs are more severe in cattle and intensively reared pigs than in sheep and goats and *FMD* has frequently been ignored or misdiagnosed in small ruminants. In cattle and pigs, after the incubation period, anorexia and fever of up to 106°F (41°C) may develop. Cattle salivate and stamp their feet as vesicles develop on the tongue, dental pad, gums, lips and on the coronary band and interdigital cleft of the feet. Vesicles may also appear on the teats and udder, particularly of lactating cows and sows and on areas of skin subject to pressure and trauma, such as the legs of pigs. Young calves, lambs, kids and piglets may die before showing any vesicles because of virus-induced damage to the developing cells of the myocardium.

Figure 1 Teat vesicles, bovine

Milk yield drops dramatically in milking animals and all animals show a loss in condition and growth rate that may persist after recovery. Sheep and goats may develop only a few vesicles on the coronary band and in the mouth. Vesicles in the mouth, even when severe, usually heal within 7 days, although recovery of the tongue papillae takes longer. Lesions on the mammary gland and feet frequently develop secondary infections, resulting in *mastitis*, underrunning of the sole and chronic lameness. In pigs, the complete horn of the toe may be lost. Cattle and deer may also lose one or both horns of the foot and deer may shed their antlers.

Vectors

- **Environment**
  FMD virus can survive in dry fecal material for 14 days in summer, in slurry up to 6 mo in winter, in urine for 39 days and on the soil between 3 (summer) and 28 (winter) days.
- **Animal**
  Transmission of *FMD* is generally by contact between susceptible and infected animals. Infected animals have a large amount of aerosolized virus in their exhaled air, which can infect other animals via the respiratory or oral routes. All excretions and secretions from the infected animal contain virus and virus may be present in milk and semen for up to 4 days before clinical signs appear. Also, avian species are not susceptible to infection, but they can carry virus on their feet and feathers and will excrete virus after ingesting infected material. Therefore, birds may carry the virus, although their role in dissemination is unclear. A typical scenario for the introduction of *FMD* into a previously clear area is for pigs to be fed imported food derived from an infected animal (as meat, offal, or milk); virus then spreads by aerosol from the infected pigs to cattle, which are the most likely species to be infected by the respiratory route because of their large respiratory volume.

- **Material**
  Aerosolized *FMD* virus can spread a considerable distance as a plume, depending on weather conditions, particularly when the relative humidity is >60% and when the topography of the surface over which it is dispersing does not cause turbulence. *FMD* has been transmitted to calves via infected milk and milk tankers carrying infected milk have been implicated in the spread of disease between farms. Fodder can become contaminated after contact with infected animals and iatrogenic spread of *FMD* has been reported.

- **People**
  Humans, horses, dogs and cats are not affected by *FMD*, but they can act as mechanical vectors.

➔ MAIN VECTOR: infected animals

Preventive action

- Hygiene.
- Bootbaths and wheel disinfection.
- Cleaning and disinfecting of barn.
- Quarantine for new animals.

Controlling action

The occurrence of *FMD* in countries previously free of the disease can have a major effect on local and international trading arrangements. Many countries free of *FMD* have a policy of slaughter of all affected and in-contact susceptible animals and strict restrictions on movement of animals and vehicles around infected premises. After slaughter, the carcasses are either burned or buried on or close to the premises and the buildings are thoroughly washed and disinfected with mild acid or alkali and by fumigation. Tracing is done to identify the source of the outbreak and premises to which *FMD* virus could have already been transmitted by infected animals or animal products, by contaminated vehicles or people, or aerosol. In areas or countries free of *FMD* in which this is not possible, control is by movement restriction, quarantine of affected premises and vaccination around (and possibly within) the affected premises. This has the disadvantage that many carrier animals may remain after the outbreak and quarantine may not be sufficiently long to prevent their subsequent movement. In countries in which *FMD* is endemic, protection, particularly of high-yielding dairy cattle, is by a combination of vaccination and prevention of *FMD* virus entering the dairy premises.

Advised protocols

For each possible vector, a hygiene protocol must be implemented. See the specific purpose protocol :

GENERAL HYGIENE

PERSONNAL HYGIENE