Guide to Foot and Mouth Disease (FMD)

Foot-and-Mouth Disease (FMD) is a notifiable disease of odd-toed ungulates **caused by** an **aphthovirus** of the family Picornaviridae with acute, febrile generalised signs and blistering of the mouth, lips, tongue, foot tips and udder buds**. The disease causes significant economic damage.**

The disease is endemic in parts of Africa, Asia, the Middle East and South America, with sporadic outbreaks in previously free countries and regions.

FMDV affects cattle, pigs, sheep, goats and wild cloven-footed ungulates (deer, wild boar). Species of particular importance are cattle, because they are highly susceptible to respiratory transmission of the virus and even low virus uptake can cause infection, and **pigs,** because although less susceptible to aerogenic transmission, they shed large amounts of virus in respiratory secretions and thus play a major role in virus transmission

FMD is one of the most contagious diseases of even-toed ungulates. The infection **can be spread by** virus-carrying **animals in** the incubation stage of the disease or by animals that have survived the disease, **raw meat** from such animals**, other products** (hides, skins, hair, wool, milk, slaughter waste, etc.), and other products (e.g. meat, meat products, meat products, etc.).), **contaminated feed, bedding, manure**, but also **contagious objects** (tools, vehicles, etc.), **non-susceptible animals** (horses, dogs, cats, birds, etc.) on infected premises and **humans** may play a role in the spread of the virus through the virus on hands, clothing and footwear, the use of non-sterile hypodermic needles, etc. **Inside the shed, infection is usually transmitted by direct contact or saliva.**

The infectivity of the RNAIF virus is very high. Once introduced, the virus **spreads rapidly** and usually appears within one or two days in herds in direct or indirect contact with infected herds (transport vehicles, milk trucks, humans, etc.).

Resilience:

The virus remains infectious in organic material in a moist and cool environment for a longer period of time. **It survives in manure for weeks, in frozen meat products and milk powder for months, and in detached horn for years,** dying below pH 6.5 and at high temperatures (56 ° C). In the environment, it can be effectively neutralised by disinfectants such as 2% NaOH or 0.2% citric acid.

Disease development, symptoms:

The primary route of infection for the RHSHS virus is the mucous membranes of the throat. From there, it travels through the lymphatic system to the epithelium of the mouth, cheeks, feet and udder, where **it causes blistering**. The blisters rupture within 1-2 days, leaving **painful discharge. Animals shed virus before clinical signs appear, from 9 hours after infection.** Many viruses are shed in the epithelial cells of the blisters on mucous membranes and skin and in the mucus of the blisters, but also in other secretions such as milk and semen. **The virus is shed in particularly large quantities by pigs.** Mass shedding usually ceases after 9-11 days in

cattle and after 7 days in pigs, but the virus may persist in the lymphoid tissues of the throat, tonsils, lymphoid tissues of the intestinal tract and in the horns of the hocks. The virus is trapped in the acid-inflammatory tissues of the hides under the horn of the leg and is subsequently released to the outside world as the horn grows and wears. In the majority of animals, virus carriage lasts only a few weeks, but in some cases in cattle, buffalo, bison it can last much longer, up to 1/2-3 years, so **infected animals are always a potential source of infection.** Both cattle and sheep have been shown to carry the virus without symptoms, but not yet in pigs.

Cattle

Mode of infection:

Cattle **are mostly infected by aerosolized virus that** they inhale. Infection through skin or mucosal lesions can also occur.

Symptoms:

- **The incubation period is 2-7 days.** Initial symptoms of the disease include fever, loss of appetite, reduced milk production, lethargy, and a sticky, foamy saliva. Irritation of the mucous membranes of the mouth often causes the animals to "gag."

- On days 2-3, **blisters** appear on the oral mucosa, tongue, lips, toes and udder buds, which rupture within 1-2 days, leaving **painful eruptions and ulcers with ragged edges.**

In young animals it can cause myocarditis, which can lead to sudden death. Older animals usually recover in 2-3 weeks, but permanent loss of production and leg-end deformity may occur.

Pigs

Mode of infection:

Infection mainly occurs through the consumption of contaminated feed, contact with infected animals or use of contaminated premises, **aerosol infection is less common.**

Symptoms:

- **The incubation period is shorter, usually 2-3 days.** At the beginning of the illness, fever, lethargy and loss of appetite may be observed. **A characteristic symptom is blistering on the ends of the feet**, especially on the heels, between the toes and on the bastard stumps.

- Within 1-2 days, the blisters will rupture and ooze, which can lead to **limping, stumbling** and lying down.

Degeneration of the heart muscle is common in suckling piglets and can lead to sudden death. Older animals usually recover, but lesions of the leg end can cause permanent mobility problems.

Sheep and goats

Mode of infection:

Sheep and goats **are often infected by aerosol**, but direct contact is also a factor. Animals infect each other through contaminated saliva, bladder secretions or contagious objects.

Symptoms:

Sheep:

- The **disease is milder,** with **blisters mainly on the ends of the legs (lameness)** and sometimes mass mortality in young lambs (myocardial degeneration/damage).

Goat:

- Symptoms are less pronounced, with **blistering mainly in the mouth**.

If a fever with vesicular fever suddenly appears in several individuals of a cloven-hoofed ungulate herd, suspect FMD and immediately notify the attending veterinarian and the local veterinary authority.

Pathology:

On dissection, blisters and excrescences may be seen on the tongue, gums, lips, palate, nasal bridge, bridge of the nose, between the fingers, between the udder and the teats, in the pre-stomach and rumen areas. **In the musculoskeletal system,** diffuse in acute cases and nodular in the prolonged form, the heart shows a '**tiger heart**' pattern.

Differential diagnosis:

Cattle

1. Smallpox (Parapoxvirus)
2. Bovine viral diarrhoea (BVD)
3. Infectious bovine rhinotracheitis (IBR)
4. Eastern beef
5. Bluetongue disease

Sheep and goats

1. Varicose veins in the mouth
2. Bluetongue disease

Pigs

The following diseases are clinically consistent with FMD and **laboratory tests are required to** confirm the suspicion of FMD.

1. Swine vesicular disease (SVD)
2. Vesicular eruption of swine (VES)
3. Vesicular stomatitis (VSV

Laboratory test:

The testing is carried out by **the Nébih Animal Health Diagnostic Laboratory Directorate in Budapest**:

National Reference Laboratory (NRL)

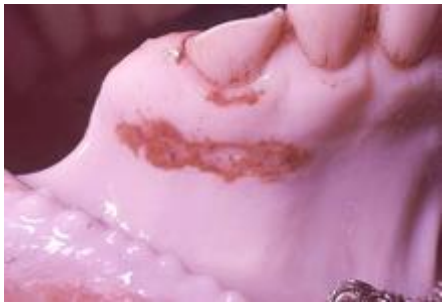
NÉBIH Directorate of Animal Health Diagnostic Laboratory
1143 Budapest, Tábornok u. 2.
Tel. (1) 460-6317
E-mail: adi@nebih.gov.hu

RT-PCR **is used for virus detection** and ELISA is used for **serological tests**. **Sampling requires 1 g of tissue from an intact or freshly ruptured part of the bladder wall.** The samples shall be placed in a plastic sample container with a screw cap, pH 7,2-7,4 liquid and the identification of the animal from which the sample was taken shall be clearly marked on the sample container. **The sample must be stored at 4°C until sending to the laboratory+ !**

Public health implications

RCCF **in humans** is very **rare and the disease is benign**. Humans can be infected by working with the virus in laboratories, vaccine production facilities or by handling or slaughtering sick animals or consuming raw milk in countries where the disease still occurs. In some cases, only seropositivity develops, while in other cases blisters appear around the nail beds, in the mouth and occasionally elsewhere, with mild generalised fever symptoms. **Gloves and protective clothing should be worn when handling the virus or sick animals.**

Photo gallery



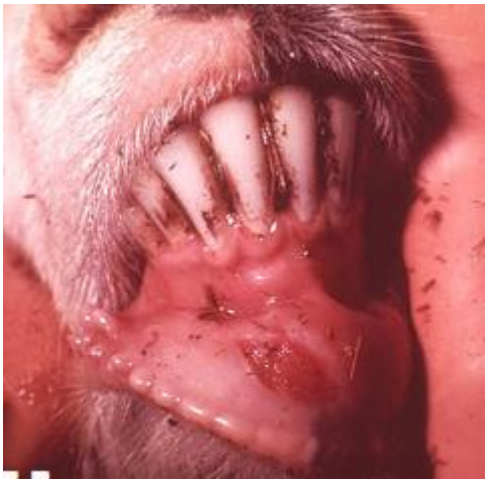
Longitudinal erosion (ruptured bladder) on bovine gum

Ruptured bladder on cattle dung

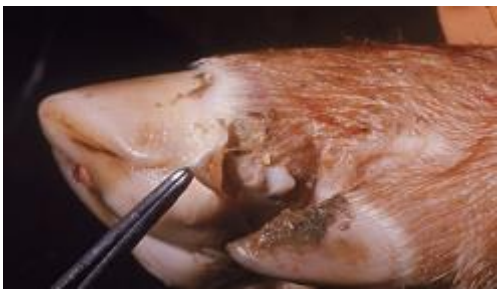
Erosion caused by the fusion of several small lesions on the bovine tongue

Multiple irregularly shaped erosions (ruptured vesicles) on bovine rumen mucosa

Multiple irregularly shaped erosions (ruptured vesicles) on bovine rumen mucosa



Extensive erosion (ruptured blister) of goat oral mucosa



Ruptured bladder on pig's foot

Extensive fissures prior to nail shedding on the tip of the foot in pigs

Ruptured blisters on pig tongue