



Foot and Mouth Disease

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Key facts

To better understand public health terms included in this Disease Tool (e.g. What is a case definition? or What is an infectious agent?), consult our page on Key concepts in epidemiology.

Importance

Foot and Mouth Disease (FMD) is a highly contagious viral infection caused by a virus from the genus Aphthovirus in the family Picornaviridae. The virus has seven serotypes: O, A, C, SAT 1, SAT 2, SAT 3, and Asia 1, each capable of infecting cloven-hoofed animals like cattle, pigs, sheep, goats, and water buffalo. Importantly, infection with one serotype doesn't provide immunity against others. FMD can also affect wildlife, especially African buffalo, which can maintain and periodically transmit the virus to livestock.

Transmission primarily occurs through direct contact between infected and susceptible animals, as well as through contaminated materials (fomites). FMD causes painful vesicles on the feet, mouth, and mammary glands. In severe cases, it can lead to mastitis in dairy cattle and, in young animals, fatal inflammation of the heart tissue. Some infected animals become "carriers," harboring the virus in their oropharynx for extended periods, though pigs do not carry the virus.

Case definition

A **case definition** is a set of uniform criteria used to define a disease for public health surveillance. It enables public health officials to classify and count cases consistently.

The following are standard case definitions to allow national health authorities to interpret data in an international context. However, during an outbreak case definitions may be adapted to the local context and the Red Cross Red Crescent should use those agreed/established by national health authorities. NB: Consider that during community-based surveillance, volunteers should use broad (simplified) case definitions (referred to as community case definitions) to recognize most or all possible cases, provide relevant risk communication and appropriate actions and encourage them to seek care. Other actors such as healthcare workers or

investigators studying the cause of a disease, on the other hand, can use more specific case definitions that may require laboratory confirmation.

Case definition

No case definition was specified

Alert / epidemic threshold

An **alert threshold** is the pre-defined number of alerts that suggest the beginning of a possible disease outbreak and therefore warrant immediate notification.

Epidemic thresholds are the minimum number of cases indicating the beginning of a particular disease's outbreak.

Single case

Risk factors

- Animal movement or migration from one place to another (for example during trade and nomadic livestock farming practices)
- Proximity to infected areas
- Inadequate biosecurity
- Proximity to wildlife reservoirs
- Sharing farm resources
- Contaminated feed or water
- Human movement
- Importation of infected animals or contaminated animal products

Attack rate (AR)

The **attack rate** is the risk of getting a disease during a specific time period (such as during an outbreak).

Attack rates will vary from one outbreak to another. In case of an outbreak, consult the latest information provided by health authorities.

- FMD has a high attack rate, especially in susceptible populations of cloven-hoofed animals, often reaching 100% in unvaccinated herds. The attack rate also varies depending on factors such as the

species affected, virus strain, and environmental conditions

Groups at increased risk of severe illness (most vulnerable)

- Cloven-hoofed animals like cattle, pigs, sheep, goats, and water buffalo

Infectious agent

Infectious agents are bacteria, viruses, fungi, prions and parasites. A disease caused by an infectious agent or its toxic products is defined as an infectious disease.

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Reservoir / host

A **reservoir of infection** is a living organism or material in or on which an infectious agent lives and/or usually multiplies. Reservoirs include humans, animals and the environment.

A **susceptible host** is a person at risk of being infected. The level of susceptibility depends on age, sex, ethnicity and genetic factors, specific immunity also depends on other factors that affect an individual's ability to resist infection or to limit its ability to cause infection.

A **zoonotic disease** or **zoonosis** is an infectious disease that has jumped from a non-human animal to humans.

Competent reservoirs/hosts of FMD virus are cloven-hoofed animals like cattle, pigs, sheep, goats, and water buffalo. Different species of wild mammals can also be infected.

How disease is spread (modes of transmission)

Categorisation of **modes of transmission** varies from one agency to another. In addition, some infectious agents can be transmitted by more than one mode. A list of modes of transmission can be found in the key concepts to serve as guidance to better understand the diseases included in this website.

FMD is primarily transmitted through aerosols or direct contact between animals living in close proximity. This mode of transmission is common in densely populated herds, where the virus spreads easily from

one animal to another, or when an infected animal is introduced into the herd. Additionally, fomites, such as contaminated bedding, feed, pasture, and water troughs, can facilitate the spread of the infection. Some infected animals become "carriers," harboring the virus in their oropharynx for extended periods, though pigs do not carry the virus. In pigs, FMD may be introduced when raw or improperly cooked infected meat is given to the pigs for consumption.

Incubation period

This time from when infection occurs to the onset of symptoms is called the **incubation period**. It is a range of days and it can be different for each disease.

The incubation period typically ranges from 2 to 14 days, depending on the virus strain, dose of exposure, and species of the affected animal.

Period of infectiousness

Period of infectiousness is the time interval during which an infected person can transmit the infection to other susceptible persons.

Humans are not infected

Clinical signs and symptoms

One of the characteristic symptoms is the development of vesicles or blisters on the feet, around the mouth, and on the mammary glands in females. These vesicles eventually rupture, causing pain and discomfort, which often leads to reluctance to move. In dairy cattle, this condition causes reduced milk production, and mastitis is commonly observed.

Affected animals also exhibit excessive drooling and weight loss due to difficulty eating. Pregnant animals may suffer abortions as a result of the infection. The severity of clinical signs varies depending on the virus strain, dose of exposure, age, breed, and the immunity of the host.

In severe cases, young animals may develop myocarditis (inflammation of the heart muscle), leading to sudden death. Other complications include bronchopneumonia and myositis (muscle inflammation).

https://www.woah.org/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/2.01.05_FMD.pdf

Other diseases with similar clinical signs and symptoms

Vesicular Stomatitis, Swine Vesicular Disease, Vesicular Exanthema of Swine, Senecavirus A (Seneca Valley Virus), Bluetongue, Rinderpest, Bovine Viral Diarrhea (BVD), Malignant Catarrhal Fever (MCF), Contagious Ecthyma (Orf), and lameness due to trauma or other non-infectious causes

Diagnosis

- Virus isolation

- Complement fixation test
- Enzyme-linked immunosorbent assay
- Real-time PCR
- Agarose gel-based RT-PCR assay
- Counter immunoelectrophoresis

- Serological tests

- Virus neutralisation
- Solid-phase competitive enzyme-linked immunosorbent assay
- Liquid-phase blocking enzyme-linked immunosorbent assay
- Enzyme-linked immunoelectrotransfer blot assay

Vaccine or treatment

Please refer to the appropriate local or international guidelines for clinical management. All clinical management including the administration of a treatment or vaccine should be conducted by a health professional.

- There is no specific treatment. However, supportive care and treatment of bacterial and parasitic coinfections may decrease mortality
- FMD vaccines are commercially available however these vaccines are typically inactivated and need to be specific to the FMD virus serotype circulating in the region.

Immunity

There are two types of immunity:

- **Active immunity** results when exposure to an agent triggers the immune system to produce antibodies to that disease.
- **Passive immunity** is provided when a person is given antibodies to a disease rather than producing them through his or her own immune system.

- Vaccines gives strong immunity

Which interventions are most effective for prevention and control?

The following is a list of activities considered for Red Cross Red Crescent volunteers to take part in. It is not an exhaustive list of all prevention and control activities for the specific disease.

- Communicate risks about the disease or epidemic, not only to share information on prevention and mitigation measures, but also to encourage informed decision-making, positive behaviour change and maintenance of trust in the Red Cross Red Crescent response. This includes the identification of rumours and misinformation around disease—frequent during health emergencies—to manage them appropriately. Volunteers should use the most context-appropriate communication techniques (ranging from social media to face-to-face interactions).
- Community education and engagement activities to encourage the adoption of protective behaviours including:
 - Mass vaccination of herds
 - Best practices are to vaccinate at an early age (4 months old for cattle, 2 months for pigs) with a booster dose given a month later. This would confer immunity for the maximum duration of one year
 - To confer adequate immunity, about 70% of the herd must be vaccinated
 - Exposed or infected animals should be slaughtered and the carcasses should be burned with deep burial
 - Other measures are;
 - Humane slaughter and disposal of affected animals and their contacts; carcasses burned or buried
 - Strict quarantine and control of animal movements
 - Effective cleaning and disinfection of contaminated areas of all premises with lipid solvent solutions of high or low pH and disinfectants; includes physical perimeters, equipment and clothing
 - Careful consideration to use of vaccine; strategic ring vaccination and/or vaccination of high-risk populations
 - Monitoring of wild and captive animals; especially avoiding contact with sheep and goats
- Social mobilization to support vaccination efforts in endemic areas, where possible. This includes extensive Information, Education and Communication (IEC) activities on the benefits of the vaccines, vaccination schedules and where/when to get the vaccines.

Epidemic characteristics and RCRC

indicators and targets

The first table below includes data that should be gathered from health authorities and relevant non-governmental actors to understand the progress and characteristics of the epidemic in the specific country and area of intervention. The second table includes a list of suggested indicators that can be used for monitoring and evaluating Red Cross Red Crescent activities; wording of indicators may be adapted to specific contexts. Target values for a specific indicator can vary widely from one context to another and therefore managers should define them based on the specific population, area of intervention and programmatic capacity. Exceptionally, some indicators in this website may include target values when these are globally agreed as a standard; e.g. 80 per cent of individuals who slept under an insecticide-treated net (ITN) the previous night—the normative World Health Organization benchmark for universal coverage with ITNs.

Epidemic characteristics and progression
Suspected cases per week (disaggregate by age, sex)
Confirmed cases per week (disaggregate by age, sex)
Case fatality rate
Indicators for Red Cross Red Crescent activities
<p>Number of volunteers trained on a specific topic (e.g. Epidemic Control for Volunteers (ECV); Community-based surveillance (CBS); WASH training; CBHFA training, etc.)</p> <p>Numerator: Number of volunteers trained Source of information: Training attendance sheets</p>
<p>Suspect cases detected by volunteers who were encouraged to seek healthcare and who arrived at a health facility</p> <p>Numerator: FMD suspect cases detected by volunteers in a determined period preceding this survey (e.g. two weeks) for whom advice or treatment was sought from an animal health facility</p> <p>Denominator: Total number of people who are FMD suspect cases in the same period preceding the survey Source of information: Survey</p>
<p>Percentage of people recognizing at least one transmission route and at least one measure for preventing it</p> <p>Numerator: Total number of people who recognized at least one transmission route and at least one measure for preventing it during the survey</p> <p>Denominator: Total number of people surveyed Source of information: Survey</p>

Indicators for Red Cross Red Crescent activities

Percentage of people who know the cause, symptoms, treatment or preventive measures

Numerator: Number of people who cite the cause, symptoms, treatment or preventive measures

Denominator: Number of people surveyed

See also:

- For Community Engagement and Accountability (CEA) indicators for activities accompanying ECV actions, please refer to: IFRC *CEA toolkit (Tool 7.1: Template CEA logframe, activities and indicators)*. Available at: <https://www.ifrc.org/document/cea-toolkit>
- For community-based surveillance guidance please see: IFRC, Norwegian Red Cross, Croix-Rouge de Belgique (2022), *Community Based Surveillance Resources*. Available at: www.cbsrc.org/resources.

Impact on other sectors

Sector	Link to the disease
WASH	Routine sanitation, clearing vegetation and maintaining cleanliness around livestock areas can reduce exposure.
Food security	The disease can lead to death of animals and cause the scarcity of meat and milk in affected communities.
Nutrition	Absence of adequate numbers of meat and milk in the market could lead to poor nutrition and malnutrition in affected communities
Shelter and settlements (including household items)	FMD can reduce income, making it harder for families to maintain their homes or afford basic household items.
Psychosocial support and Mental health	FMD can have several negative impacts on psychological, social and emotional aspects of a livestock farmer's life, particularly in the long-term.

Sector	Link to the disease
Sex and Gender	<p>FMD affects livestock mainly, which in turn impacts men and women differently based on their roles. Men often face income losses from animal sales or trade, while women may face increased unpaid labor and reduced household nutrition.</p> <p>Limited access to animal health services can further disadvantage women, especially if they are excluded from vaccination and training efforts.</p>
Education	<p>Importantly, schools and other facilities dedicated to children and youth can offer an important space for them to engage, mobilize and raise awareness around health education issues. With support, trust and appropriate capacity-building, young people can be effective advocates for the adoption of preventive measures during an epidemic and are those best placed to mobilize their peers.</p>
Livelihoods	<p>Livelihoods based on sheep and cattle breeding or dairy products can be significantly affected during outbreaks (quarantine of herds, slaughtering of livestock).</p> <p>Another impact on livelihoods is the reduction in work activity and to the diversion of resources to seek medical treatment for sick animals, particularly for patients with severe forms of FMD</p> <p>Furthermore, quarantine and selective slaughtering (culling) of animals due to FMD outbreaks may impact the livelihoods of the farmers as it affects their source of income, food and nutrition</p>

Resources:

- Food and Agriculture Organization of the United Nations; [Foot and Mouth Disease](#) (n.d.)
- World Organisation for Animal Health (WOAH); [Foot and Mouth Disease](#). (2009)
- World Organisation for Animal Health (WOAH); [Foot and Mouth Disease](#) (n.d.)