

Foot and Mouth Disease (FMD)

Extended version

Classic case: Malaise, **salivation**, **lameness** that **spreads quickly** within herd; **Vesicles**, **erosions**, ulcers on muzzle, in mouth/on tongue, teats, and coronary bands.

REPORTABLE Disease – worldwide

One of the **most contagious** animal diseases known, FMD is endemic in southern Asia, Africa, Middle East, some of Latin America.

Currently, **NOT** found in the Americas, Australia, New Zealand, Indonesia, Chile, Western Europe;

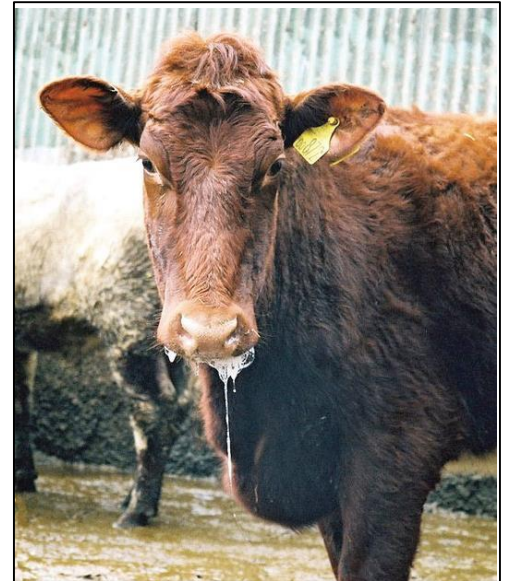
Presentation:

Clinical signs (C/S):

- **High fever**
- **Drooling** w/ viscous, sticky saliva
- Lip smacking, bruxism
- **Lameness**, unwilling to move, foot 'stomping', shifting feet
- Poor milk production, agalactia
- **Vesicles, erosions** on:
 - Tongue, lips, gums, teats, between claws
 - Pressure points – hocks, above claws
- Weight loss
- Abortions; Neonatal disease/death

Secondary problems:

Mastitis; Chronic weight loss, debilitation
Chronic lameness; loss of antlers, horns of feet, toes



Salivation is one of the 1st signs of FMD infection.
Image courtesy, USDA APHIS

DDX:

Cattle:		Swine:	Sheep:
Bluetongue	Malignant catarrhal fever	Vesicular Stomatitis**	Bluetongue
Bovine Herpes-1	Bovine parapox virus	Vesicular Exanthema**	Contagious ecthyma
Vesicular stomatitis	(papular stomatitis)	Swine Vesicular Ds**	
Bovine Viral Diarrhea	Infectious Bovine Rhinotracheitis		
Rinderpest			

Note: Vesicular lesions are often difficult to distinguish via clinical signs alone; (especially in swine**). Laboratory testing is **required**.

When FMD is suspected – the **FIRST** step - Notify regulatory officials

US - The Area Veterinarian in Charge (AVIC), & the State Veterinarian

UK - The duty vet at local Animal Health Veterinary Laboratories Agency (AHVLA)



FMD lesions in the interdigital cleft in a Shorthorn cow. Image courtesy, US Govt

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Test of choice:

Several tests available – circumstances determine which to choose:

- Confirmation that a vesicular disease **IS** FMD
- Identify the particular strain involved AND the SOURCE
- Stage of disease - acute infection, outbreak, screening, carrier state
- Surveillance/screening for ongoing control, import of new animals
- Distinguish vaccination vs infection

Remember Federal Accreditation guidelines?

The DVM is the first line of defense vs. foreign animal disease, but a Foreign Animal Disease Diagnostician (FADD) from Veterinary Services (VS) always directs the protocol for diagnosis of FMD cases in the US.

Positive diagnosis for FMD

- Find either of the following

★ ■ Viral antigen

- ELISA – fast; probably most common
 - Used w/acute, carrier, and surveillance
- CF - not sensitive; some countries still use
- Virus isolation, followed by ELISA, CF, PCR - slow
- Electron microscopy on tissue, often myocardium

-OR-

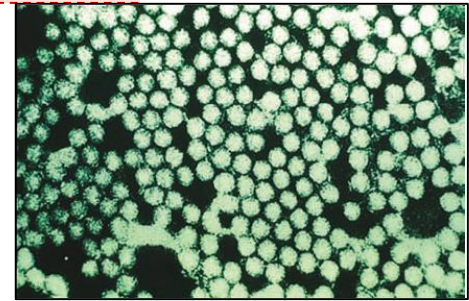
★ ■ Nucleic acids – reverse transcriptase PCR (RT-PCR); pretty fast

- PCR being used more often for FMD Dx

- A rapid patient-side test is available *outside US*; uses serum or plasma
 - Identifies antibodies to non-structural proteins (NSP) of the FMD virus
 - **Distinguishes vaccine vs. infection** – vaccine virus does not have NSP
 - **Not** sensitive – false negatives possible, may not identify carriers

Get samples from the following:

- Fluid from vesicles
- Affected epithelium
- Nasal/oral secretions
- Serum
- Necropsy - myocardium
- Milk, semen
- Esophageal/pharyngeal fluids
(use when no vesicles are present and to identify carriers)



Electron micrograph of FMD virus,
Image courtesy, US Govt.



Early vesicles on bovine teat
Image courtesy of Defra

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Guidelines for handling and submission of samples:

- Use appropriate **transport media** – keep cool, maintain pH 7.2-7.6
- Secure packaging – **double leak-proof** containers
- Send to national lab responsible for FMD testing
 - Approved National Animal Health Laboratory in the US
 - National/regional labs elsewhere
- Specially approved labs do further testing
 - The OIE/FAO World Reference Lab for FMD
 - The Institute for Animal Health (IAH) at Pirbright Laboratory, UK
 - Plum Island Animal Disease Center, US

Rx of choice:

- No specific treatment
- **Supportive care**, antibiotics for mastitis, foot care, etc.

Prognosis:

- Good - *survival* of infected individuals
- Poor - overall health of herd and economic outcome
- Guarded in neonates, nursing animals

Prevention:

- FMD free countries – usually – **Euthanasia of all positive & in-contact animals**
 - Carcasses are burned
 - Or buried on/around source premise
- **Quarantine** +/- vaccination in countries that cannot depopulate positive herds (\$\$\$)
 - Killed vaccine
 - Quite useful but immunity not long-lived - 4-6 mo.
- **Movement restriction** within/around affected areas – animals AND people
 - Affected premises must be posted with warning signs
 - **PEOPLE can be temporary CARRIERS** – if exposed, cannot leave for ~3-5 days
- Maintain **strict entry requirements** for animals, people, vehicles
- Thorough disinfection - premises, equipment, trailers
- Use acidic or alkaline agents - FMD inactivated at pH < 6.0 or >9.0

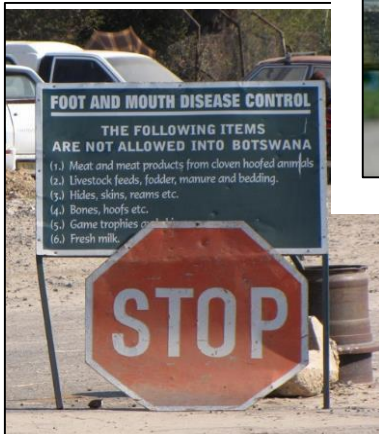


Lesions on a steer's tongue; courtesy of

Defra

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FMD regulations - Warning sign at a border entry in Botswana



Warning sign on affected premise in the UK; courtesy of Defra



Severe lesions on pig's feet Image courtesy of Defra

Pearls:

★★ **Severe economic impact** - Production losses ★★
Export/travel bans on animals and products; within and between nations

Who gets FMD? *Artiodactyla* -cloven hoofed species

- **Bovine** most susceptible species
- **Pigs** - severe signs common, especially on feet; propagates readily, amplifies outbreaks
- Sheep and goats less susceptible; agalactia common
- S. American Camelids – susceptible but rarely spread disease to other species
- **African Buffalo** - *important reservoir – carriers w/ no disease*
- HUMANS can get FMD, but this is very rare
- Morbidity often 100%; worse in large groups & intensive production situations
- Mortality – depends on age
- Most adults survive, but recovered animals are weak, debilitated
- High mortality in young – myocarditis, lack of milk
- FMD is an Aphthovirus**, family picornaviridae
 - 7 serotypes - A, O, C, SAT1, SAT2, SAT3, Asia1
 - No cross-immunity - Specific vaccine required for each strain

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Did you know?

**An '*aphtha*' is an ulceration on a mucous membrane; from a Greek root meaning 'mouth sore'

Why is that?

In 1924, the Office of International Epizooties (OIE) was established in Europe. In 2003, it became the World Animal Health Organization, but kept the old acronym.

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TRANSMISSION – VERY contagious

Incubation period 2-14 days

- **Contact** – All secretions, excretions carry virus, including milk, semen
Contaminated environment, feed, clothing, equipment, etc.
Fomites - People, dogs, cats, even birds may spread the virus
- **Aerosol** - Huge #s of virus particles in expired breath
Between animals *AND between properties* via **wind**
- Pharyngeal mucosa – most common entry site; GI mucosa & broken skin also
- Virus travels via lymphatics; replicates in oral and dermal epithelium
- Vesicles in mouth, on feet, teats, muzzle w/in 48 hrs; viremia 4-5 days

Recovered animals may be carriers for months to years!

Refs: Overview of FMD, from the Merck Veterinary Manual, 10th Ed. online. Unless otherwise noted, the images in this FlashNotes topic are from the US Department of Agriculture and are in the public domain.

My notes: