


## Foot-and-Mouth Disease


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| S<br>l<br>i<br>d<br>e<br><br>1 | <p style="text-align: center;"><b>Foot-and-Mouth<br/>Disease</b></p> <p style="text-align: center;"><i>FMD</i></p>   | Foot-and-mouth disease is often referred to as FMD.  |
| S<br>l<br>i<br>d<br>e<br><br>2 | <p style="text-align: center;"><b>Overview</b></p> <ul style="list-style-type: none"><li>• Cause</li><li>• Economic impact</li><li>• Distribution</li><li>• Transmission</li><li>• Disease in animals</li><li>• Prevention and control</li></ul> <div style="text-align: right;"></div> <p style="text-align: right; font-size: small;">Center for Food Security and Public Health<br/>Iowa State University 2006</p>   | In today's presentation we will cover information regarding the organism that causes foot-and-mouth disease. We will also talk about the economic impact the disease has had in the past and could have in the future. Additionally, we will talk about how it is transmitted, the species it affects and signs of the disease. Finally, we will address prevention and control measures for the disease as well as actions to take if foot-and-mouth disease is suspected.        |
| S<br>l<br>i<br>d<br>e<br><br>3 | <p style="text-align: center;"><b>The Cause</b></p>  | Let's begin by discussing the cause of foot-and-mouth disease.   |
| S<br>l<br>i<br>d<br>e<br><br>4 | <p style="text-align: center;"><b>Foot and Mouth Disease</b></p> <ul style="list-style-type: none"><li>• Virus<ul style="list-style-type: none"><li>- 7 different types</li><li>- Infection with one does not protect against another</li><li>- New types may develop</li></ul></li><li>• Affects cloven-hoofed animals<ul style="list-style-type: none"><li>- Cattle, sheep, goats, pigs</li></ul></li><li>• Survives in milk, milk products, bone marrow, lymph glands</li></ul> <p style="text-align: right; font-size: small;">Center for Food Security and Public Health<br/>Iowa State University 2006</p> | Foot-and-mouth disease (FMD) is caused by a virus. There are 7 distinct types. This means that infection with one type will not protect against infection with a different type. New subtypes may suddenly develop, making effective vaccination difficult with new outbreaks. FMD primarily affects cloven-hoofed domestic and wild animals such as cattle, sheep, goats, pigs and water buffalo. It can survive in milk and milk products, frozen bone marrow, and lymph glands. |
| S<br>l<br>i<br>d<br>e<br><br>5 | <p style="text-align: center;"><b>Importance</b></p>   | FMD is a threat to the U.S. because American livestock are naïve and it could have a huge economic impact.   |

Foot-and-Mouth Disease

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**History**

- 1929: Last case in U.S.
- 1953: Last cases in Canada and Mexico
- 1993: Italy
- 1997: Taiwan
- 2001: United Kingdom
  - Other outbreaks in 1967-68 and 1981



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Prior to 1929, the United States had FMD in several states, generally due to the importation of infected animals or their products. This led to restrictions being imposed on importations of animals or their products from infected countries in 1929, many of which are still in effect today. An outbreak in Canada in 1953 was quickly controlled and Mexico was endemic with FMD until then as well. The North American continent has been free of FMD since 1953. Internationally, many countries have endemic FMD and some have had significant outbreaks that are highlighted here. Italy's 1993 outbreak cost over \$130 million, and the 1997 Taiwan outbreak cost roughly \$15 billion. Great Britain had documented outbreaks in 1967-68 and 1981 in Hampshire. The outbreak in 2001 was estimated to cost the country £8 billion over a 4 year period. Diagram of United Kingdom.

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**Economic Impact**

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| <ul style="list-style-type: none"> <li>• Direct costs                             <ul style="list-style-type: none"> <li>- Economic losses to farmers and producers</li> <li>- Eradication costs</li> <li>- Millions to billions of dollars lost</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Indirect costs                             <ul style="list-style-type: none"> <li>- Exports shut down</li> <li>- \$3.1 billion in beef</li> <li>- \$1.3 billion in pork</li> <li>- \$14 billion in lost farm income</li> <li>- \$6.6 billion in livestock exports</li> <li>- Consumer fear</li> </ul> </li> </ul> |
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Economically Devastating!!

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FMD is considered by many to be the most economically devastating livestock disease virus in the world. This is largely due to the fact that it is easily transmitted, results in economic losses in animal production, and depopulation (as a means of control) would cost the producer and the government millions, even billions of dollars. The indirect effects of FMD would occur when countries around the world close their doors to our exports of beef, pork, mutton, dairy products, and live animals. This means the United States would have the potential to lose \$3.1 billion in beef exports and \$1.3 billion in pork exports each year. In a revenue impact analysis done of a FMD outbreak in the U.S. by Paarlberg and others (Potential revenue impact of an outbreak of foot-and-mouth disease in the United States. *JAVMA*; 220,7:988-992), it was estimated that \$14 billion would be lost in farm income. Livestock exports would drop \$6.6 billion. Another indirect effect is that of consumer fear. Even though FMD is not a risk to humans, consumption of red meat and dairy products could be reduced and estimates include a 20% decline in consumer purchases, causing a loss to farm income of \$20.8 billion.


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Distribution

Next we will discuss where FMD is found and how severely it affects animals with the disease.

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**Geographic Distribution**



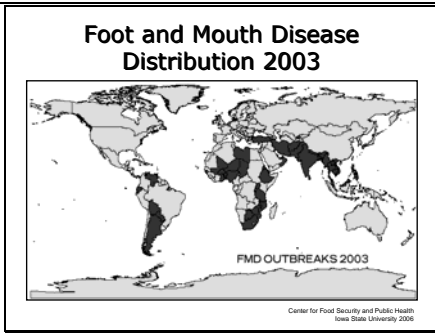
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FMD was found worldwide after WWII. The areas where FMD circulates among animals include Asia, Africa, Middle East and parts of South America. Outbreaks have occurred in Taiwan, South Korea, Japan, Mongolia, Britain, France, and the Netherlands. The Netherlands, North and Central America, Australia and New Zealand have been free of FMD for many years. The World Organization for Animal Health (formally known as the OIE- Office des International Epizootics) has a list of Member Countries that are FMD free countries where vaccination is not practiced. The map depicts those countries by shading them white. Taken from the OIE website on Sept. 16, 2005.

[http://www.oie.int/Cartes/world/a\\_Monde.htm](http://www.oie.int/Cartes/world/a_Monde.htm) For updates to that information, please access [www.oie.int/eng/info/en\\_fmd#Resolution](http://www.oie.int/eng/info/en_fmd#Resolution) as outbreaks continue to occur and FMD-Free status changes.

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It is important to understand that FMD has and is currently occurring in many countries around the world. This map is taken from the Food and Agriculture Organization of the United Nations giving us an accurate assessment of the worldwide impact as of June 29, 2004 from the FAO website  
<http://fao.org/ag/againfo/commissions/en/fmdmaps/maps2003/2003.gif>

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**Sickness/Death**

- Sickness 100% in animals that have never had FMD
  - United States, Canada, Mexico, others
- Death rate less than 1%
  - Higher in young animals and with certain virus strains
  - Animals generally euthanized to prevent spread of disease

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In animals that have never had FMD, like the United States, sickness may reach 100% but the death rate is generally less than 1%. Younger animals and certain strains of the virus may cause the death rate to increase. Because of the economic impact of this disease, animals are generally euthanized to prevent further spread, but could recover in time.

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**Transmission**

*Spread of FMD*

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**Animal Transmission**

- Aerosols
  - Proper temperature and humidity
  - Survives 1-2 days in human respiratory tract
- Direct contact
  - Infected animals with ruptured blisters
  - Contaminated biologicals, hormones
  - Artificial insemination

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Transmission primarily occurs by inhaling respiratory aerosols, direct contact with infected animals, oral consumption, or through fomites that are contaminated. Aerosol transmission requires proper temperature and humidity. The FMD virus can survive for 1-2 days in the human respiratory tract, thus there is potential for human spread to animals. Direct contact with other infected animals or with contaminated biological and hormone preparations can spread FMD. Peak transmission occurs when vesicles rupture. Reproductive spread can occur through infected semen used for artificial insemination.

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**Animal Transmission**

- Oral
  - Ingestion of infected animal parts
- Fomites
  - Boots, clothing, tools
  - FMD virus survives for days to weeks if in dried blood

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Oral consumption of contaminated animal parts such as meat, milk, bones, glands, and cheese can also spread the disease. Contact with contaminated fomites (non-living objects) such as boots, clothing or tools can also be a source of infection. It can remain active on surfaces for days to weeks and survives drying if it is in a part of blood known as serum.

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| Animal Transmission |  |             |
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| Species             | Host                                     | Carrier     |
| Sheep<br>Goats      | Maintains the virus                      | 4-6 months  |
| Pigs                | Increases the virus                      | Short-term  |
| Cattle              | Often first to show signs of the disease | 6-24 months |

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Different animal species react to FMD in different ways. Sheep and goats are considered maintenance hosts in that they have mild signs which delay diagnosis and allow for aerosol, direct contact spread, and environmental contamination. Sheep can carry the virus in their throat tissue for 4-6 months. Pigs are amplifying hosts in that they concentrate the virus in their respiratory secretions and are much more infective via aerosol transmission. Pigs shed high levels of virus, but for only a short time (not long-term carriers). Cattle are indicator hosts because they most often are the first species to show clinical signs with more severe, rapidly progressing lesions. Cattle can carry the virus in their throat tissue for 6-24 months once exposed or vaccinated with FMD.

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| Human Transmission   |
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| <ul style="list-style-type: none"> <li>• Very rare</li> <li>• Act as a transmitter to animals                             <ul style="list-style-type: none"> <li>- Harbor virus in respiratory tract for 1-2 days</li> <li>- Contaminated boots, clothing, vehicles</li> <li>- Spread to susceptible animals</li> </ul> </li> <li>• Ingestion of milk or dairy products from infected animals</li> </ul> |

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It is very rare for humans to become infected with FMD. Vesicles may appear on the skin at the point of contact with an infected blister from an animal. The most important point to understand is that humans may pick up the virus in a variety of ways and transmit FMD to other animals. As mentioned previously, humans can carry the FMD virus in their respiratory tract for 1-2 days. Also, if their boots, clothing or vehicles become contaminated, they may spread the virus to susceptible animals. Although rare, a person may contract an infection if they ingest milk or dairy products from infected animals.

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| Animals with FMD |
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| Clinical Signs   |
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| <ul style="list-style-type: none"> <li>• Period of time from exposure to signs of disease: 2-12 days</li> <li>• Fever and blisters                             <ul style="list-style-type: none"> <li>- Feet, mouth, nostrils, muzzle, teats</li> </ul> </li> <li>• Abortion</li> <li>• Death in young animals</li> <li>• Recovery in two weeks unless secondary infections arise</li> </ul> |




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The period of time from exposure to signs of disease (incubation period) for FMD is 2 to 12 days and animals that are in contact with infected animals will generally develop signs in 3 to 5 days. Fever and blisters (vesicles) on the feet, mouth, nostrils, muzzle and teats are the characteristic lesions of FMD. These will eventually progress to erosions which cause the affected animal to have clinical signs associated with the lesioned area. Abortion may occur in adults and death in young animals without any other clinical signs. Animals generally recover in two weeks but secondary infections may lead to longer recovery time. The photo depicts oral erosions on the tongue and lips of a cow with FMD.

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| Clinical Signs in Cattle  |
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| <ul style="list-style-type: none"> <li>• Mouth lesions                             <ul style="list-style-type: none"> <li>- Blisters on tongue, dental pad, gums, back of mouth, nostrils, muzzle</li> <li>- Progress to erosions</li> <li>- Excess saliva, drooling, watery nasal discharge</li> </ul> </li> </ul> |



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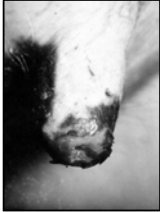
Clinical signs in cattle include mouth lesions such as blisters on the tongue, dental pad, gums, back of the mouth, nostrils or muzzle. These will eventually progress to erosions which cause the affected animal to have clinical signs associated with the lesioned area. This will lead to excess saliva, drooling (due to difficulty in swallowing), and watery nasal discharge. The photo depicts a cow with excess saliva and drooling due to mouth lesions. Photo courtesy of the Gray Book.

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### Clinical Signs in Cattle

- Teat lesions
  - Decreased milk production
- Hoof lesions
  - Between toes
  - Top of the hoof
  - Lameness
  - Reluctant to move




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Teat lesions can occur and cause a decrease in milk production. Hoof lesions between the toes and on the top of the hoof are also common leading to lameness and a reluctance to move. Photo depicts ruptured blisters at the end of a bovine teat, from the Gray Book.

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### Clinical Signs in Pigs

- Hoof lesions
  - More severe than in cattle
  - Top of hoof, heel, between toes
  - Lameness
- Snout blisters
- Mouth blisters less common
  - Drooling is rare



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Pigs have more severe hoof lesions than cattle with blisters at the top of the hoof, heel and between the toes. Blisters are often seen on the snout but mouth lesions are not as common or less severe than in cattle if they do occur. Drooling is rare in pigs because of this. Top photo depicts severe hoof and leg lesions on a pig with FMD (from USDA <http://www.usda.gov/oc/photo/01cs0008.htm>) and the lower picture is of lame pigs due to their hoof lesions (Gray Book).

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### Clinical Signs in Sheep and Goats

- Mild signs (if any)
  - Fever
  - Mouth lesions
  - Lameness
- Makes diagnosis and prevention difficult



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Since sheep and goats are referred to as a maintenance host, fever, mouth lesions and lameness occur but are very mild and sometimes are not detected. This makes it difficult to diagnose and prevent the spread of disease to other species.

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### Vesicular Diseases

- FMD one of four vesicular (blister) causing diseases
- Cattle affected by two of them
  - FMD and Vesicular Stomatitis
- Only way to tell the difference is by lab tests – call the veterinarian!

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FMD is one of four vesicular (blister) causing diseases. Cattle can be affected by two of them (FMD and Vesicular Stomatitis). The only way to tell the difference between the two diseases is to run laboratory tests – call the veterinarian!


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|                           | Foot & Mouth Disease   | Vesicular Stomatitis  | Swine Vesicular Disease   | Vesicular Exanthema of Swine                          |
|---------------------------|--|---|---|---|
| Clinical Signs by Species | All vesicular diseases produce a fever with vesicles that progress to erosions in the mouth, nares, muzzle, teats, and feet      |   |   |   |
| Cattle                    | Mouth & hoof lesions, salivation, drooling, lameness, abortions, death in young animals, "pankers";<br><i>Disease Indicators</i> | Blisters in mouth, on teats, top of the hoof, between toes                                | Not affected  | Not affected  |
| Pigs                      | Severe hoof lesions, hoof drooping, snout blisters, less severe mouth lesions;<br><i>Amplifying Hosts</i>                        | Same as cattle  | Severe signs in animals housed on concrete; lameness, salivation, neurological signs, younger more severe | Deeper lesions with proud flesh formation on the feet |
| Sheep & Goats             | Mild signs if any;<br><i>Maintenance Hosts</i>   | Rarely show signs   | Not affected  | Not affected  |
| Horses, Donkeys, Mules    | Not affected   | Most severe with blisters on mouth top of hoof, drooling, rub mouths on objects, lameness | Not affected  | Not affected  |

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Clinically, all vesicular diseases produce a fever with blisters (vesicles) that progress to erosions in the mouth, nostrils, muzzle, teats and feet. A person cannot tell the different types of vesicular diseases apart just by looking at them, especially in swine as this chart shows, and diagnosis can only be made through testing for a specific virus. Any disease with blisters (vesicles) and fever should warrant an immediate phone call to your veterinarian.

## Foot-and-Mouth Disease

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| S<br>1<br>i<br>d<br>e<br><br>2<br>5 | <p style="text-align: center;"><b>Actions to Take</b></p> <p style="text-align: center;">Contact your veterinarian<br/>Stop all animal movement</p> <p style="text-align: right; font-size: small;">Center for Food Security and Public Health<br/>Iowa State University 2006</p>  | <p>If you suspect a blister-like (vesicular) illness like FMD in your animals, call your local veterinarian immediately and stop all animal movement.</p>   |
| S<br>1<br>i<br>d<br>e<br><br>2<br>6 | <p style="text-align: center;"><b>FMD in Humans</b></p> <ul style="list-style-type: none"><li>• FMD in humans is not a public health concern</li><li>• 40 documented human cases since 1921<ul style="list-style-type: none"><li>– Europe, Africa, South America</li></ul></li></ul> <p style="text-align: right; font-size: small;">Center for Food Security and Public Health<br/>Iowa State University 2006</p>   | <p>FMD infection in humans is not considered a public health concern. Since 1921, there have only been 40 human cases that were isolated and typed on three continents (Europe, Africa, South America).</p>   |
| S<br>1<br>i<br>d<br>e<br><br>2<br>7 | <p style="text-align: center;"><b>Prevention and Control</b></p>   | <p>There are various prevention and control methods that can be applied to foot-and-mouth disease and those will be discussed next.</p>   |
| S<br>1<br>i<br>d<br>e<br><br>2<br>8 | <p style="text-align: center;"><b>Prevention: Nationally</b></p> <ul style="list-style-type: none"><li>• USDA APHIS: Strict import restrictions<ul style="list-style-type: none"><li>– Prohibit live ruminants, swine and their products from FMD-affected countries</li><li>– Monitor travelers and belongings at ports of entry</li></ul></li><li>• 450 FADD to investigate suspicious lesions</li><li>• State planning/training exercises</li></ul> <p style="text-align: right; font-size: small;">Center for Food Security and Public Health<br/>Iowa State University 2006</p>   | <p>The USDA (United States Department of Agriculture) has upgraded the safeguarding measures in place to prevent introduction of FMD into the U.S. The USDA APHIS (Animal and Plant Health Inspection Service) has strict import restrictions in place to prohibit importation of live ruminants, swine and their products from FMD-affected countries. Government officials at ports of entry continue to monitor travelers and their belongings that have returned from an FMD area. There are 450 foreign animal disease diagnosticians (FADD) employed to investigate suspicious lesions and other unusual symptoms that private veterinary practitioners alert them to. Several states have also been involved in training exercises regarding actions to take if FMD is introduced. Additionally, APHIS has a federal plan in place should it occur on U.S. soil.</p> |
| S<br>1<br>i<br>d<br>e<br><br>2<br>9 | <p style="text-align: center;"><b>Prevention: On the Farm</b></p> <ul style="list-style-type: none"><li>• Limit access to your farm</li><li>• Post signs informing visitors of policies</li><li>• Monitor traffic and visitors</li><li>• Wear personal protective equipment in animal areas<ul style="list-style-type: none"><li>– Clean coveralls, boots, hats</li><li>– Disinfect boots</li><li>– Wash hands</li></ul></li></ul>  <p style="text-align: right; font-size: small;">Center for Food Security and Public Health<br/>Iowa State University 2006</p> | <p>Producers should implement and follow strict, complete biosecurity protocols on U.S. livestock production facilities as their best means of prevention. See the FMD Prevention Practices handout for specific guidelines on protecting your facility from FMD. Biosecurity protocols should include steps such as limiting access to only personnel necessary for the function of the farm. Signs should be posted at the farm entrance to inform visitors of biosecurity policies, such as the one pictured here (graphic design by Clint May, CFSPH). All traffic (vehicle, people and animals) should be closely monitored and recorded in a log book. Clean clothing (coveralls, hats, boots) should be worn when accessing animal</p>   |

areas. These materials should be disinfected or removed and disposed of following the procedure to prevent cross contamination between different areas of your farm. Additionally, hands should be washed with soap and water after contacting animals to prevent spread of disease to animals or humans.

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**Prevention: On the Farm**

- Restrict or stop animal movement
  - To prevent the spread of the disease
  - Quarantine any new or returning animals for 30 days
  - Prevent contact with free roaming animals
    - Wildlife, rodents, dogs, cats

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If FMD is reported in the U.S., you can protect your farm by restricting or disallowing movement of your animals off or onto your farm. If animals have been newly introduced or recently returned (e.g., from a show) to your farm, they should be quarantined in an area away from other animals for a period of at least 28-30 days. These animals could be infected with a disease but have not developed signs of illness. By allowing this time period, you can prevent spread of a disease to the remainder of your herd from an ill animal. Although difficult, prevent contact of your herd with other free-roaming animals such as wildlife, rodents or even domestic animals like dogs or cats that could spread disease between farms.

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**Prevention: On the Farm**

- Know the signs of FMD
- Monitor animals closely, frequently
- Isolate any sick animals immediately
- Contact your herd veterinarian


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The best way to prevent the spread of FMD is rapid detection. This will require close and frequent monitoring of your herd. Other diseases can look similar to FMD, so it is important to immediately isolate animals showing signs of illness or acting unusually and contact your herd veterinarian.

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**Control**

- Disinfection
  - Remove all organic matter
    - Manure, dirt, feed, etc.
  - Use proper concentration
  - Allow proper contact time
- Vehicles, shoes, equipment



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In order to control FMD, proper disinfection of all contact premises and infected materials is necessary. Preparing disinfectants for the farm entrance, vehicles, and people is imperative in preventing the spread. An essential step in effective disinfection is to remove all organic matter (manure, feed, dirt, etc.) prior to application of any disinfectants. Most disinfectants are inactivated by organic material. Additionally, this debris can allow microorganisms “hiding” from the action of disinfectants. Always read the label instructions to determine to concentration needed. More is not always better. Another often overlooked step is to allow for proper contact time after application of the disinfection solution. The chemicals need time to do their job. Cleaning and disinfection of vehicles, equipment, footwear, clothing is essential to minimize the spread of FMD. Photo courtesy of: Danelle Bickett-Weddle, DVM, ISU

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| EPA and USDA Approved Disinfectants                  |          |   |  |
|--|----------|---|--|
| Product  | Dilution | Mixing Instructions   | Comments   |
| Sodium hypochlorite 5.25% (NaOCl) (household bleach) | 3%       | 2 gallons of bleach to 3 gallons of water. Mix thoroughly.  | Inactivated by organic soiling; unstable in warm sunny conditions.   |
| Acetic acid*   | 4-5%     | 6-5 oz. glacial acetic acid to 1 gallon of water. Mix thoroughly.   | Vinegar is a 4% solution of acetic acid.   |
| Potassium peroxymonosulfate and sodium chloride      | 1%       | Follow label directions.  | e.g. Virkon-S  |
| Sodium carbonate (soda ash)                          | 4%       | 5.33 oz. sodium carbonate to 1 gallon of hot water OR 1 lb. soda ash to 3 gallons of hot water. Mix thoroughly. | The solution is mildly caustic, but can dull paint and varnished surfaces.   |
| Sodium hydroxide (lye, NaOH)                         | 2%       | 1/3 cup of lye/31 pellets (2.7 oz. of lye) to 1 gallon of cold water. Add lye to the water. Mix thoroughly.     | This solution is highly caustic. Use protective (water-resistant) clothing, gloves and safety glasses. <b>Warning: Always add the lye to the water. Never pour the water over the lye.</b> |

\* Citric acid may also be effective. Iowa State University 2006

Selected disinfectants have been approved by the EPA and USDA for use against the FMD virus. Many of them have safety issues and concerns and should be used with caution. In the event of an FMD outbreak, the best disinfectant of choice will likely be determined by animal health officials. To protect your farm, some of these solutions may be used for preventive purposes. As with all chemicals, always read the label directions and mix the concentration appropriate for your purposes. Wear gloves and goggles to avoid damage to your skin and eyes while mixing or applying most disinfectants.

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| Control   |  |
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| <ul style="list-style-type: none"> <li>No treatment available</li> <li>Supportive care to those infected</li> <li>U.S. outbreak could result in                             <ul style="list-style-type: none"> <li>Quarantine</li> <li>Euthanasia</li> <li>Disposal</li> </ul> </li> <li>Vaccine available                             <ul style="list-style-type: none"> <li>Difficult decision</li> </ul> </li> </ul> | Center for Food Security and Public Health<br>Iowa State University 2006 |

Currently there is no treatment for FMD as it is a virus. Supportive care may be provided to those animals afflicted with the disease, but due to the grave economic impact, animals will likely be quarantined, euthanized, and disposed of once they are found infected. Vaccines are available for use in some countries, but in the U.S. this may be a difficult decision.

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| Vaccination  |  |
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| <ul style="list-style-type: none"> <li>Not currently used in the U.S.                             <ul style="list-style-type: none"> <li>No animals affected since 1929</li> </ul> </li> <li>May be used to control an outbreak</li> <li>Implications if we do vaccinate                             <ul style="list-style-type: none"> <li>International trade status harmed</li> <li>Annual re-vaccination required                                     <ul style="list-style-type: none"> <li>Costly, time consuming</li> </ul> </li> <li>Does not protect against infection, just clinical signs                                     <ul style="list-style-type: none"> <li>Spread infection to other animals</li> </ul> </li> </ul> </li> </ul> | Center for Food Security and Public Health<br>Iowa State University 2006 |

Why don't we vaccinate for FMD? There is no need to vaccinate against a disease that animals have not had in this country since 1929. However, we may need to do so during an outbreak to contain it. There are implications to vaccinating animals. First, our international trade status would be in jeopardy as we couldn't claim FMD-free status. To earn FMD-free status, the OIE health code requires a 3-month waiting period after they slaughter their last positive animal, given ongoing surveillance through testing has occurred throughout the disease monitoring process. Next, annual re-vaccination would be required to maintain immunity and this is very costly and time consuming. It would be necessary to vaccinate against all 7 varieties of the virus. Finally, the FMD vaccine does not protect against getting the infection, it just lessens the outcome of the disease. So if a vaccinated animal came in contact with the virus, it could harbor it for months or years in its respiratory tract and shed it to others. This false sense of security of "vaccinated animals" could do more harm than good.

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| Additional Resources |  |
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**Resources**



- Center for Food Security and Public Health website  
– [www.cfsph.iastate.edu](http://www.cfsph.iastate.edu)
- World Organization for Animal Health (OIE) website  
– [www.oie.int](http://www.oie.int)
- USDA APHIS Veterinary Services  
– [www.aphis.usda.gov/vs](http://www.aphis.usda.gov/vs)
- 1-866-SAFGUARD is a toll-free hotline

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The 1-866-SAFGUARD (723-48273) is a toll-free hotline with recorded messages for international travelers

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**Acknowledgments**

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