

# Foreign Animal Diseases

**Editor's Note:** The following papers are published in order to create an awareness of the possible introduction of devastating cattle diseases into the United States and Canada. I am acutely aware of the potential ravage of foot and mouth disease since I encountered an outbreak in our practice in Wales many years ago. Our readers are also reminded that contagious pleuropneumonia was introduced to the U.S. in 1843 when a Brooklyn milkman bought a British ship's dairy cow and soon destroyed herds throughout the country. With Dr. Daniel E. Salmon as

Director of a handful of Veterinarians in the recently established Bureau of Animal Industry (BAI), this disease was wiped out by combined slaughter and quarantine in 1892. It was the first instance of the eradication of a disease.

Some of the diseases included in this group, such as Blue Tongue, are already present in this country but are included for reasons explained by the authors.

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## The Threat of and Response to a Foreign Animal Disease Outbreak

**W. W. Buisch, D.V.M.,**  
Principal Staff Officer  
National Emergency Field Operations  
Emergency Programs

The United States is fortunate to have a well managed livestock population located on 1.7 million farms and valued at over 50 billion dollars. This includes approximately 120 million cattle, 60 million swine, and 30 million sheep and goats.

If we look at livestock populations worldwide, 8 percent of the World's livestock population is located within the United States. Sixty percent is located in the undeveloped and/or developing countries of the World such as those located in Africa, Asia, and South America. It is interesting to note that our livestock population at 8 percent is equal in total production of meat, meat products, and milk and milk products to that of all the undeveloped and/or developing countries combined at 60 percent of the World's livestock population.

So, what is the potential threat and associated losses that could be foreseen should a foreign animal disease such as foot-and-mouth disease (FMD) or African swine fever (ASF) become established in our land? According to Drs. McCauley and Sundquist of the University of Minnesota, the presence of FMD in the United States would result in a \$12 billion loss to our livestock industry over a 15-year-period and the presence of ASF would result in a \$560 million loss to our livestock industry over a 10-year-period of time. In addition, the losses to our export markets would be dramatic involving millions and possibly billions of dollars over such an extended period of time.

Today, the threat of ASF to our swine population is very real. In 1971, ASF was diagnosed for the first time in the Western Hemisphere in Cuba and was quickly eradicated after all of the swine (460,000) were destroyed in Havana Province. Then in May of 1978, ASF was diagnosed in Brazil; July of 1978, it was diagnosed in the Dominican Republic; and in January of 1979, in Haiti. Thus, ASF is now within close proximity to our shores.

The threat of exotic disease has recently been dramatized by our repeatedly being bombarded by the entry of viscerotropic velogenic Newcastle disease (VVND), a highly contagious viral disease of birds, causing high mortality in poultry. Luckily, each of these outbreaks has been quickly contained to the pet bird population and eradicated before it gained entry into the poultry populations. The last case of VVND involving poultry was diagnosed in November 1971 and involved extensive losses to the pet bird and poultry industries before it was contained and eradicated.

In 1971, Venezuelan equine encephalomyelitis (VEE), a mosquito borne viral disease affecting both equidae and man was diagnosed after it had moved into the United States from Mexico. In order to effectively eradicate VEE, over 2.8 million of the 8 million horses known to exist in the United States were vaccinated. In addition, over 13 million acres were sprayed with Malathion for effective control of the many species of mosquitoes thought to be the primary perpetuators of the disease.

Fortunately, FMD has not been diagnosed in the United States since 1929 even though it has been diagnosed in Canada in 1952 and in Mexico, 1946-1954. We have had nine outbreaks of FMD and the largest was in 1914 and 1915. It started in Michigan, soon became established in the Chicago Union Stockyards, and spread to 22 States and the District of Columbia. It involved the depopulation of 77,000 cattle, 85,000 swine, 10,000 sheep, 100 goats, and 9 deer.

With these examples, it is evident that the threat of exotic diseases gaining entry is very real. Since the cost/benefit ratio for keeping exotic disease out of the United States is 1/120, it is imperative that we be aware worldwide of the existence as well as the known endemic areas for each foreign animal disease of interest.

By maintaining a close liaison with the agricultural officials of each foreign country and our agricultural attaches in each U.S. embassy, we are able to closely monitor the spread of animal disease and any changes in their characteristics. For example, in the past, classic ASF has been noted for its high morbidity (90-100 percent) and mortality 90-100 percent). However, in the Dominican Republic, it seems to have a high morbidity (90-100 percent) with a much lower mortality (20-60 percent). This type of information is of value in maintaining proper surveillance for and preparedness for a possible disease outbreak.

In addition, all animals and birds presented for importation are closely screened, qualifying only after satisfying rigid test and quarantine requirements. All foreign travelers arriving at U.S. ports of entry are checked for possible contraband, including meat, meat products, dairy and dairy products, as well as smuggled birds.

Since ASF seems to pose a specific threat at this time, all swine samples submitted to the National Veterinary Services Laboratories (NVSL), Ames, Iowa, are now routinely screened for ASF. Also, additional technicians have been assigned to Puerto Rico (only 100 miles from the Dominican Republic) and to New Jersey and New England (areas noted for their garbage feeding operations). They are monitoring the local swine herds for possible signs of exotic diseases and specifically ASF.

Should an exotic disease gain entry, early detection and diagnosis is important in preventing further spread. All suspicious foreign animal disease cases reported by practitioners, meat packing plants, county agents, farmers, etc., are immediately investigated by one of over 200 veterinarians specifically trained in the differential diagnosis of foreign animal diseases. If he or she should tentatively diagnose a foreign animal disease, laboratory samples are collected and sent to the Plum Island Animal Disease Center (PIADC) for confirmation. PIADC is a biologically secure laboratory located off the Northeastern portion of Long Island, specifically established for working with exotic diseases.

**When a foreign animal disease is diagnosed within the United States, the U.S. Secretary of Agriculture immediately declares an emergency, the affected area is**

**quarantined, and the Regional Emergency Animal Disease Eradication Organization (READEO) is called into action. This organization is made up of local, State, Federal, and university type personnel who are trained in the READEO concept and are also knowledgeable in their respective areas of expertise. These individuals work daily at their own jobs throughout the country, and yet on a moment's notice travel to the scene of the outbreak and within 24 hours are functioning productively as part of the READEO team.**

The administrative personnel arrive promptly and procure office space, telephone communication systems, furniture, and office equipment. They coordinate personnel actions, maintain the vehicles, and of course see that the pay checks arrive on time. In addition, they serve as a source of supply, serving the needs of the eradication effort.

The diagnosticians (veterinarians trained in the differential diagnosis of foreign animal diseases) are usually already on the scene. They survey the area on a daily basis and assist the epidemiologists in tracing the spread and determining the source of infection. Trained technicians assist them in surveillance activities including the taking of routine surveillance samples and are usually overwhelmed during the initial stages of an outbreak. It is, therefore, most reassuring to know that the military (Department of Defense) is willing and able to supply our manpower needs on a moment's notice. All they have to do is issue the order with a reporting date and the manpower will be there. Their veterinary corps also assists in providing specialists such as trained veterinary pathologists as needed.

When herds or flocks are diagnosed positive for foreign animal diseases for which there is no known cure, they are appraised by trained appraisers who work with the owner in reaching a final agreement on the value of the animals to be destroyed before the depopulation and disposal teams arrive on the scene. After all parties are in agreement, the animals are depopulated humanely and are disposed of by burial, on the premises, or rendering. Shortly thereafter, the cleaning and disinfecting team arrives. It should be emphasized that this may be one of the most important sections in maintaining biosecurity. They seek out filth and thoroughly clean and disinfect all areas considered to be contaminated.

Depending on the disease, the READEO may also have individuals working on vaccination, vector control, regulation enforcement, etc.

Finally, there is a staff support section which is delegated the responsibility of assuring that the READEO team is functioning properly. This section serves in an advisory capacity and includes epidemiologists, laboratory support officers, economics, and environmental officers. Also, in order to maintain the proficiency of all the members of the READEO team, a training officer is assigned to this section. He provides orientation for the new recruits and periodically reviews the training needs of the seasoned team members to maintain his or her competency. At present, there is a READEO team on standby in each of the five regions as established by Veterinary Services of the United States

Department of Agriculture. Each of these READEO's is under the direction of a veterinarian from the Veterinary Services Regional Director's office. He is assisted by State veterinarians representing the specific States affected and/or under quarantine.

The Director maintains a close liaison with the military, legal staff, Meat and Poultry Inspection personnel, information specialists, and wildlife specialists. He also works closely with a disease specialist, who is considered to be an authority on that specific disease problem.

Each foreign animal disease outbreak presents its own unique problems:

1. How do we control milk and/or assure it is safe?
2. How do we control meat and/or assure it is safe?
3. What role does wildlife play in the scenario?
4. If vaccination is indicated, how do we distribute and monitor administration?

All of these problems are being discussed with the affected industries. Based on these discussions, the eradication procedures and policies are being updated with the hope of developing a workable plan which will eradicate the disease agent and yet let business go on as usual as much as possible.

In addition, we are looking for alternatives to the policy of diagnose and slaughter. For example, in a FMD campaign, one might consider the use of vaccine. It is for this reason that USDA has decided to purchase 2 million doses each of Types A, O, and C from Bayer laboratories in Cologne, Germany, and has asked them to stockpile it as an antigen for possible future use during a FMD outbreak.

**When will the next foreign animal disease strike? We do not know. With the rapid transportation systems available today, it is only a matter of time. But, we do know that with the help of every veterinarian, animal health official, and the livestock industry, we will be prepared.**

# Foot-and-Mouth Disease in Cattle— Some Relationships Between Pathogenesis and Epizootiology

**J. J. Callis, D.V.M.**  
*Plum Island Animal Disease Center  
 Northeastern Region, Agricultural Research Service  
 USDA, Greenport, NY 11944.*

## Definition

Foot-and-mouth disease (FMD) is one of the most infectious of all of the animal diseases. It is viral in origin and occurs principally in cattle, swine, sheep, goats, and other cloven-footed animals, domesticated and wild. It was first described in Italy in 1546. The causative agent was isolated and determined to be a virus which was later shown to be approximately 23 millimicrons in diameter. Its high infectivity in several species; ability of the virus to spread rapidly; its widespread distribution; and its plurality of serotypes, are some of the characteristics which made FMD difficult to control.<sup>1</sup>

## Geographic Distribution

It occurs in all of the large land masses of the world with the exception of North America, Central America, Panama, Australia, and New Zealand. It has not occurred in North America since 1953 when it was eradicated in Mexico. It last occurred in Canada in 1952, in the United States in 1929, and in Australia in 1872 (ref. 1).

## Economic Considerations

Wherever it has existed, it interferes with import and export trade in animals and animal products. Entry of products from enzootic areas into FMD free countries is either prohibited or so severely restricted that the price is affected. Because of the interference from FMD in world trade, the disease has on occasion been called a political disease; however, the problems which result from controlling FMD are real as well as political. Each new epizootic is widely publicized and often those responsible for its eradication are criticized. In spite of the fact that the disease has a long history, the public awareness of it and quarantine methods used by many countries, world-wide, effective control is in the distant future (ref. 1).

## Host Range

While natural infection is limited to cloven-footed animals, domestic and wild, experimentally the virus can be propagated in other species including dogs, cats, chickens, rats, mice, rabbits, and guinea pigs. The horse has never been