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Foot and Mouth Disease: A Threat to U.S. Agriculture

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Summary

An outbreak of foot-and-mouth disease (FMD) among livestock in the United Kingdom and parts of Europe that began in February 2001 has raised concerns about the United States' ability to prevent the disease from spreading to this country and readiness to eradicate it should an outbreak occur. This report describes the characteristics of the FMD virus and disease, the current measures the U.S. Department of Agriculture (USDA) is taking to prevent its importation, and the authorities USDA has to act to eradicate an outbreak. The FMD threat also raises issues concerning the adequacy of funding for disease exclusion and research, the availability of vaccines, and USDA's authority to move preemptively against a potential outbreak, among other things. This report will be updated as events warrant.

Introduction

The current foot-and-mouth disease[1] (FMD) crisis in Europe began in February 2001 when a veterinarian in northwestern England diagnosed the disease in several animals at a hog slaughtering operation. In the few weeks following the first diagnosis, more than one million sheep, cattle, and swine – infected, exposed, or living in close proximity to infection sites – have been killed and buried or burned. It is suspected that the disease organism – a highly contagious virus – entered England on illegally imported meat from Asia or the Middle East, where recent FMD outbreaks have occurred, and that scraps of the infected meat was used in hog feed. FMD now has been detected in France, the Netherlands, and Ireland. Most major trading countries, including the United States, have banned meat and meat product imports from the European Union (EU).

The last FMD outbreak in England occurred in 1967, when 442,000 animals had to be slaughtered. Early estimates suggest that the current outbreak could cost the British economy in excess of $10 billion in control measures, farmer compensation, lost trade, and drop in tourism. Many are concerned that the timing of this outbreak, in the wake of the

[1] Also known popularly as "hoof and mouth" disease.

European Union's "mad cow" disease (BSE) crisis, could be disastrous to the recuperating livestock industry.[2]

Foot-and-mouth disease affects cloven-hooved animals like cattle, swine, sheep, goats, elk, and deer. The virus causes blister-like sores around the hooves and mouth, loss of appetite, fever and lethargy. FMD is rarely fatal in adult animals, but it causes serious production losses and animals may continue to harbor the virus, causing further outbreaks. The disease spreads not only through physical contact between animals, people, or materials, but also by wind. The virus generally does not affect humans. The FMD virus exists worldwide. There are seven strains or serotypes of the virus, each with many subtypes. Serotype "O" is responsible for the outbreak in the United Kingdom and is related to an ongoing Asian FMD outbreak that started in Taiwan in 1997 (then an important pork exporter), later spreading to Korea and Japan in 2000. Other outbreaks currently are underway in Argentina, South Africa, Colombia, and the Middle East.

The United States has faced FMD nine times since 1870. Each time the disease was eradicated with strict slaughter and quarantine control procedures. The most serious outbreak started in Michigan in 1914 and spread to 22 states after it gained entry to the Chicago stockyards. Between 1914 and 1915, over 172,000 cattle, sheep, and swine were slaughtered. In 1924, an outbreak in California resulted in the slaughter of 109,000 farm animals and 22,000 deer. The last FMD outbreak occurred near Montebello, California, in 1929. Infected hogs contracted the disease after being fed swill with meat scraps from a tourist steamship coming from Argentina. Five herds were slaughtered (3,600 animals) and the outbreak was controlled within one month.

Economic and Trade Impacts

Livestock production is the single largest segment of U.S. agriculture with a herd of close 100 million cattle, 60 million hogs and pigs, and 7 million sheep. Domestic U.S. meat and dairy sales surpassed $70 billion in 2000.[3] Meat and dairy exports also represent a sizable portion of U.S. agricultural output. In 2000, the United States sold $2.9 billion in beef and veal, $2.1 billion in livestock, $1.2 billion in fresh or frozen pork, and $1 billion in dairy products to trading partners. Four countries buy 95% of U.S. beef exports. Japan is the principal buyer ($1.1 billion), followed by Mexico ($533 million), Korea ($398 million), and Canada ($253 million). Similarly, Japan ($588 million), Mexico ($302 million) and Canada ($138 million) are our largest pork customers.

Trade analysts suggest that although it is too early to produce reliable estimates, U.S. livestock producers could see increased sales of animals and meat to Japan, Mexico, Korea and Canada since these countries have closed their doors to livestock and meat products from Europe and Argentina. On the other hand, other segments of U.S. agriculture, such as animal feed and soy meal producers could lose sales in Europe if widespread herd depopulation shrinks demand.

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[2] Unlike FMD, "mad cow" disease or bovine spongiform encephalopathy (BSE) is difficult to contract, very slow-acting, and fatal to cattle. For additional information about mad cow disease see CRS Report RS20839, *Mad Cow Disease: Agriculture Issues.*

[3] Milk and dairy products, together with saliva, urine and semen, are known sources of contagion.

If a FMD outbreak occurred in the United States other agricultural sectors related to livestock and dairy would likely feel the impact. For example, according to livestock industry officials, every other bushel of U.S. grain goes to animal feed. A significant drop in demand for feed (caused by extensive cattle and swine herd depopulation) could further depress grain prices, now at historically low levels. Likewise, agricultural input industries (e.g., animal health, pharmaceuticals) and marketing and distribution segments (e.g., stockyards, packers, distributors, and retailers) could be negatively impacted by FMD. Conversely, alternative sources of animal protein, such as poultry and farm-raised fish, could potentially benefit from low feed prices and increased consumer demand.

Current Prevention Measures in the United States

Import bans. The lesson from past outbreaks of FMD in the United States is that the most economical way to deal with the virus is to prevent it from entering the country. As a first step, the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) imposes a ban on livestock and meat product imports from any country with an active FMD outbreak. Also, APHIS inspectors at U.S. ports of entry check incoming airline and ship passengers, baggage and cargo, and confiscate and destroy illegal agricultural and food products. APHIS has placed 450 diagnosticians of foreign animal diseases on alert to investigate potential cases, in coordination with state officials.

APHIS cooperates with animal health officials in Canada and Mexico to prevent FMD importation and movement throughout North America and to coordinate mechanisms for a speedy response to a potential outbreak (the three nations conducted an FMD simulation exercise in November 2000). Agency officials interviewed placed great value in experience gained during these intensive simulated exercises, because it allowed them to identify weaknesses as well as strengths in the current system.

Information Efforts. APHIS also has mounted a large public information campaign to re-educate the public and farmers since FMD has not been seen in the United States since 1929. APHIS is encouraging livestock owners and private veterinary practitioners to report any unusual animal health symptoms to their local agricultural officials. In addition, the agency has distributed FMD posters in ports and airports and started a media campaign in key livestock producing areas. There is an information hotline (800-601-9327) and website (www.aphis.usda.gov/oa/fmd/index.html).

Feed regulation. The 1929 California and current U.K. outbreaks began with hogs that were fed food waste (garbage) containing scraps of FMD-infected meat. Hogs are the only livestock whose rations may include food waste. The majority of U.S. hogs are raised in large controlled environments and fed a precise diet of grains, oilseeds and nutritional supplements. Smaller hog operations, or those located near significant sources of garbage (i.e., tourist attractions) are more likely to use garbage as feed. APHIS requires hog producers wanting to use food waste in hog rations to be licensed and to cook the waste to kill disease organisms. Because the practice is small-scale and local, APHIS has delegated enforcement to the states. APHIS regulations indicate that currently 33 states and Puerto Rico permit feeding edible waste to hogs, and 17 states prohibit it.[4]

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[4] Alabama, Delaware, Georgia, Idaho, Illinois, Indiana, Iowa, Louisiana, Mississippi, Nebraska,
(continued...)

Vaccination. U.S. livestock currently are not vaccinated preemptively to protect against a potential outbreak, because of several drawbacks associated with that approach. Current FMD vaccines are costly and must be re-administered every 4 to 6 months. Second, like the human influenza virus, it is difficult to know in advance exactly which strain of the FMD virus might be responsible for the next outbreak and, therefore, to be sure that the vaccine being administered will be effective. Third, current vaccines may contain incompletely inactivated virus particles that could become a source of infection.[5]

Finally, use of the vaccine poses significant disadvantages in international trade. Meat from vaccinated animals cannot be exported, and current testing technology cannot distinguish between animals and meat that have had the disease and those that have been vaccinated. The internationally agreed-upon criterion for acquiring "FMD-free" status for a *non-vaccinating* country is a wait of 1 year after the last clinical case, while a *vaccinating* country must wait 2 years before it can be declared FMD-free.[6] USDA Research on an FMD vaccine may resolve some of these problems. Agricultural Research Service (ARS) scientists at USDA's Plum Island Animal Disease Center, in collaboration with APHIS, are developing a vaccine that would be effective against several strains of virus and that would not itself pose an infection threat. In addition, ARS scientists report progress on developing a diagnostic test that could differentiate between vaccinated and infected animals.

Not all observers agree that the factors just mentioned justify the absence of a preemptive livestock vaccination program. Some argue that following a "no-vaccination" policy in order to maintain FMD-free country status is high risk because it maintains a permanently vulnerable animal population. Today's frequent and rapid global travel of both animals and people, proponents argue, means that an infection in one country can be passed quickly to another. In addition, the cost of preventive vaccinations in the long run could be smaller to a country than the destruction of livestock required once an outbreak occurs. Finally, proponents of preemptive FMD vaccination maintain that it would eliminate the disease as a bioterrorism threat and protect ancillary industries like tourism, and that it would be the most effective policy for controlling and even eradicating the disease worldwide. Given the large number of hard-to-quantify factors involved, observers on both sides of the issue note that a cost-benefit analysis of a preemptive vaccination policy versus the current policy of guarding against importation of the FMD virus and stamping out outbreaks with herd depopulation programs would be helpful but very difficult to develop.

U.S. Plans for Controlling an Outbreak

In the event of an FMD finding, the U.S. Secretary of Agriculture has broad authority to take the steps necessary to eradicate the disease. The Secretary currently is exercising her

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[4] (...continued)
New York, North Dakota, South Carolina, South Dakota, Tennessee, Virginia, and Wisconsin prohibit feeding garbage to swine (9 CFR §166.15).

[5] Vaccine stocks are limited by law in most countries, including the United States. 21 USC §113a prohibits the possession of FMD virus in any part the United States, except at the USDA Plum Island Animal Disease Center in New York. In practice, this ban also includes inactivated forms of the virus, such as antigens, which are used in vaccine production.

[6] Food and Agriculture Organization. Animal Health Code 2000, Articles 2.1.1.2 and 2.1.1.3.

authority to stop importation of animals and animal products from FMD countries (21 USC §§101 and 111). If an outbreak is found she is authorized, among other things, to:

- Stop U.S. animal exports (21 USC §113) and interstate transport of diseased animals (21 USC §115);
- Issue quarantines on any state or territory (21 USC §123);
- Seize and dispose of infected livestock and prevent dissemination of the disease (21 USC §134a);
- Declare an extraordinary emergency on confirmation of an FMD diagnosis (21USC §134a);
- Compensate owners for the fair market value of animals destroyed by the Secretary's orders (21 USC §134a(d); and
- Transfer the necessary funding from USDA's Commodity Credit Corporation to cover costs related to eradication, tracing, and quarantine operations (7 USC §147b) (e.g., inspection and testing, slaughter, facility and personnel disinfection, quarantine enforcement, and producer indemnification).[7]

Day-to-day decisions on the best course of action for controlling an outbreak would be made using a "decision tree" that includes factors such as geographical spread, rates of infestation, available veterinary and field personnel, public sentiment, and industry cooperation.

Potential Issues

Increased funding for exclusion, diagnosis and research. According to APHIS officials, the funding mechanisms exist to respond initially to an FMD outbreak by using existing appropriated and emergency Commodity Credit Corporation funds. They admit, however, that the agency's resources could be stretched depending upon the severity of the crisis. FY2001 APHIS appropriations for FMD exclusion are $3.8 million plus general funding from user fees paid for authorized APHIS inspections at U.S. ports of entry. FY2001 appropriations for renovating and refurbishing Agricultural Research Service buildings and facilities at USDA's National Animal Disease Center in Ames, Iowa were $9 million. Similar ARS appropriations for the Plum Island Animal Disease Center facility in FY2001 were $10.2 million ($7 million from ARS and $3.2 million from APHIS). At a Senate Agriculture Committee hearing on March 27, 2001, ARS officials and livestock industry representatives testified that both of these facilities are in need of major renovations and that more funding is necessary to speed cutting-edge advances in diagnostics and vaccine development.

Vaccine availability. Some scientists and animal health practitioners say that the 1948 law that banned the existence of live FMD virus in the United States hinders the future development of vaccines and disease diagnostic tools (Act of April 24, 1948; 62 Stat. 198). They state that advances in scientific technologies and the ability to construct secure containment facilities would significantly reduce the threat of having the virus available domestically. They also argue that dependence on limited foreign sources of FMD vaccine

[7] The costs for a vaccination program, if one were ordered as an emergency measure during an FMD outbreak, would be additional.

increases U.S. vulnerability in an emergency. On the other hand, some livestock industry representatives argue that the benefit of having even inactivated FMD antigens available domestically for quick vaccine production does not outweigh the risk of an outbreak from an accidental or deliberate release of this potentially infective material.

APHIS also contributes funds to the North American Vaccine Bank, an entity established in 1982 by an agreement among the United States, Mexico and Canada. The bank's location (outside the United States) is kept confidential. The bank keeps highly concentrated inactivated antigens that can be used to generate millions of doses of vaccine. An annual contractual obligation of close to $500,000 is shared proportionally according to each country's cattle population (10% Canada, 20% Mexico, and 70% U.S.). The current contract specifies that the bank would deliver 1 million doses of vaccine containing its current FMD antigen within 7 days of notification, an additional million after 14 days, and half a million after 21 days. A vaccine for that strain would require 5-6 weeks to produce, according to officials.

New authorities. Some policymakers are in favor of giving USDA additional authority to deal with a potential FMD outbreak in the United States. Currently, the Secretary can impose a state quarantine under extraordinary emergency conditions only after confirmation of a disease. Proponents argue that the Secretary should be able to act when there is a *likelihood* of infection or exposure. They also support new authorities to preempt state laws for livestock inspections in interstate commerce and allowing for uniform enforcement of all federal quarantines.[8] Finally, some policymakers support an increase in the civil penalties that can be imposed for importing prohibited animal products. Violators currently may be fined a maximum of $1,000 per infraction. A provision to raise the minimum fine to $250,000 per violation was part of major legislation to consolidate and reform all of APHIS's animal protection programs that Representatives Peterson and Pombo introduced in June 2000 (H.R. 4801). H.R. 4801 also would have given the Secretary the additional authorities mentioned above, among other things. The bill was referred to the House Agriculture and Judiciary Committees, but was not acted upon during the 106th Congress.

Legislation

The Animal Disease Risk Assessment, Prevention, and Control Act of 2001 (S.700) passed the Senate, with one amendment, by unanimous consent on April 4, 2001. The bill would establish a Federal interagency task force for the coordination of actions to prevent the outbreak of bovine spongiform encephalopathy (commonly known as "mad cow disease") and foot-and-mouth disease in the United States.

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[8] Virginia and Colorado have banned the entry of equines from FMD-infected countries. Alabama has placed a moratorium on the importation of used agricultural equipment, and South Dakota has placed restrictions on farm visits in that state by people who are traveling from FMD countries.