White Paper

Foot-and-Mouth Disease — Fostering a New Preparedness Paradigm: Facilitating a Conversation Among Public and Private Sector Stakeholders

Information synthesized from April 17-18, 2013, Foot-and-Mouth Disease Symposium in Louisville, Ky: "Fostering a New Preparedness Paradigm: Facilitating a Conversation Among Public and Private Sector Stakeholders"

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INTRODUCTION

The U.S. food animal industry has changed significantly in size, structure, efficiency and extent of movement since the last U.S. outbreak of foot-and-mouth disease (FMD) in 1929. The goal of the symposium **"**Fostering a New Preparedness Paradigm: Facilitating a Conversation Among Public and Private Sector Stakeholders" was to enhance preparedness for FMD across food animal production sectors by bringing together industry stakeholders representing the entire supply chain as well as regulatory agency stakeholders, academicians and policymakers. By engaging this broad range of stakeholders, the symposium facilitated the exchange of information and identification of next steps that can help foster scientific innovation, industry engagement and consumer confidence.

The FMD Symposium "Fostering a New Preparedness Paradigm: Facilitating a Conversation Among Public and Private Sector Stakeholders" was developed by the National Institute for Animal Agriculture (NIAA) and conducted April 17-18 in Louisville, Ky., at the conclusion of NIAA's Annual Conference. More than 130 individuals registered for the Symposium, including producers, producer organization leaders, production veterinarians, researchers, regulatory and diagnostic laboratory veterinarians and allied business representatives.

NIAA is a non-profit, membership-driven organization that unites and advances animal agriculture: the aquaculture, beef, dairy, equine, goat, poultry, sheep and swine industries. NIAA is dedicated to furthering programs working toward the eradication of diseases that pose risk to the health of animals, wildlife and humans; promote the efficient production of a safe and wholesome food supply for our nation and abroad; and promote best practices in environmental stewardship, animal health and well-being.

BACKGROUND ON FMD

Foot-and-mouth disease (FMD) is a severe, highly contagious viral disease that affects cattle, swine, sheep, goats, deer and other cloven-hoofed ruminants. It does not affect horses, dogs or cats.[1]

FMD is not a public health or food safety threat. It is also not related to hand, foot and mouth disease, a common childhood illness, which is caused by a different virus.[2] FMD should not be confused with bovine spongiform encephalopathy (BSE), which is commonly known as "mad cow disease."[3]

Pasteurization of milk effectively eliminates the virus. Strict quality control programs and regular government inspections assure that proper pasteurization procedures are in place and are being followed.[4]

Classical signs of FMD include a fever and blisters on the tongue and lips, in and around the mouth, on the teats of the udder and between the hooves. These blisters, called vesicles, rupture and upper layers of skin are sloughed off leaving erosions or open sores. Extreme pain and discomfort from the vesicles and erosions lead to other symptoms such as depression, anorexia, excessive salivation, lameness and reluctance to move or stand. While most affected adult animals will not die from FMD, the disease causes significant animal discomfort and leaves animals weakened and unable to produce meat and milk the way they did before. It can also result in very high death rates in young stock.[5]

FMD can be transmitted in many ways, including direct contact between infected and susceptible animals; indirect transmission via contact between susceptible animals and contaminated products or inanimate objects including hands, clothing, footwear, equipment and vehicles; via swill feeding of pigs and milk feeding of calves; via windborne spread; and via artificial breeding. The major route of infection in ruminants is the respiratory system, and extremely small doses of virus can initiate infection.[6]

Domestic pigs—which are easily infected via contaminated feed materials—are important amplifying hosts due to their capacity to excrete large quantities of virus in their exhaled breath (about 3,000 times as much as cattle). Cattle are good indicator hosts as they are extremely sensitive to infection by the respiratory route and typically develop severe, classical clinical signs of infection. Sheep are maintenance hosts as infection with some virus strains can spread through flocks with little overt sign of disease.[7]

In addition to direct transmission between and among domestic animals, limited spread of FMD can occur between domestic animals and wildlife such as feral swine and deer.[8] Continued cross-over of FMD virus between domestic and wildlife populations may prolong virus circulation. However, the wildlife population is not able to maintain FMD in the absence of FMD virus infection in the domestic host population.[9] The extent of the role of wildlife in prolonging an outbreak in domestic animals is in question.[10]

Excretion of the FMD virus can begin up to four days before clinical disease becomes apparent. Most excretion of the virus ceases four to six days after the appearance of vesicles, when circulating

antibodies develop.[11] While the FMD virus can be killed with heat, low humidity or some disinfectants, the FMD virus can retain infectivity in the environment for 14 days in dry fecal material, six months in slurry in winter, 39 days in urine, 28 days on the surface of soil in autumn and three days on the surface of soil in summer.[12] Time, extreme temperatures and pH outside the range of 6 to 9 will inactivate—kill—the virus.[13]

FMD causes production losses and emotional and financial hardships for farmers and ranchers and has serious impacts on livestock trade. A single detection of FMD will slow or even completely stop local, regional, national and international trade. Since the disease spreads widely and rapidly and has grave economic and animal health consequences, FMD is among the animal diseases that livestock owners dread most.[14]

Applying the National Interstate Economic Model (NIEMO), the total economic impacts across the United States is estimated at $23 billion to $34 billion. The overwhelming sources of the losses are due to domestic and international demand cuts.[15]

North America has been free of FMD for more than 50 years.[16] The last case of FMD in the United States occurred in 1929 while the last case of FMD in Canada was in 1952 and the last case of FMD in Mexico was in 1954. However, FMD is widespread around the world, and is considered endemic in Africa, Asia, the Middle East and some South American countries.[17]

Numerous outbreaks of FMD have occurred in countries that were previously FMD free. Some of the most notable include Taiwan, 1997; Japan, 2010; Korea, 2000 and 2002; South Korea, 2010-11; Uruguay, 2001; Paraguay, 2011; Argentina, 2000, 2001 and 2006; and United Kingdom, 2001 and 2007. The OIE, the World Organization for Animal Health, has also received multiple reports of FMD in China.[18]

The United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS) vigilantly and continuously monitors for FMD in the United States and worldwide. APHIS also works with U.S. Customs and Border Protection to screen for products that could carry the FMD virus at U.S. ports of entry. Additionally, the USDA prohibits the importation of susceptible animals and animal products from FMD-affected countries.[19]

In addition numerous farms and agribusinesses such as feedyards and packing and processing plants screen visitors to ensure those who have recently visited specific countries where FMD is active do not visit their facilities until a specific number of days have elapsed.

Despite these measures, the U.S. agricultural sector is highly vulnerable to the accidental introduction of FMD or bioterrorism attacks that use FMD pathogens. As such, it is vital that U.S. animal agriculture have a working plan in place and be prepared to act immediately and confidently should an incident of FMD occur in North America.

PURPOSE, DESIGN OF SYMPOSIUM

At this point in time, the U.S. food animal industry is FMD-free and, as such, has FMD-free status that is extremely vital to maintaining international trading partners. With the FMD virus in foreign countries, FMD is considered an ever-present threat as the United States has immunologically naïve populations of animals.[20]

To manage the risk and have an effective emergency management plan in place ready to activate requires cooperation among all levels of government, the private sector and the community. Other response agencies include health and conservation departments, local government, police, emergency services and volunteer organizations.

Should an incursion occur, government and industry's state of preparedness determines whether FMD can be contained and controlled as quickly as possible. The highest priority is to safeguard a secure food supply for the nation and the world by ensuring business continuity for food animal producers and all associated industries.

To address the challenge of controlling an outbreak of a highly contagious animal disease such as FMD in the context of consolidation and extensive movement of animals and products inherent in modern food agriculture, many changes have been made to enhance U.S. preparedness. Some individuals outside of State and Federal animal health circles fear the United States will repeat the mistakes of the United Kingdom when dealing with FMD in 2001. However, U.S. response policy allows for vaccination and is proceeding to develop secure movement plans to more effectively contain disease without unnecessarily harming the affected livestock sectors. The FMD Symposium was developed to help all stakeholders better understand the current state of response plans and policies and what still needs to be addressed.

Symposium Steering Committee Co-Chairs:

Dr. Julie Smith, Extension Dairy Specialist, Assistant Professor, Department of Animal Science, University of Vermont

Dr. Annette Jones, California State Veterinarian, Director of Animal Health and Food Safety Services, California Department of Food and Agriculture

Steering Committee Members:

Dr. Pam Hullinger, Associate Clinical Professor, Department of Medicine and Epidemiology, University of California-Davis

Dr. Matt Cochran, Assistant Executive Director of Administration, Texas Animal Health Commission

Dr. Mike Sanderson, Professor, Production Medicine, School of Veterinary Medicine, Kansas State University

FMD Cross-Species Crisis Communication Team

The steering committee engaged with additional representatives from academia, producer organizations and allied industry as well as staff of the National Center for Animal Health Emergency Management with USDA APHIS Veterinary Services during the process of planning the symposium.

SYMPOSIUM TOPICS AND SPEAKERS

"FMD, Animal Agriculture and Public Opinion" – Dr. Sebastian E. Heath, Branch Chief for Program Development, *Federal Emergency Management Agency*

"Response and Recovery Challenges Faced in FMD Outbreaks in Other Countries: Take Home Lessons for the U.S." – Dr. Pam Hullinger*,* Associate Clinical Professor, *Department of Medicine and Epidemiology, University of California-Davis*

"Government Preparedness Role and Response Framework: Where Animal Health Authority Leaves Off and Private Sector Agency Begins" – Dr. Jon Zack, Director*,* Preparedness and Incident Coordination Staff, *USDA APHIS VS*

"Industry Perspectives on FMD Preparedness: Why Invest Now?" – Mr. Charles Ahlem, Co-founding Owner, *Hilmar Cheese*

"Overview of Current FMD Countermeasures" – Dr. Jon Zack, Director*,* Preparedness and Incident Coordination Staff*, USDA APHIS VS*

"Diagnostic Technology Update: Strategic Development and Deployment" – Dr. Sarah Tomlinson, Associate National Animal Health Laboratory Network Coordinator, *USDA APHIS VS*

"Crisis Communications Update: Messages and Channels" – Ms. Stacey Stevens, Vice President of Media & Industry Affairs, *Dairy Management Inc./National Dairy Council*

"Foot-and-Mouth Disease Preparedness and Response: A Wicked Problem" – Dr. Gay Miller, Professor of Epidemiology and Preventive Medicine, and Adjunct Professor, Agricultural and Consumer Economics, *University of Illinois*

"Outbreak Terminology: Definitions of Phases, Zones and Premises" – Dr. Patrick Webb*,* Director of Swine Programs, *National Pork Board*

"Permitting and Movement Control: Progress and Challenges" – Dr. Annette Jones, California State Veterinarian, Director of Animal Health and Food Safety Services, *California Department of Food and Agriculture*

Additional FMD Presentations Given at National Institute for Animal Agriculture Committee and Council Meetings, April 16-17, 2013, and Included in This White Paper

"Animal Welfare during a Disease Outbreak" – Dr. Patrick Webb*,* Director of Swine Programs, *National Pork Board*

"Feral Swine and Foreign and Emerging Animal Diseases"—Dr. Lindsey Holmstrom, Diagnostic Epidemiologist, *Center for Foreign Animal and Zoonotic Center*

"Foot-and-Mouth Disease: A Looming Threat for U.S. Cattle Producers" – Dr. Gay Miller, Professor of Epidemiology and Preventive Medicine, and Adjunct Professor, Agricultural and Consumer Economics, *University of Illinois*

"Outbreak Response from a Packer's Perspective" – Dr. Lily Edwards-Callaway, Technical Services, Animal Welfare, *JBS USA LLC*

PRESENTATION HIGHLIGHTS

Economic Impact of FMD Outbreak

Foot-and-mouth disease (FMD) is often referred to as an economic disease because of the magnitude of economic harm it can cause to food-animal producers and to surrounding communities.[21] Regardless of the size of the outbreak, an FMD outbreak could impact international trade, reduce commodity prices and disrupt interstate commerce.[22]

In 2008, a modeling study showed that an FMD outbreak in the U.S. Midwest could have an economic impact of $2.8 billion to $4.1 billion: $1.95 billion to $3.08 billion to beef packing/processing and beef cattle sectors and $1.65 billion to $2.36 billion to pork and swine sectors.[23]

A California study modeled the epidemic and economic impacts of delayed detection of FMD in a dairy herd with more than 2,000 cows, with disease spread limited to California. Employing several scenarios—number of quarantined herds from 680 to 6,200 and animals depopulated from 8,700 to 260,400, the median economic impact of an FMD outbreak in California was estimated to result in national indirect economic losses to agriculture of $2.3 billion to $69.0 billion as detection delay increased from 7 to 22 days. Assuming a detection delay of 21 days, it was estimated that, for every additional hour of delay, the impact would be an additional approximately 2,000 animals slaughtered and an additional economic loss of $565 million.[24]

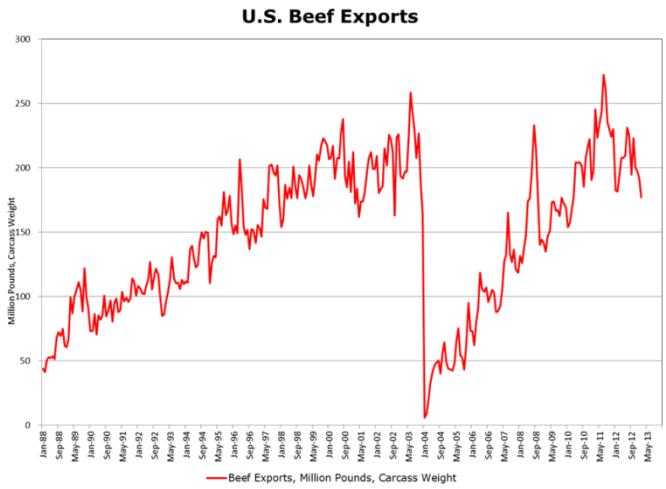
A study that simulated an outbreak of FMD on 60 farms in a single rural county in Kansas using real economic data showed the following economic impact should the disease occur:[25]

- Operational costs of $1.4 million/week, affecting 750 personnel
- Local impact of $6.4 million/week to Gross County Product and the loss of 752 food manufacturing jobs, 1,466 retail jobs, 1,128 hospitality jobs and 1,203 health and social services jobs. Stop movement of animals was estimated to cost more than $700,000 in lost revenue to producers and owners of non-susceptible species.

If the FMD virus was introduced into large feedyards in the 14-county region of southwest Kansas and 1.2 million cattle had to be destroyed, 987.2 million pounds of beef would be lost to consumers.[26]

The Center for Agricultural and Rural Development Food and Agricultural Policy Research Institute (CARD FAPRI) model estimates total losses of revenue over 10 years to be $57 billion, pork; $71 billion, beef; $1 billion, poultry; $44 billion, corn; $25 billion, soybeans; and $1.8 billion, wheat. Estimated revenue losses to pork and beef industries alone were pinpointed at $12.9 billion per year, which equates to a loss of 58,000 full-time jobs.[27]

It took close to eight years for U.S. beef exports to recover after the discovery of a cow with another economically important disease—BSE—in December 2003.[28]



Four types of costs associated with an FMD outbreak include:[29]

1. Transaction costs – These are the direct or additional costs of doing business in an outbreak, such as federal compensation for culled animals and interest on loans for recovery. In the United Kingdom outbreak, direct costs totaled approximately $2.4 billion.
2. Lost revenue – These are indirect costs such as revenue not earned on depopulated herds, effects of quarantines on livestock species not affected by FMD and non-agricultural impacts such as loss of tourism.
3. Marginal costs – These are the costs associated with proving disease status. For example, following an outbreak, new production costs kick in for producers and the industry overall. These could include disease investigation, new requirements to test for and eliminate the disease, etc. Marginal costs can be quite significant and perhaps the largest cost.
4. Opportunity costs – These are the costs of choosing one option over another. The question arises "What else could have been done with the same resources?"

While immediate loss would be related to costs of operations and personal loss, longer-term loss related to restructuring of the industry and changing priorities for rural areas would have much larger impact. Research findings underpin how critical it is that the United States has an effective early detection system and a response plan in place before an introduction of the FMD virus.

Lessons Learned

The United States has had nine outbreaks of FMD. The most recent outbreak was in 1929, with the largest outbreak occurring in 1914. The 1914 outbreak started at the Chicago Stockyards, was spread through a national dairy show and made its way across the country, infecting 3,500 herds with 172,720 animals in more than 22 states. Business at the Chicago Stockyards, a large livestock market at the time, ceased as the facility was closed for seven months.

An FMD outbreak in Taiwan in 1997 impacted more than 4 million hogs on 6,147 farms. Delayed diagnosis allowed the disease to spread, with 38 percent of Taiwan's swine population ultimately depopulated. Taiwan turned to vaccine to control the spread of the disease, and vaccine could play a major role in the United States should an FMD outbreak occur.

In 2001, FMD struck the United Kingdom resulting in animals on more than 10,000 farms being depopulated and "human costs that can't be measured."[30] It is believed that action the United Kingdom took depopulating neighboring farms was an over-reaction, as the country had an animal identification and premises identification in place which significantly assisted the country's response. The United States' lack of a robust animal identification system could hinder response time.

Simultaneously to the outbreak in the United Kingdom, Uruguay experienced an outbreak. Uruguay had been free from FMD without vaccination and had controlled a small outbreak in 2000. A "vaccination to live" program was implemented during the dairy-intense 2001 outbreak on Day 7 at which point there were 131 infected farms. The country depopulated only 7,000 cattle total and did not dispose of any milk. Milk pickup from infected farms and non-infected farms was handled separately.

South Korea's 2011 outbreak received significant negative attention as it was poorly managed. Swine were not properly euthanized and live animals were sometimes buried. Approximately one-third of South Korea's swine herd was culled (3.4 million pigs), leading to a 43 percent increase in wholesale pork prices. In addition, 151,000 cattle had to be culled. South Korea's quarantine collapsed and failed due to cold weather conditions, delay of obtaining vaccines and the spreading of disease by trucks and other vehicles.

Additional lessons the United States can learn from these outbreaks and outbreaks that have occurred during the past three years in Japan, Bulgaria, Turkey, Israel and Egypt include:

- Early recognition, reporting and detection are keys to controlling the outbreak.
- Effective biosecurity helps minimize the spread of the disease.
- When necessary, early implementation of vaccination is critical to success.
- The issues that can have the biggest impact should receive top priority.
- The United States must have the ability to scale up and quickly prepare large numbers of FMD vaccines.

The experiences of USDA-APHIS with foreign animal diseases underscore further lessons:

- State-Federal-Tribal-industry planning should respect local knowledge.
- Unified Command goals should be clearly defined and attainable.
- Action should be taken quickly and with certainty.
- Science- and risk-based approaches should be employed.
- Guidelines, strategies and procedures need to be communicated and understood by responders and stakeholders.

- Early detection and rapid tracing are essential for the effective and timely control of an outbreak.
- High expectations for successful outcomes may require the rapid scale-up of resources and trained personnel.
- Communication is vital.

Types of FMD Outbreaks, FMD Response

U.S. livestock industries have changed dramatically, as has technology, since the last U.S. FMD outbreak in 1929. As such, the United States must be prepared to respond in new ways.[31]

It is important to identify systemic problems that could become an animal welfare crisis in a disaster.[32] It is also imperative that the United States not have a response to an outbreak that is more harmful than the disease.[33] A highly informative and useful planning resource for FMD is the "Foot-and-Mouth Disease Response Plan: The Red Book" developed by, and available from, USDA APHIS Veterinary Services.

An FMD response to any size of outbreak in the United States has three goals: 1) to detect, control and contain FMD in animals as quickly as possible; 2) to eradicate FMD using strategies that seek to stabilize animal agriculture, the food supply and the economy and protect public health; and 3) to provide science- and risk-based approaches and systems to facilitate continuity of business for non-infected animals and non-contaminated animal products.[34]

The size of an FMD outbreak can vary in terms of number of animals involved, number of premises infected and the jurisdictions affected. Types of FMD outbreaks conceptually defined based on size of the outbreak include:[35]

- Type 1 - Outbreak limited to a small area or number of premises.
- Type 2 - Moderate regional outbreak.
- Type 3 - Large regional outbreak.
- Type 4 - Widespread or national FMD outbreak.
- Type 5 – Catastrophic U.S. outbreak.
- Type 6 – Catastrophic North American outbreak.

Of 24 outbreaks in non-endemic areas between 1992 and 2003, most outbreaks affected fewer than 150 premises. Four of the 24 outbreaks were considered extremely large, affecting more than 2,000 premises. In 11 of 24, fewer than five premises were affected. Disease spread by movements through markets was a critical factor in large outbreaks.[36]

With the United States sharing borders with Canada and Mexico, the United States' FMD response plan has a heightened alert phase that applies to an FMD outbreak in Canada or Mexico plus four additional phases should an outbreak occur in the United States:[37]

- Heightened Alert Phase—FMD outbreak in either Canada or Mexico but not in the United States.

- Phase 1—From confirmation of the first case of FMD in the United States until reasonable evidence to estimate outbreak extent.
- Phase 2—Surveillance and epidemiology provides timely evidence of outbreak extent to support decisions by Incident Command.
- Phase 3—Recovery: Surveillance and epidemiology indicates FMD is under control; plan implemented to recover disease-free status.
- Phase 4—United States declared free of FMD, possibly with vaccination.

Three key epidemiological principles form the foundation for any FMD response effort:[38]

- Prevent contact between FMD virus and susceptible animals.
- Stop the production of FMD virus in infected or exposed animals.
- Increase the disease resistance of susceptible animals to the FMD virus or reduce the shedding of FMD virus in infected or exposed animals.

Critical activities and tools for containing, controlling and eradicating FMD include:[39]

- Rapid diagnosis and reporting.
- Epidemiological investigation and tracing.
- Increased surveillance and diagnostic capacity.
- Swift imposition of effective quarantine and movement controls.
- Continuity of business measures for non-infected premises and non-contaminated animal products.
- Biosecurity measures for at-risk facilities.
- Cleaning and disinfection of contaminated premises.
- Effective and appropriate disposal procedures.
- Mass depopulation and euthanasia (as the response strategy indicates).
- Emergency vaccination (as the response strategy indicates).
- Information management.
- Communication and public awareness campaign.

When an FMD virus has been detected, recommended steps during the first 24 hours of an FMD outbreak include:[40]

- Initiate quarantine, hold orders, movement restrictions and standstill notices (e.g. 24-72 hours) for relevant zones and regions.
- Notify States, Tribes, industry, trading partners, media.
- Initiate biosecurity measures.
- Initiate tracing activities.
- Initiate virus identification for vaccine.
- Initiate Incident Command processes.

Steps to take at 24 to 48 hours post-outbreak:[41]

- Evaluate quarantine and movement controls.
- Ongoing surveillance and tracing activities.
- Initiate coordinated public awareness campaign.
- Ongoing biosecurity measures.
- Initiate continuity of business plans.
- Continue virus identification for vaccine.

Steps to take 48 to 72 hours after an FMD virus is detected:[42]

- Evaluate quarantine and movement controls.
- Continue ramping up Incident Command and Operations Center.
- Ongoing surveillance and tracing activities.
- Ongoing biosecurity activities.
- Ongoing public awareness campaign.
- Continue virus identification for vaccine.

The four response strategies dealing with an outbreak include:[43]

- Stamping-out—Depopulation of clinically affected and in-contact susceptible animals. This strategy is most appropriate if the outbreak is contained by a jurisdictional area or a region in which FMD can be readily contained and further dissemination of the virus is unlikely.[44]
- Stamping-out modified with emergency vaccination to slaughter—This strategy has two options: 1) delayed depopulation and disposal of vaccinated animals, or 2) slaughter of vaccinated animals, if animals are eligible for slaughter under USDA Food Safety and Inspection Service (FSIS) authority and rules and/or State and Tribal authority and rules. The goal is to suppress virus replication in high-risk susceptible animals by using emergency vaccination, then slaughtering vaccinates at a later date as determined by Incident Command and the Veterinary Services Deputy Administrator.[45] This strategy is highly likely depending on the type of FMD outbreak.[46]
- Stamping-out modified with emergency vaccination to live—Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, without subsequent slaughter of vaccinated animals. The goal is to protect susceptible animals from infection using emergency vaccination with the deliberate intent to maintain vaccinates for the duration of their usefulness.[47] This strategy is highly likely depending on the type of FMD outbreak.[48]
- Vaccination to live without stamping-out—Vaccination used without depopulation of infected animals or subsequent slaughter of vaccinated animals. The goal is to protect susceptible animals from infection using emergency vaccination with the deliberate intent to maintain vaccinates for the duration of their usefulness.[49] It is unlikely this strategy would be considered in a focal outbreak.[50]

No action may be considered a final strategy. With this strategy, FMD would take its course in the affected population. It is highly unlikely that this strategy would be implemented.

Employing a combination of stamping-out with emergency vaccination to slaughter and emergency vaccination live is highly likely depending on the type of FMD outbreak.[51]

Many factors would play a role in the selection of a response strategy, including resources available and known epidemiological information about the outbreak. No single factor will independently dictate a response strategy or whether an emergency vaccination strategy will be employed.[52] Attachment 1 lists factors influencing the decision to use emergency vaccination strategies.[53]

As the size of an outbreak increases, response shifts from emphasis on stamping-out to emphasis on alternative strategies. Nevertheless, even a focal FMD outbreak would require significant operational capabilities for the United States.[54]

While depopulation is known to cause significant economic losses and emotional distress to producers, depopulation may be necessary since FMD inhibits an animal's ability to eat in the short-term and permanently affects the health, productivity and overall well-being of infected animals. Further, the USDA may determine that the quickest, most-effective way to prevent more animals from being affected is to humanely euthanize livestock in targeted areas.[55]

The use of harvest facilities (slaughter plants) to support response efforts may be possible under some circumstances. Transporting animals out of a feeding facility or farm to the slaughter plant in a biosecure manner would need to be addressed.[56]

Public opinion can become a dominant driver of strategic choices in a crisis. Public opinion concerns that could impact the strategy or strategies chosen during an FMD outbreak include:[57]

- Environment
- Animal welfare, including vaccination, depopulation
- Food safety
- Economics
- Biotechnology

If public perception resulted in loss of consumer confidence for meat and dairy products, this would further deepen the economic consequences of an outbreak. Communication strategies and response options must take public opinion into account.

Quarantine, Restricting Movement

When an outbreak of FMD occurs, premises are assigned a designation that relates to disease status of animals and activities or controls associated with those premises. The designations are as follows:[58]

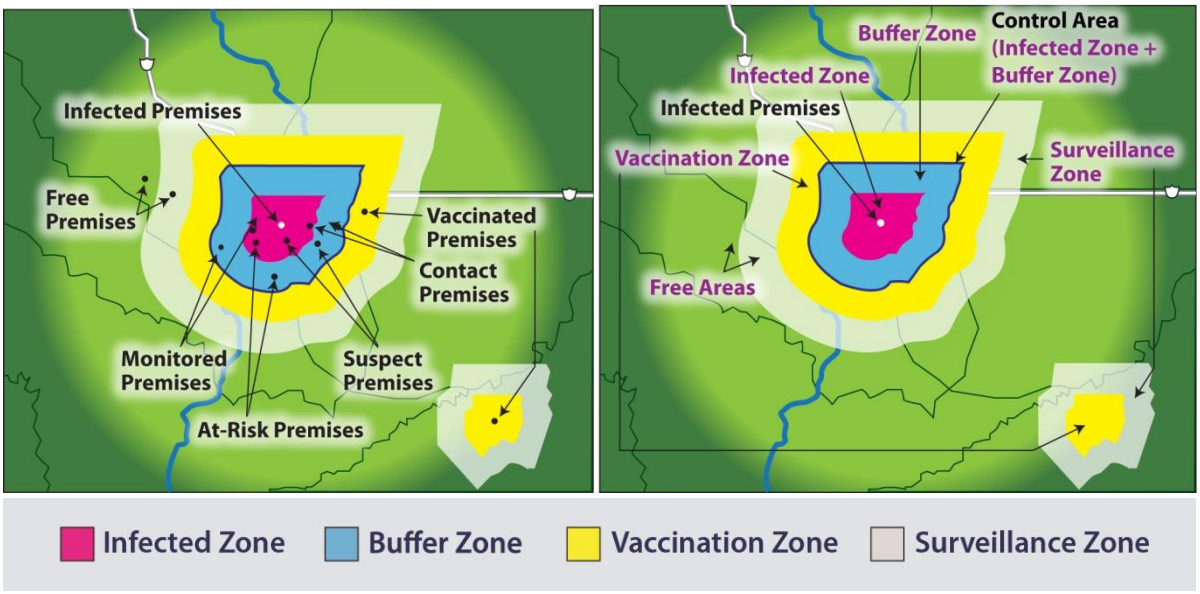
- **Infected Premises** are premises where presumptive positive case or confirmed positive case exists based on laboratory results, compatible clinical signs, FMD case definition and international standards.

- **Contact Premises** are premises with susceptible animals that may have been exposed to FMD, either directly or indirectly, including but not limited to exposure to animals, animal products, fomites or people from Infected Premises.
- **Suspect Premises** are premises under investigation due to the presence of susceptible animals reported to have clinical signs compatible with FMD. This is intended to be a short-term premises designation.
- **At-Risk Premises** are premises that have susceptible animals but none of those susceptible animals have clinical signs compatible with FMD. A premises objectively demonstrates that it is not an Infected Premises, Contact Premises or Suspect Premises. At-Risk Premises seek to move susceptible animals or products within the Control Area by permit. Only At-Risk Premises are eligible to become Monitored Premises.
- **Monitored Premises** are premises that objectively demonstrate that they are not an Infected Premises, Contact Premises or Suspect Premises. Only At-Risk Premises are eligible to become Monitored Premises. Monitored Premises meet a set of defined criteria in seeking to move susceptible animals or products out of the Control Area by permit.
- **Free Premises** are premises outside of a Control Area and are not Contact or Suspect Premises.
- **Vaccinated Premises** are premises where emergency vaccination has been performed. This may be a secondary premises designation.

Zones and areas are similarly defined based on premises designations within them and activities or controls applied within them or at borders. The following designations are assigned to zones and areas:[59]

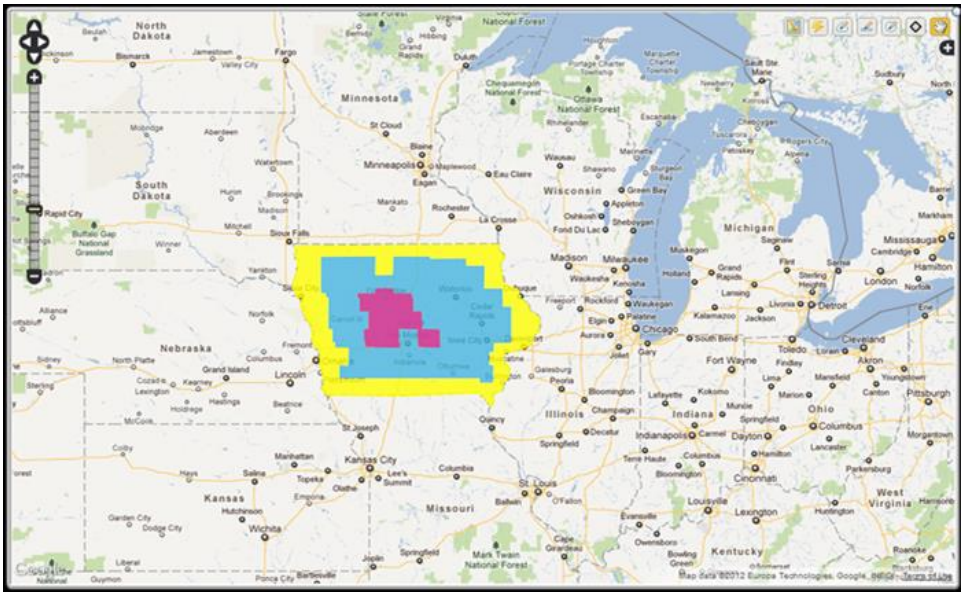
- **Infected Zone**—The zone that immediately surrounds an Infected Premises.
- **Buffer Zone**—The zone that immediately surrounds an Infected Zone or a Contact Premises.
- **Control Area**—The area comprised of an Infected Zone and a Buffer Zone.
- **Surveillance Zone**—The zone outside and along the border of a Control Area.
- **Free Area**—The area not included in any Control Area.
- **Vaccination Zone**—Emergency vaccination zone classified as either a containment Vaccination Zone—typically inside a Control Area—or a protection Vaccination Zone—typically outside a Control Area. Vaccination zone may be a secondary zone designation.

Illustrations of Infected Zone, Buffer Zone, Control Zone and Surveillance Zone[60]

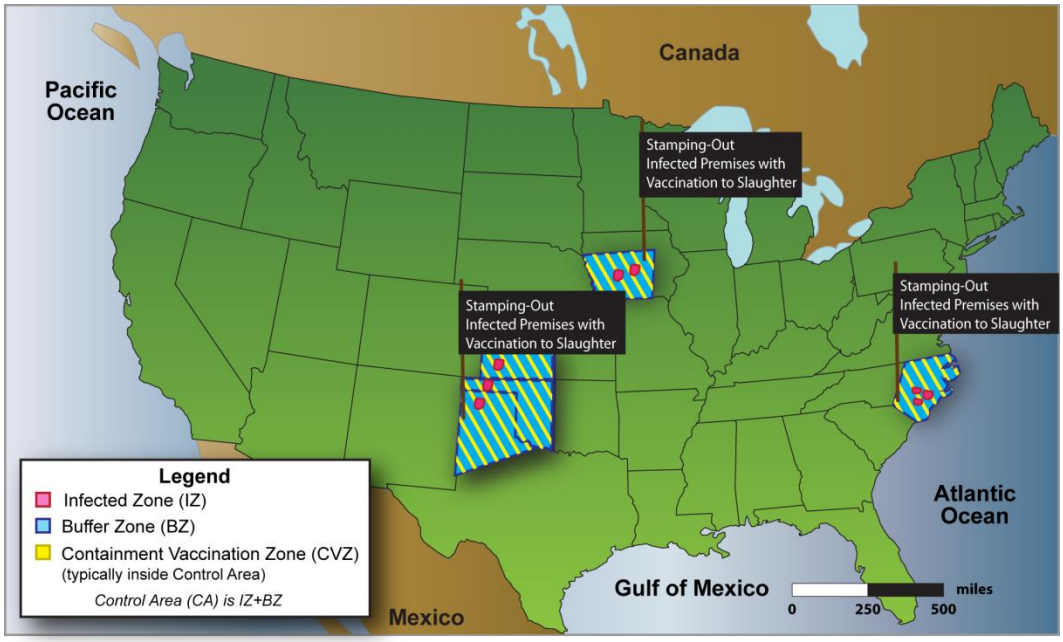


The recommended minimum perimeter of an infected zone is 3 kilometers or about 1.86 miles beyond the perimeters of the presumptive or confirmed infected premises. The perimeter of the buffer zone should be at least 7 kilometers or about 4.35 miles beyond the perimeter of the infected zone. The perimeter of the Control Area should be a minimum of 10 kilometers or about 6.21 miles beyond the perimeter of the closest infected premises. All of these areas may be redefined as the outbreak continues. The width of the surveillance zone should be at least 10 kilometers or 6.21 miles but it may be significantly larger. The minimum zone and area sizes are based upon international standards for responding to highly contagious diseases.[61]

Illustration[62]



Illustration[63]



For more information regarding response zones and premises, please see:

- USDA APHIS Foreign Animal Disease Framework: Response Strategies, May 2012.
- USDA APHIS FAD Ready Reference Guide – Zones, Areas and Premises in an FAD Outbreak, March 2013.
- USDA APHIS Foot-and-Mouth Disease Response Plan: The Red Book, June 2012.

Determining the size of a Control Area requires looking at a variety of factors.

The upsides to a small Control Area are quarantine and movement controls are easier to manage, fewer resources are required and fewer animals and premises need to be managed. There is also potentially less impact to normal business. The downsides include the certainty that all infected premises are contained in a Control Area is lower and the likelihood of disease spread to outside the Control Area may be higher.

The upsides to a large Control Area are the certainty that all infected premises are contained in a Control Area is higher and the likelihood of disease spread to outside the Control Area may be lower. Downsides include there is potentially more impact to normal business, quarantine and movement controls are more difficult to manage, more resources will be required and there will be more premises and animals to manage.[64]

Knowledge of all animals in a control zone is critical, and the number of animals in a control zone can change from day to day. In addition to knowing the location of all farms/ranches, processing plants,

livestock auction facilities, packing plants and such, activities at various facilities must be considered. For example, the zone might include a fairgrounds where food-producing animals are in attendance when an FMD outbreak occurs.

To help control and contain an outbreak, infected, contact and suspect premises will be subject to individual premises quarantines, and at-risk and monitored premises will be subject to movement control restrictions.

Biosecurity measures are critical to prevent spread of the disease by direct or indirect contact. Measures such as limiting on-farm traffic to essential activities, cleaning and disinfection and wearing appropriate outer gear or personal protective equipment would be applied to, but not limited to, animals, people, vehicles, feed and equipment entering or leaving livestock premises.

While quarantine and movement restrictions are highly effective at limiting the spread of disease, they can also impede typical business operations.[65] If stop movement is put into place at the time of an FMD outbreak, a significant number of animals on trailers could be impacted. For example, more than 2,200 semi-loads of hogs—624,508 pigs—are in semi-trailers on the road to harvest plants five days a week. Among the concerns related to stop movement is animal welfare since every 10 minutes a semitrailer is stopped results in the temperature in the trailer increasing 1.4 degrees.[66]

Stop movements also have on-farm challenges. For example, most swine farms have a three-day holding capacity, and a stop movement could produce welfare challenges related to space and feed. Swine producers could also face economic challenges resulting from contract disruption (production or slaughter) and additional feed costs. The beef and dairy industries would face similar challenges.[67]

An alternative to "global" stop movement would be managed movement or permitted movement that would apply to non-infected premises and allow for continuity of business.[68]

Managed Movement/Continuity of Business

Managed movement—also known as continuity of business—has three goals:[69]

- Protect animal health by working to stop the spread of FMD, limiting the number of newly infected premises and infected animals.
- Minimize disruptions to interstate commerce and international trade, thereby minimizing economic hardships.
- Guard food security by facilitating the movement of unaffected animals and animal products during an FMD outbreak.

Elements of continuity of business or managed movement encompass:[70]

- Proactive risk assessments—Determine transmission risk of product or animal movement.
- Surveillance requirements—Determine frequency of samples to be collected, from what populations, for how long.

- Biosecurity guidance—Appropriate precautions, personal protective equipment, specific steps addressing handling of inanimate objects that can carry the FMD virus (fomites).
- Cleaning and disinfection procedures—Requirements for fomites and equipment, including information regarding appropriate disinfectants.
- Epidemiological information—Movement to and from premises, number of animals, species, age and geographic location on premises.
- Permitting guidance—Transparent, explicit guidance for Incident Command regarding movement requirements based on commodity.

To provide business continuity in the face of a foreign animal disease outbreak, Secure Food Supply Plans based on science- and risk-based approaches and current capabilities have been or are being developed for eggs, turkeys, milk and pork. The country's Secure Food Supply Plans are a collaborative effort among public, private and academic partners: the USDA APHIS VS, the Center for Food Security and Public Health at Iowa State University, the Center for Animal Health and Food Safety at the University of Minnesota, the University of California-Davis, the National Center for Foreign Animal and Zoonotic Disease Defense, industry partners and other Federal and State personnel.[71] Several states and regions are adapting these plans to their specific circumstances.

Permitted Movement[72]

Transport of animals is most critical to stop since infected animals can transmit the FMD virus to other susceptible animals and can shed virus prior to showing clinical signs. An emergency disease response permitting process coupled with appropriate surveillance and biosecurity would allow non-infected animals and products to move again without undue risk of further disease spread.

FMD emergency disease response permits would differ from normal state entry permits as the normal state entry permit primarily tracks movement and is only triggered when a state boundary is crossed. FMD emergency disease response permits will likely reflect a more refined level of actual risk of movement relative to the commodity, zone and premises status.

Several types of permits could be created and issued to minimize resources while getting animals and products moving:

- Individual movement (highest risk movement—those within an infected or buffer zone)—Issued by Incident Command and based on specific circumstance.
- General—Issued by Incident Command, based on a biosecurity and compliance agreement, may be pre-approved, may be for multiple movements.
- Self-permitted (low-risk movement)—Tracks movement in case an outbreak changes.

Permitting movements through Incident Command would require numerous individuals to evaluate routes and cooperatively plan so cross-contamination and spread beyond infected zone could be minimized.

A challenge occurs especially early in a major response, however, as stopping movement then starting movement using permits can be slow and chaotic. To that end, pre-planning is critical. It is recommended that guidance for various permits be developed now based on FAD biosecurity and surveillance preparedness.

Robust information management—information technology (IT)—systems are needed to manage permitting in the context of a large-scale outbreak response, and these IT systems need to be in place prior to an event.

Diagnostic Technology, Deployable Capabilities

Multiple partners—USDA (APHIS and National Institute of Food and Agriculture), American Association of Veterinary Laboratory Diagnosticians and National Animal Health Laboratory Network—have been working together to improve the nation's preparedness for an FMD outbreak, with significant progress made in addressing identified preparedness gaps in diagnostic capabilities through collaborative efforts and projects.

Agriculture Screening Tool workshops have helped the partners to identify preparedness gaps, with collaborative efforts and projects addressing the identified gaps. Among the projects underway are the optimization and validation of a real-time RT-PCR assay for the rapid detection of the FMD virus in bulk tank milk and a pilot study of in vivo cross-protection for FMD vaccines.[73]

New tools in a preparedness and response toolkit will require new, creative approaches to policies related to testing protocols, notification expectations, investments and funding.

APHIS' National Veterinary Stockpile (NVS) program provides support to States, Tribes and Territories responding to damaging animal disease outbreaks such as FMD. Within 24 hours, the NVS can provide veterinary countermeasures—including certain types of animal vaccines, antivirals, supplies, equipment and response support services—to animal health officials in affected areas. Current deployable capabilities include 24-hour Push Packs of personal protective equipment (PPE), PPE individual kits, antiviral medications, vaccine, poultry depopulation foaming units and CO_2 carts, mobile refrigeration/vaccine storage and transport systems, animal handling equipment and response support services. [74]

Vaccination

The decision to vaccinate to protect against the spread of FMD in the face of an outbreak is important and complex[75] due to the scientific, economic, political and societal factors specific to the outbreak.

FMD vaccine is controlled by the U.S. Department of Agriculture, with no pre-emptive vaccination allowed at this time. Should an FMD outbreak occur in the United States and vaccination was a designated strategy, according to current regulations, all vaccine produced must occur outside the United States which would delay application.[76]

To be effective, FMD vaccines must closely match the serotype and strain of the infecting strain, and there are seven serotypes of FMD virus: O, A, C, SAT 1, SAT 2, SAT 3 and Asia 1. Vaccination with one serotype does not protect the animal against other serotypes, and may not protect the animal completely or at all from other strains of the same serotype.

Currently, there is no universal FMD vaccine. Vaccine banks contain a wide variety of strains, particularly those judged to be the greatest threat of introduction, for use in an outbreak. Some countries maintain individual vaccine banks. There are also three international vaccine banks: the North American FMD Vaccine Bank (for Canada, the U.S. and Mexico), the E.U. Vaccine Bank (for all EU countries) and the International Vaccine Bank (for a variety of countries including Australia, New Zealand and some European nations).[77]

Whether a country with an FMD outbreak uses vaccination or does not employ a vaccination strategy influences the amount of time the OIE (World Organization for Animal Health) requires for the country to return to FMD-free status after the country's last detected case of FMD.[78] Status decisions are approved by the OIE each May.

When an FMD outbreak or FMD virus infection occurs in an FMD-free country or zone where vaccination is not practiced (such as the United States), one of the following waiting periods is required to regain the status of FMD-free country or zone where vaccination is not practiced:[79]

- 3 months after the last case where a stamping-out policy and serological surveillance are applied.
- 3 months after the slaughter of all vaccinated animals where a stamping-out policy, emergency vaccination and serological surveillance are applied.
- 6 months after the last case or the last vaccination (according to the event that occurs the latest), where a stamping-out policy, emergency vaccination not followed by the slaughtering of all vaccinated animals, and serological surveillance are applied in accordance with Articles 8.5.42. to 8.5.48., provided that a serological survey based on the detection of antibodies to nonstructural proteins of FMD virus demonstrates the absence of infection in the remaining vaccinated population.

Where a stamping-out policy is not practiced, the above waiting periods do not apply, and the Member country should send a declaration to the OIE stating that:[80]

a. There has been no outbreak of FMD during the past 12 months;
b. No evidence of FMD virus infection has been found during the past 12 months;
c. No vaccination against FMD has been carried out during the past 12 months;
d. No vaccinated animal has been introduced since the cessation of vaccination.

As such, if the United States opted to use stamping-out and vaccination rather than just stamping-out, the time to obtain FMD-free status after the end of the outbreak would increase by at least three months. A longer wait period is required if a country desires status as free with vaccination. The decision

to use vaccination must weigh unknown length of outbreak—which may be affected by response strategy—against the known length of wait period to regain recognition of status after the end of the outbreak.

Currently, there is no status category for a country that is free of disease—and has not recently returned to freedom—and is practicing vaccination.

Should an outbreak of FMD occur in the United States and steps are taken to return to its FMD-free status, it is not known how long importers of U.S. animal products would bar U.S. exports, and it is unknown if vaccination would change the time exports are barred by trading partners. Decisions by trading partners are influenced by more than OIE status.

Among the challenges facing the United States regarding vaccination are:[81]

- Communication with owners/managers.
- How a vaccine program would be implemented, including who qualifies to administer vaccinations.
- Personnel, time and other resources to carry out a vaccination program.

Communication to Industry, Government, Trading Partners

During an FMD outbreak, communication regarding the status of the outbreak and actions being taken to control and eradicate the disease should be delivered as quickly as possible to all entities within animal agriculture. It is imperative that information shared be accurate.[82]

Communication involves coordinating with food animal producers and all segments of animal agriculture; Federal, State and local agencies; Tribal entities; and others to ensure consistent messaging regarding animal health, public health and food safety. State animal health authorities should have—and will have—access to information beyond that released to the public. It is imperative that state animal health authorities know details of confirmed cases before hearing about an FMD incident on the news.

Congress, trading partners and other stakeholders should also be briefed as quickly as possible.

Information regarding the source of the outbreak should be as complete as possible and, at minimum, include number of animals on the infected farm/farms or facility/facilities, location of the business/businesses, disease status and any known animal movement. Competence can be shown when information is at one's fingertips. The key is to build message maps beforehand and be prepared for an outbreak. A network of stakeholders and systems for communications has been established and should be maintained and continually invested in prior to an FMD incident.

In the face of an outbreak, communication must be ongoing. Early in an outbreak when the situation and situational awareness may be changing rapidly, deliveries at 24 hours, 48 hours and 72 hours are critical.

During an outbreak, two web sites—www.usda.gov and www.footandmouthdiseaseinfo.org—will help individuals stay updated on the situation.

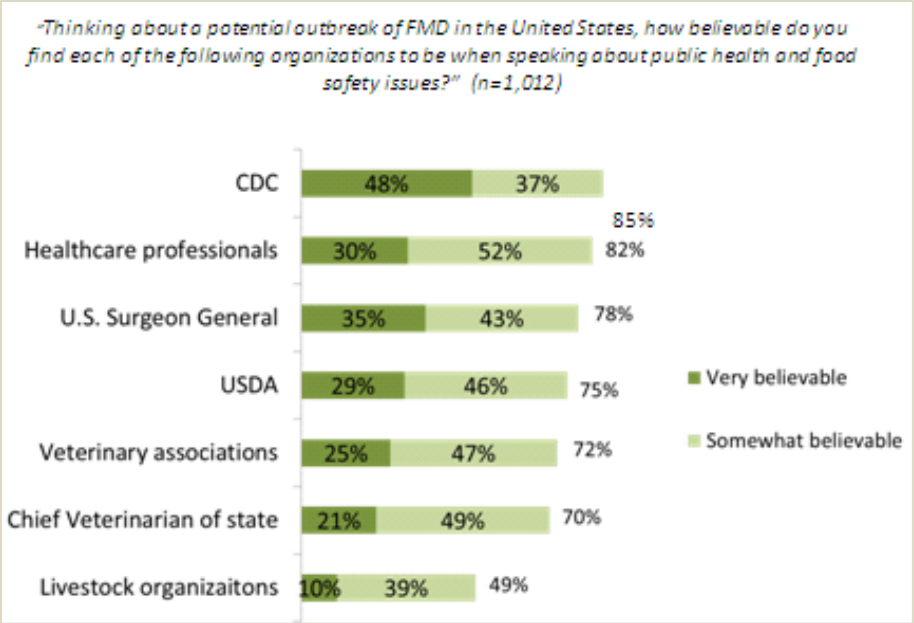
Communication with the Public

Proactive, ongoing communication will be essential to reassure the public about food safety and maintain demand for meat and milk products in the face of an FMD outbreak. Coordination and collaboration among state and federal agencies, industry organizations, producers, processors and retailers will enable consistent, timely accurate and reassuring messages to be delivered through a variety of channels including print, broadcast and online news and social media.

Current public awareness and understanding of FMD is limited, and confusion between FMD and hand, foot and mouth disease (HFMD) is widespread. A December 2012 survey of 1,000 meat and dairy consumers found that 85 percent believe they have heard of FMD, and 49 percent of that group believes small children can contract the disease. During discussion of the FMD team's research, it was suggested that these concerns might be alleviated if FMD was referred to as hoof-and-mouth disease rather than foot-and-mouth disease.[83]

Consumers in both the qualitative and quantitative phases of research commissioned by the FMD Cross-Species Communication Team said the messages used to explain FMD, its impact and the containment plan made them feel reassured and instilled confidence in the safety of milk and meat. Still, when people were placed in the mindset of a significant outbreak that is geographically close by, a majority (61 percent) said they would stop consuming dairy and meat products until the threat has subsided.

Regarding credible spokespeople and sources of information, consumers rate the Centers for Disease Control (CDC) and independent healthcare professionals as the most believable, followed by the U.S. Surgeon General, USDA and veterinary associations. USDA will serve as the communications and operations lead for the U.S. government in the event of an outbreak, and it would be beneficial for CDC to deliver a strong, complementary message to the public about the implications of the outbreak and the safety of the food supply. The livestock community has an important role to play in amplifying the government's messaging; conducting outreach with local stakeholders across the country; and "putting a face on the industry," but it's important that all communication from livestock community sources cites credible, third-party sources for information on food safety and disease containment.



Questions have arisen regarding consumer acceptance of milk and meat in light of the potential use of a vaccinate-to-live containment strategy. The research found that the vast majority of consumers agree vaccination is a necessary and routine practice that protects the health of humans, pets and livestock. Most consumers are unaware that livestock are routinely vaccinated, but once they are asked to think about it, they assume this is the case. When consumers were asked to envision a scenario where vaccination was used to help control a significant FMD outbreak, some expressed concern that FMD vaccine would be passed onto humans who ate meat or drank milk from these animals. However, these concerns were alleviated when more information was provided about the reasons for vaccination and the research that proves there is no impact on meat and milk.

Overall the research identified the following key components to effective communication in the event of an outbreak: [84]

- Provide timely, straightforward, accurate information written at a sixth-grade reading level.
- Demonstrate the collaboration between government, industry, veterinarians and academia.
- Because consumers will monitor the outbreak via traditional news coverage and then seek additional information via online searches, multiple online resources should be readily available with up-to-date information on the status of the outbreak and documentation of food safety and, if appropriate, vaccine safety, messages.

The FMD Cross-Species Communication Team—which includes representatives of the dairy, beef, pork and sheep industries—serves as a foundation for consumer and producer communications and has consumer-tested, core messages available that can help individuals involved in an FMD outbreak respond quickly, consistently and confidently to media and public inquiries. For the most up-to-date consumer message document, contact Becky Johnson, coordinator, FMD Cross-Species Communications Team, at becky.johnson@fleishman.com.

FMD SCENARIO-DRIVEN DISCUSSION

The discussion portion of the symposium led off with a realistic description of the situation regarding livestock production practices and livestock movements through the area around Louisville, Ky., the site of the symposium. It would be business as usual for the vast majority of livestock businesses until the moment an FMD outbreak occurred and became public knowledge. The object of the discussion was not to outline operational logistics but to address key challenges of stakeholders—specifically animal health authorities and livestock producers—that preparedness activities should address or continue to address.

During the discussion session, diverse stakeholders shared their perspectives on the challenges posed by an outbreak of FMD. The goal of the discussions was not to reach consensus but to learn from each other via the exchange of stakeholder perspectives.

Participants at each table included a diverse representation of producers or producer organization representatives, regulatory or diagnostic laboratory veterinarians and other agricultural business representatives from multiple states. All participants and facilitators were given the hypothetical scenario, associated maps and information plus a primer on risk communication. A discussion leader at each table helped keep participants on task.

Participants considered the impacts of an announcement of FMD in the United States from a farm-level perspective. The discussion provided an opportunity for all to reflect on whether current efforts are in alignment with industry priorities and how regulatory authorities, livestock producers and the organizations which represent them can work cooperatively to advance preparedness to the next level. Participants returning to their home states were asked to have similar conversations locally.

Discussion Period Outline

Having a hypothetical announcement of FMD as the starting point, participants focused on the challenges that livestock producers and animal health authorities would face should an outbreak of FMD occur. Participants considered the challenges of the other livestock farms in the scenario—for example, the large dairy, farrowing facility, cow-calf operation, beef farm CSA and Kansas feedlot—as well as the challenges faced by livestock producers and animal health authorities outside of the specific farms identified in the scenario.

The word cloud highlights the terms most frequently included in notes from the first discussion period:

During Discussion Period 2, discussion centered on the perspective of livestock producers or animal health authorities. Participants identified and ranked the top three or four issues and justified the importance of their top issues.

During Discussion Period 3, based on the priority issues identified during Discussion Period 2, participants addressed three key questions: 1) What needs to happen in terms of preparedness to address these issues? 2) How should this be done? and 3) Who will do these things?

For each priority issue, participants during Discussion Period 4 identified who needs to take action and developed the components of effective messaging that should encompass four areas: 1) why that stakeholder group (audience) should care; 2) key points this audience needs to know; 3) what this audience wants to know; and 4) important points this audience might get wrong unless you state them clearly.

Preparedness Priorities

Symposium participants identified priorities regarding being prepared for an FMD incident in the United States. With various segments of the food-animal industry represented at the Symposium, this sharing session revealed the similarities and differences in priorities among stakeholder groups.

Producers, Producer Organizations Priorities:

- FMD information sources.
- Familiarization with current FMD response plan.
- Biosecurity on the farm/ranch.
- Active disease surveillance program.
- Producer education/awareness material—from how to identify FMD in their animals to biosecurity measures that can be implemented before an event takes place.
- Consumer education, including Secure Food Supply plans for all food animal species, developed.

- Valid pre-harvest traceability system.
- Communication protocols, including those who deliver messages to different entities.
- Vaccination policy, including when vaccination should be used.
- Identification of person/persons responsible for implementing a response plan, including vaccinations.
- Animals in transport be allowed to continue to destination at the time an outbreak is announced.
- Permitting during a disease event.

Trade Media and Industry Public Relations Priorities:

- Media-trained spokespeople.
- Communication channels to producers.
- Working relationships with all affected stakeholder groups.
- Food safety drills with animal emergency management elements.
- Enhancement of the FMD cross-species team web site www.footandmouthdiseaseinfo.org based on insights from consumer messaging research.
- Consumer research messaging shared with across animal agriculture groups and emergency management groups.

Practicing Veterinarians and Public Health Veterinarians Priorities:

- Overall biosecurity.
- Familiarization with current efforts.
- Emergency Support Funding-11 plans published and templates available
- Food-animal producers educated about FMD.
- Veterinarian-Client-Patient Relationship.

State Veterinarians and Animal Health and Regulatory Personnel Priorities:

- Measures to prevent FMD.
- Field exercises and tabletop exercises simulating an FMD outbreak.
- Outreach/education of industry stakeholders.
- Business continuity plans and options.
- Consistent biosecurity practices—pre-outbreak and post-outbreak.
- Ready-to-implement biosecurity plan.
- Ready-to-employ response plan. (Specific elements listed as priorities: communication strategies, continuity of business plan, vaccination strategies.)
- Educating producers about changing response paradigm.
- States have a coordinated response to the announcement of FMD in the United States.
- Communicate with packers to determine: 1) their concerns regarding purchasing animals during an FMD outbreak; 2) if they would continue to harvest and process if demand for their product is limited; and 3) if they would purchase and harvest vaccinated animals.

- Vaccine development with Differentiation of Infected from Vaccinated Animals (DIVA) capabilities.
- Working animal disease traceability system.
- Animal movement mapping.
- Indemnity and emergency funds for producers.
- Protocols to communicate among communicators, including Public Information Officers informed about flow of communication from both directions.
- Message maps, web site information, etc., ready to implement.
- Streamlined or automated import systems developed.
- Certificate of Veterinary Inspection completeness and legibility improved.
- Animal disease traceability incorporated into state agricultural department planning response.
- Handling delays in supply plan.

Diagnosticians Priorities:

- Employee training.
- Standard Operating Procedures.

Government Personnel Priorities:

- Diagnostics in field.
- Significant focus on realistic scenarios.
- Trade relations.
- Public education.
- Improved communication among local/State/Federal industry regarding roles during a response.
- Vaccination policy.
- Physical resources to use during a response identified.

Intended Actions

At the close of the symposium, participants shared actions they will take post symposium.

Producers, Producer Organizations:

- Identify strategic partners and work with to be prepared for an FMD outbreak.
- Implement a comprehensive traceability system.
- Implement and encourage participation in biosecurity and disease surveillance programs.
- Develop and implement Secure Food Supply plans.
- Develop and distribute producer-focused education so producers know how to identify FMD and are familiar with the country's FMD preparedness and response plan.
- Help foster and participate in FMD preparedness meetings involving commodity groups, government officials and processors
- Interact with county emergency management group to discuss FMD response plan strategies and their responsibilities should an outbreak occur.

- Encourage state and county to have an agro-disaster plan in place.

Trade Media and Industry Public Relations:

- Host food safety drills with animal emergency management elements.
- Convene FMD cross-species team to enhance www.footandmouthdiseaseinfo.org web site.
- Share consumer messaging with other animal agriculture groups and emergency management groups.

Practicing Veterinarians and Public Health Veterinarians:

- Support Secure Milk Supply planning.
- Interact with state and industry public information officers (PIOs) so become familiar with information sources.
- Double check that communication channels include all individuals and groups that should be included.
- Clarify roles in FMD preparedness and response—from USDA to states to producers and allied stakeholders.

State Veterinarians and Animal Health and Regulatory Personnel:

- Communicate with and educate stakeholders—producers, state agencies, etc.—about FMD, biosecurity protocols, country's preparedness and response plan and their role should an outbreak occur in their area.
- Participate in multi-state tabletop exercises.
- Conduct biosecurity audits and stress importance of keeping excellent records.
- Support and assist emergency planning staff with planning and exercises.
- Encourage producer groups to approach packers about solutions to vaccination policy and trade issues
- Update state readiness.
- Help local jurisdictions write ESF-11 document.
- Help coordinate state agencies, law enforcement and first responders.
- Engage state highway officers in discussions with State Animal Health Officials and staff regarding the realities for a stop movement situation.
- Develop permitting movement system.
- Create messages in preparation for an FMD outbreak.
- Promote Secure Food Supply plans.
- Enhance Incident Command System (ICS) training.
- Support data management experts and tools to improve permitting process.
- Work to improve speed of information retrieval and improve quality of Certificates of Veterinary Inspection.
- Work on Secure Milk Supply plan.
- Underscore importance of collaboration and trust among all sectors.
- Distribute FMD Symposium White Paper.

Diagnosticians and Government Personnel:

- Determine surge capacity of laboratory and plan for an emergency.
- Determine the needs of state officials.
- Finalize stop movement and permitted movement protocols within state and at state borders.
- Encourage and enable stakeholder meetings to exchange ideas regarding how to best move forward.
- Address policy regarding using foreign animal disease diagnostics in National Animal Health Laboratory Network.
- Improve data sharing information technology systems and policy.

SUMMARY THOUGHTS

Key points were offered by closing speakers Patrick Webb, Chuck Ahlem and Sebastian Heath.

1) Significant progress toward the United States having a well-thought-out, scientific response plan to an FMD outbreak has been achieved since 2001 when an outbreak of FMD occurred in the United Kingdom. Increased awareness of the threat of intentional acts of bioterrorism also stimulated animal agriculture and animal health officials to re-evaluate the U.S. state of preparedness.

2) Some agricultural industries are investing now in response preparedness with the understanding that doing so will help support their continuity of business even in the face of an outbreak.

3) New technologies that support rapid, large-scale diagnostics, mass vaccination and controlled movement offer hope for businesses to survive an outbreak of FMD in the United States.

4) Looking at historical outbreaks, when the first case of FMD is diagnosed, it's not usually the first case. Normally, when the first case is announced, infected animals have already moved, and FMD has already spread. The "first case" diagnosed is a time and place within the epidemic.

5) The first diagnosis of FMD puts a State and all of animal agriculture in the middle of an outbreak. Involved entities should start with this understanding—not think "small outbreak" but think "larger outbreak"—and plan accordingly.

6) Involved entities should be prepared to use vaccines. Entities cannot wait three to seven days and see if vaccination is needed. Rather, they should plan to use vaccine and abort such plans should certain outbreak criteria be met that indicate the outbreak can be controlled by other means.

7) Opportunity costs get larger the longer it takes to make a decision.

8) All parties involved with an FMD outbreak should continue to think realistically regarding what needs to get done, what resources will be needed, who has authority to do what, who has the money to do what, etc. When these items are known, fewer surprises will arise when an actual outbreak of FMD occurs.

9) One important way agricultural entities and government officials can work together right from the initial diagnosis of FMD is to frame the size and scope of the outbreak so that response resources can be used most effectively and negative impacts to non-affected businesses can be minimized.

10) Systems mapping—a strategic tool that identifies who proposed ideas, who listens to the options, etc. —is invaluable at the very beginning of an outbreak as it helps those involved in response plans to implement strategies and not allow various groups to take the plan off-track.

11) Response plans must include an animal welfare and environmental impact component.

12) Operations and communications need to work together to ensure accurate information is being distributed to all audiences while the outbreak is being managed.

13) Research and past experience show that the government is viewed by consumers as credible in the context of an animal health emergency. USDA will serve as the communications and operations lead for the U.S. government, and it would be beneficial for the CDC to deliver a strong, complementary message to the public about the implications of the outbreak and the safety of the food supply. The livestock community will then amplify the message via its spokespeople and well-established consumer communications channels.

14) All individuals involved in a response need to be on the same page. Common operating objectives and consistent messaging are a critical component of any well-coordinated response.

15) Because government first responders to an animal health emergency can have enormous impacts on farmers, ranchers, processors and other allied industries, animal agriculture should be aware of and influence State and Federal FMD preparedness efforts.

16) Preparedness is a process. Continual improvement is part of the process.

17) FMD will be eradicated should the United States get an outbreak.

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Factors Influencing the Decision to Use Emergency Vaccination Strategies[53]

Factor or Criterion Supporting the Response Strategy	Strategy			
	Stamping-Out	**Stamping-Out with Emergency Vaccination to Slaughter**	**Stamping-Out with Emergency Vaccination to Live**	**Emergency Vaccination without Stamping-Out**
Suitable vaccine for FMD outbreak strains	Not available/ feasible	Available	Available	Available
Resources for stamping-out (such as disposal)	Adequate	Adequate	Limited	Limited
Resources for vaccination (such as diagnostic testing, tracing efforts and permitting activities)	Limited	Adequate	Adequate	Adequate
Population density of susceptible animals at high risk of becoming infected	Low	High	High	High
Population density of virus amplifying animals	Low	Moderate	High	High
Movement of infected animals, products or formites out of Control Area	No evidence of extensive movement	Evidence of extensive movement	Evidence of extensive movement	Evidence of extensive movement
Origin of outbreak	Known	Unknown	Unknown	Unknown
Location of initial outbreak	Isolated premises	Livestock-producing area	Livestock-producing area	Livestock-producing area
Spread of outbreak	Slow	Rapid	Rapid	Rapid
Distribution of outbreak	Limited or restricted	Widespread	Widespread	Widespread
Risk of infection in valuable, rare, endangered or high-value genetic livestock	High	High	Moderate	Low

Factor or Criterion Supporting the Response Strategy	Strategy			
	Stamping-Out	**Stamping-Out with Emergency Vaccination to Slaughter**	**Stamping-Out with Emergency Vaccination to Live**	**Emergency Vaccination without Stamping-Out**
Likelihood that FMD could become prevalent in feral swine, deer or other wildlife	High	High	Moderate	Low
Public acceptance of stamping-out	Neutral reaction or weak opposition	Weak opposition	Strong opposition	Strong opposition
Surveillance, diagnostic and laboratory resources for sero-surveillance after vaccination	Limited	Limited	Available	Available
Domestic stakeholders' acceptance of regionalization with vaccination to live or vaccination to slaughter	No	Yes	Yes	Yes
Third-country acceptance of regionalization with vaccination to slaughter	N/A	Accepted	N/A	N/A
Third-country acceptance of regionalization with vaccination to live	N/A	Not accepted	Accepted	Accepted

Factor or Criterion Supporting the Response Strategy	Strategy			
	Stamping-Out	**Stamping-Out with Emergency Vaccination to Slaughter**	**Stamping-Out with Emergency Vaccination to Live**	**Emergency Vaccination without Stamping-Out**
Assessments and economic analysis of competing control strategies	It is likely that a control strategy without stamping-out will lead to significantly higher economic losses or longer duration of the outbreak	It is likely that a control strategy without stamping-out modified with emergency vaccination to slaughter will lead to significantly higher economic losses or longer duration of the outbreak	It is likely that a control strategy without stamping-out modified with emergency vaccination to live will lead to significantly higher economic losses or longer duration of the outbreak	It is likely that a control strategy without emergency vaccination to live will lead to significantly higher economic losses or longer duration of the outbreak