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**NAVAL
POSTGRADUATE
SCHOOL**

MONTEREY, CALIFORNIA

THESIS

**STATE AND LOCAL POLICY CONSIDERATIONS FOR
IMPLEMENTING THE NATIONAL RESPONSE PLAN**

by

John J. Cline

March 2005

Thesis Advisor:
Second Reader:

Christopher Bellavita
Bruce Anderson

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**STATE AND LOCAL POLICY CONSIDERATIONS FOR IMPLEMENTING
THE NATIONAL RESPONSE PLAN**

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Submitted in partial fulfillment of the
requirements for the degree of

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from the

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ABSTRACT

Faced with the threatened loss of Homeland Security and Emergency Management federal funding, state, tribal, and local officials must now implement the National Incident Management System (NIMS) and the National Response Plan (NRP) to manage natural and man-caused disasters, including acts of terrorism. Mandated by Congress, and implemented by Homeland Security Presidential Directive 5, underdeveloped areas of Indian Country and small rural towns, especially farming and ranching communities and counties are likely to find that they do not have the capacity to fully implement the NIMS and NRP. They are in a catch-22. If they don't adopt the required federal plans, they may not receive funding to obtain needed material resources for terrorism and disaster preparedness; yet few small rural counties and communities have the human resources necessary to implement the NIMS and NRP except at the most basic levels. There are over 200,000 jurisdictions; many of which rely on part-time employees and volunteers for management and response to major emergencies and disasters. Jobs and professions of volunteers offer little time for formal training and certification.

A terrorist-induced Foot and Mouth Disease (FMD) bioattack is used to examine the impact that fully implementing the NRP and the NIMS will have on small agriculturally-based communities. Because the United States has not experienced Foot and Mouth Disease (FMD) since 1929, many of the skills required to quickly diagnose and respond to an outbreak may no longer exist. Recovering from such an outbreak would require a coordinated multi-disciplinary response that is heavily dependent on local, tribal, state and federal agencies and the private sector. State and local entities are neither prepared nor ready to respond to a well-orchestrated FMD attack. Just implementing a nationwide stop movement order from USDA would overwhelm most jurisdictions. Because it is not the killing machine as is smallpox and other types of bioweapons and chemical agents, FMD may be the ideal weapon with which to attack and cripple the economy of the United States; an often stated goal of Osama bin Laden.

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I. INTRODUCTION

A. BACKGROUND

Faced with the threatened loss of Homeland Security and Emergency Management federal funding, state, tribal, and local officials must now implement the National Incident Management System (NIMS) and the National Response Plan (NRP) to manage natural and man-caused disasters, including acts of terrorism.¹ As mandated by Congress, and implemented by Homeland Security Presidential Directive 5, areas of Indian Country and small rural towns, especially farming and ranching communities and counties, are likely to find that they do not have the capacity to fully implement the NIMS and NRP. They are in a catch-22. If they don't adopt the required federal plans, they may not receive federal funding to obtain needed material resources for terrorism and disaster preparedness; yet few small rural counties and communities have the human resources necessary to implement the NIMS and NRP except at the most basic levels.

Even if they do adopt the NIMS and NRP, they are up against a powerful lobby for large cities which argues that, based on per capita, rural states should not receive the currently authorized formula levels of Homeland Security funding; and Congress is listening. While marking-up the FY-2005 budget, the House Subcommittee on Homeland Security provided increased funding for large cities, and simultaneously reduced funding for less populated states because of the perception that there is little or no risk to rural communities.² That approach is out of step with the reality that as high profile targets are hardened, terrorist attacks are more likely to occur on softer targets at other locations throughout the country. That approach does not consider the overall effects that reduced funding for less populated states will have on the nation; that low-risk states and communities must become a "third tier" of response and recovery for high risk communities. Responders from unaffected parts of the nation must be equally

¹ Letter to State Governors from U.S. Secretary of Homeland Security, Tom Ridge dated September 8, 2004, found on-line at www.fema.gov/txt/nims/letter_to_governors_09082004.txt, last accessed on January 27, 2005.

² House Appropriations Subcommittee on Homeland Security FY-2005 budget mark-up provides \$1.25 billion for basic formula grants (\$45 million less than FY-04) and provides \$1 billion for the Urban Area Security Initiative (including \$100 million for rail security), June 3, 2004. Ranking member's lead staffer.

trained, certified, and equipped so that they will be able to provide support to primary and secondary units (mutual aid responders) who have been killed, injured, or spent by long hours (days and weeks) of response and recovery operations. Neither does such thinking seriously consider the risk of animal and agricultural diseases as terrorist bioweapons.

This thesis argues that significant policy development will be required at the state and local levels in order for agriculturally-based states, Indian country, and small town America to implement the NIMS and NRP. More regionalized local organizations may have to emerge, possibly replacing autonomous community response to major disasters, (including acts of terrorism) in order that they may fully participate in the NIMS and NRP, and to coordinate response and recovery operations with state and federal agencies.

B. IMPORTANCE OF RESEARCH

This research is important because nationally, there are over 200,000 jurisdictions; many of which rely on part-time employees and volunteers for management and response to major emergencies and disasters. Jobs and professions of volunteers offer little time for formal training and certification.

Implementation of the NRP, NIMS, its Incident Command System (ICS), and the Multiagency Coordination System (MAC) will add to the training and certification costs of local governments -- costs that will continue year after year as volunteers drop out of programs and paid staff retire or move on to other opportunities. Congress will not likely continue to fund terrorism preparedness at current levels.³ State and local jurisdictions could be left with expensive recurring costs. Decisions made today for the implementation of the NIMS and NRP, both to meet federal legal requirements and grant eligibility, may affect funding for community services in the future.

To examine the impact that fully implementing the NRP and the NIMS will have on small agriculturally-based communities, this thesis will use a terrorist event that could logically be expected to occur in a rural setting. An attack on agriculture is the most likely terrorist event that rural communities will have to face. There are many foreign

³ Comments to tabletop exercise participants by the Director, Idaho Bureau of Homeland Security, November 19, 2004.

animal diseases that might be employed; however, Foot and Mouth Disease (FMD) is especially well-adapted for such an attack on rural America while simultaneously causing serious consequences for the local, state, regional, and national economies.

While FMD has been clinically well researched, its use as a bioweapon to effect change in national security and foreign policy has not. Because this nation has been FMD-free since 1929, many of the skills, knowledge, and resources that are required to successfully conduct outbreak recovery may no longer be available. Few people outside of agriculture and veterinary services are aware that being FMD-free has actually increased the vulnerability of cattle, swine, sheep, and some wildlife and zoo animals because the various species have lost any resistance they may have had to the disease. Such resistance is maintained by periodic, natural exposure to virus-infected, carrier animals. As a bioweapon, the FMD virus can be imported without risk of discovery. There are no tests or instruments to detect the virus at our nation's borders. The virus can be carried anywhere in the pocket of an attacker. There is no need for protective equipment, nor is there a need for specialized knowledge to effectively deploy the virus in an attack.

C. PURPOSE AND DIRECTION OF THESIS

This project identifies policy changes that state and local responders and policymakers will have to consider in order to meet the federal mandate to incorporate the NIMS (including ICS and MAC) and the NRP into state and local response plans. A large-scale FMD outbreak, implemented as an act of terrorism, is used in this research as the trigger-mechanism to identify those issues.

It could be argued that the use of FMD as a terrorist bioweapon in small agricultural communities was chosen as a trigger-mechanism for this project simply because such a disease outbreak is so overwhelming and requires so many human and material resources, thereby requiring a more regionalized approach. Such is not the case. Rather, some small communities admittedly cannot meet anything more than the most basic requirements of ICS for more common natural disasters. Some have only the council or commission chambers with which to set up an Emergency Operations Center

(EOC). Communities in remote areas may have inadequate access to the Internet. They will find it increasingly more difficult to meet reporting, logistical, and administrative requirements in a computer and Internet-dependent world. It is a given that catastrophic disasters would completely overwhelm their capacity to staff ICS, Unified Command, Multiagency Coordination Systems, and NIMS positions. For these small communities, a more regionalized approach might be required for response to major emergencies and disasters, not just FMD.

- The author chose a terrorist-inspired FMD outbreak for this research project because:
- It is an ideal terrorist bioweapon with which to attack our national economy (and therefore more likely to occur than is generally realized).
- The initial response to FMD would affect almost every jurisdiction in the nation simultaneously.
- A FMD outbreak would require the use of human and material resources not normally associated with more routine types of response and recovery scenarios. It would require state and federal Veterinary Services to be the lead agencies for response and recovery.
- State and local response and recovery plans for all hazards, including foreign animal disease outbreaks, need to be quickly rewritten to accommodate National Response Plan and National Incident Management System standards. Personnel need to be trained and certified to hold NIMS positions.
- Existing animal disease response plans have not likely considered the problems that terrorism and its subsequent criminal investigation and crime scene protocols would pose for responders to an animal disease outbreak when used as a terrorist bioweapon.

D. OVERVIEW

The estimated recovery costs of the 9/11 terrorist attacks on the World Trade Center and the Pentagon have now exceeded \$300,000,000,000.⁴ The use of commercial airliners as weapons to attack commercial and military targets was truly powerful television drama. Scenes of the second airliner crashing into the south tower of the World Trade Center have been indelibly etched into people's memories around the globe.

⁴ Congressional Record, Proceedings and Debates of the 108th Congress, Senate Floor Speech by Senator Kay Bailey Hutchison, September 11, 2003, Page: S11367. Senator Hutchison said, "The financial cost of 9/11 has been estimated at a staggering \$300 billion. But that pales in comparison to the immeasurable toll of human lives lost that day."

Those scenes will not soon fade from memory, and even if they should, the replayed pictures that were captured on tape will likely continue to instill fear in free societies around the world for years to come. Similarly, the 2004 bombings in Madrid, Spain, have again etched fear-instilling pictures displaying the physical impact of terrorism on open societies. Television, cellular telephones, and other personally-owned portable technologies have brought terrorism into our personal lives, often in real time. Terrorism is no longer a subject just for the evening news.

The next terrorist attack on the United States may be directed exclusively at the economy. Osama bin Laden has often stated that the U.S. economy is his intended target. Most recently, the Associated Press reported that in a December 16, 2004, tape recording posted on an Islamic web site, “bin Laden claims to have bled the Soviet Union into bankruptcy as an Islamic guerrilla fighter in Afghanistan in the 1980s.”⁵ He believes that he can similarly bleed the United States into bankruptcy in order to reduce its world influence. FMD may be the ideal bioweapon for bin Laden, independent terrorist groups espousing bin Laden philosophies, or a lone sympathizer to use against the U.S. and its local and national economies. An attack using FMD is not just an attack on animals; it is an effective way to attack local, state, and national economies.

News media pictures and descriptions of the physical symptoms of the use of biological weapons, such as smallpox, briefly heightened public concerns. However, some analysts have theorized that one reason this country has not yet been attacked with weapons of mass destruction is that “mass casualties undermine political support;” that “strategic-minded terrorist organizations recognize that limited political ends cannot be achieved by unlimited violent means;” and that terrorist groups “must strike a delicate balance between attracting too little attention and being ignored, and attracting so much attention that public hatred affects their cause.”⁶ Also to a lesser degree, bioweapons such as plague, typhoid, smallpox, and others represent a direct physical threat to the user-attacker as well as to intended victims; they require extraordinary technical and financial resources with which to weaponize and deploy the micro-organisms.

⁵ David McHugh, The Associated Press with contributions by The Washington Post, “Bin Laden says he’s aiming at U.S. economy,” *The Idaho Statesman*, December 19, 2004, Front Page.

⁶ Richard A. Falkenrath, Robert D. Newman, and Bradley A. Thayer, *America’s Achilles’ Heel*, (The MIT Press, Cambridge, Massachusetts and London, England) Fourth Printing 2001, pg 48.

As a bioweapon, FMD represents no such direct threat to human life. Consequently, the scope and effectiveness of FMD when used as a bioweapon are generally underappreciated by state and local officials, and completely unrecognized by the general public. Its use would literally guarantee grabbing the attention of the global news media for an extended period of time, a strategically desirable outcome for organizations engaged in terrorism. Unlike other bioweapons that would cause a magnitude of human death and carnage, FMD might actually be tacitly condoned by nation-states (including some nations that are considered friendly to the U.S.) who would like to see the United States get its “comeuppance” after decades of relative prosperity.

In terms of contagious spread and economic consequences, FMD is one of the most threatening foreign animal diseases to emerge on the world scene, yet it remains naturally resident in over 30 countries. The difference between a naturally occurring outbreak and a terrorist-induced epidemic is the likelihood that terrorists would infect numerous locations simultaneously, whereas a naturally occurring outbreak is usually introduced through just one location, such as that which occurred during the 2001 FMD outbreak in the United Kingdom. In a widespread terrorism scenario, the need for resources would dramatically exceed availability.

E. RESEARCH METHODOLOGY AND QUESTIONS

Research included a review of the NRP and the NIMS for the purpose of determining the impact that implementation will have on state and local governments. The NIMS was finalized and adopted for use on March 1, 2004.⁷ The NRP was adopted for use in January 2005. The research included a review of documents and interviews with personnel in the animal production and health care industries to determine what key factors would be required for a response to a terrorist-inspired FMD outbreak. Questions were developed as follows:

- What costs (possibly non-reimbursable) would state and local governments have to withstand as a result of an outbreak of FMD in the U.S.?

⁷ U.S. Department of Homeland Security Fact Sheet, May 30, 2004, found on-line at www.dhs.gov/dhspublic/display?theme=15&comment=3250, page 1.

- How will implementing NIMS affect a response to FMD at the state and local levels?
- Is NIMS a practical tool for use in an Emergency Operations Center?
- Should we use the NIMS and its subsequent organizations to manage sustained long term recovery operations at the state and local levels?

In order to examine the impact that the NIMS and NRP will have on state and local entities during a response to FMD, it is necessary to first determine how the FMD virus might be obtained and deployed in a bioattack. This project identifies such a potential deployment strategy.

Extensive documentation from the 2001 FMD outbreak in Great Britain was reviewed. This thesis leans heavily on their lessons learned. It similarly leans heavily on the advice of veterinary professionals at the local, state, and federal levels for the purpose of identifying key elements of a FMD outbreak that need to be addressed in response and recovery operations. Chapter III examines those lessons learned. The 2001 FMD outbreak in Great Britain occurred not through an act of terrorism, but rather as a result of poor biosecurity -- the use of infected swill that was not boiled for the prescribed period. The use of FMD in a bioattack presents new obstacles not experienced by Great Britain.

Terrorism falls under the jurisdiction of the Justice Department through the Federal Bureau of Investigation. Response plans must consider how to implement crime scene protocols (to identify, protect, and gather evidence), while simultaneously conducting animal inspections, depopulation, cleaning, and disinfection to eradicate the disease. Law enforcement and medical needs in this scenario are mutually exclusive and, without prior agreement and practice, could create misunderstanding.

To test the impact that new federally-imposed response programs will have on state and local entities in response to a terrorism-induced FMD outbreak, a tabletop exercise was conducted using private and public sector personnel. Exercise participants were chosen because they currently occupy senior veterinary, governmental, and private sector positions responsible for managing operations in foreign animal disease response and recovery. The exercise is discussed in Chapter IV. Overall findings and recommendations are provided in Chapter V.

F. REVIEW OF THE NATIONAL RESPONSE PLAN (NRP)

In the months following the 9/11 attacks on the World Trade Center and the Pentagon, President Bush signed a number of Homeland Security Presidential Directives (HSPD) including, HSPD 1, “*Organization and Operation of the Homeland Security Council*,” HSPD 2, “*Combating Terrorism Through Immigration Policies*,” HSPD 3, “*Homeland Security Advisory System*,” and HSPD 4, “*National Strategy to Combat Weapons of Mass Destruction*.” Each of these documents required specific actions to be taken by federal agencies, but they had little effect on state and local jurisdictions. On February 28, 2003, President Bush signed HSPD 5, *Management of Domestic Incidents*.” Like the previous documents, HSPD 5 directs federal agencies to take specific actions as a result of domestic incidents; however, it is not limited to acts of terrorism. Rather, it includes “major disasters and other emergencies,” which previously have almost always been the exclusive purview of state and local jurisdictions and the private sector until federal assistance was requested by the Governor of a State. ⁸

HSPD 5 requires the Secretary of Homeland Security to develop and administer a national incident management system to

provide a consistent nationwide approach for Federal, State, and Local governments to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size or complexity. To provide for interoperability and compatibility among federal, state, and local capabilities, the NIMS includes a core set of concepts, principles, terminology, and technologies covering the incident command system; multi-agency coordination systems; unified command; training; identification and management of resources (including systems for classifying types of resources); qualifications and certification; and the collection, tracking, and reporting of incident information and incident resources.” ⁹

Staff reports and testimony concerning the 9/11 World Trade Center response, introduced during public hearings of the “National Commission on Terrorist Attacks Upon the United States”, (better known as the 9/11 Commission) present a compelling

⁸ Homeland Security Presidential Directive 5, on-line at <http://www.whitehouse.gov/news/releases/2003/02/20030228-9/html>, paragraph (3).

⁹ Homeland Security Presidential Directive 5, on-line at <http://www.whitehouse.gov/news/releases/2003/02/20030228-9/html>, paragraph (3).

argument for a national incident management system.¹⁰ Congress, through the Homeland Security Act of 2002, mandated that there will be both a national response plan and a national incident management system.¹¹

Even if current state and local plans were near-perfect, response and recovery plans must now be rewritten to accommodate the requirements of the NIMS as mandated by the NRP and Homeland Security Presidential Directives. Jurisdictions that currently use the ICS, including Unified Command, will find significant differences in the application of resource management under the NIMS Multi-Agency Coordination System. Also, jurisdictions will have to train and certify all personnel who have a role in response and recovery operations to meet NIMS standards. This NIMS-required certification extends well beyond the firefighter, medical responder, and law enforcement professionals who routinely make up the first responder community. It will require the training and certification of health care providers, utility emergency response personnel, private sector volunteers active in disasters, and many others. Additionally, there will be various levels of training and certification for each category of responder.

Most state and local firefighting officials know how to implement basic ICS in response to local emergencies and disasters. Yet few jurisdictions have successfully applied ICS and the Multiagency Coordination System to manage the EOC or to manage major disaster “recovery” operations.¹² Where response operations may take a few hours or a couple of weeks, major disaster recovery operations routinely take years to complete. It took Great Britain nearly a year to recover from the 2001 FMD outbreak. Can rural governments maintain the manpower requirements of ICS in a long-term recovery operation?

The following chapters will determine how FMD might be employed in an agrobioterrorism attack against the United States. This thesis will also look at the challenges

¹⁰ “Emergency Preparedness and Response,” Staff Statement Number 13 presented to the eleventh public hearing of the National Commission on Terrorist Attacks Upon the United States, May 18-19, 2004, on-line at www.9-11commission.gov/hearings/hearing11.htm.

¹¹ “Homeland Security Act of 2002,” H.R. 5005, One Hundred Seventh Congress of the United States of America at the Second Session, Section 501(3) and (5), January 23, 2002.

¹² Personal interviews of State Emergency Management Directors attending annual conferences of the National Emergency Management Association (NEMA), 1995 - 2003.

that were faced by Great Britain during the FMD outbreak of 2001 to see how the spread of the disease affected an entire nation and its response organizations. Great Britain's experiences have already affected many of the response and recovery strategies of federal agencies in the United States. Therefore, this thesis will attempt to find strategies that might help state and local governments with such a response in an NIMS and NRP environment.

II. FOOT AND MOUTH DISEASE: AN IDEAL TERRORIST BIOWEAPON

A. PURPOSE

Because the United States has not experienced Foot and Mouth Disease (FMD) since 1929, many of the skills required by the private sector to quickly diagnose and respond to an outbreak may no longer exist. The investigation of animal disease, including Foot and Mouth Disease (FMD), is a highly technical field that requires years of dedicated study best left to veterinarians and epidemiologists. However, recovering from such an outbreak would require a coordinated, multi-disciplinary response that is heavily dependent on local, tribal, state, and federal agencies and the private sector.

A terrorism-induced FMD outbreak is used in this thesis to examine the impact of implementing newly established federally mandated response management programs on rural and tribal communities and states. Any major hazard could have been used to drive this study. However, FMD was chosen because it is a low tech – high impact potential weapon with which to attack the economy of the United States. As such, it may be an ideal bioweapon for use by terrorists, including al Qaeda which has a history of using highly effective, nontraditional weapons against democratic nations. The term low tech – high impact, as used herein, means that few if any technical resources, intricate weaponry, or special knowledge is necessary to mount an attack resulting in significant casualties to people, critical infrastructure, or the economy of a target country.

Although any individual or terrorist group could initiate an attack using FMD as a bioweapon, it is noted that “al-Qaeda has repeatedly stated its intention to conduct economic warfare against the United States,” and that they have “explicitly endorsed the acquisition and use of biological agents to undermine U.S. interests (in whatever manner is possible) as a religious duty for all “true” Muslims” (Chalk, 2004). Using the lessons learned from 9/11, we cannot afford to wait until after an attack to connect the dots that may be used in asymmetric warfare. Rather we must now expand the awareness of state and local public and private sectors as to the potential threat that agroterrorism represents.

As used herein, FMD is best characterized as a catalyst. Its purpose is to drive situations that will facilitate the analysis of the effects of implementing the National Response Plan (NRP), the National Incident Management System (NIMS) with its revised Incident Command System (ICS), the Multi-Agency Coordination System, and peripheral federal response and recovery programs. This chapter explains how FMD could be imported and deployed as a terrorist bioweapon. Understanding how the virus can be introduced and deployed is an essential planning element with which to develop strategies for prevention and preparedness.

B. WHY USE FMD AS A BIOWEAPON?

Foot and Mouth Disease (FMD) is one of the most contagious viral diseases on the face of the earth. Merely walking through an infected field in one part of the world could result in the infection of livestock in an entire region or nation in another part of the world by transporting the sub-microscopic FMD virus on shoes and clothing. The virus affects cloven-hoofed animals including cattle, sheep, goats, and swine. An outbreak of FMD represents a threat not only to domesticated farm animals, but also to some types of wildlife such as bison, deer, antelope, reindeer, llama, camel, giraffe, and elephants. The disease is characterized by fever, vesicular lesions, and, subsequent erosions of the epithelium (where the skin meets mucous membranes)¹³ of the mouth, tongue, nares (nostril openings), muzzle, feet, and teats.¹⁴

The FMD virus is environmentally hardy. It is a picornavirus (a single-strand RNA virus with a protein coat) preserved by refrigeration and freezing temperatures and which can survive temperatures over 120 degrees Fahrenheit. It thrives in a pH factor (acidic – alkaline factor) between 6.0 and 9.0 and persists unaided in the environment for about one month. The virus is disseminated by direct and indirect contact. Contaminated animals, people, clothing, vehicles, farm implements, and other vectors can carry the virus around the globe. The virus has been carried by wind currents about 35 miles over land, and over 185 miles over the sea in temperate zones (Sutmoller et al, 2003).

¹³ Dr. Radford Davis, DVM, MPH, DACVPM, where the skin meets mucous membranes is called the mucocutaneous junction. FMD likes rapidly growing cells of mucous membranes and of the mucocutaneous junction.

¹⁴ Eyre, Kendal, DVM, FMD Awareness Presentation, October 2001.

FMD is attractive as a terrorist bioweapon because it represents almost no direct physical threat to people.¹⁵ Just as FMD represents no risk to human victims, neither does it present a risk to the user-attacker. While the use of chemical, radiological, nuclear materials, and most biological agents would require the attacker to know and use expensive and complex containment procedures and personal protective equipment, FMD requires no such procedures, equipment, or special handling. The FMD virus can easily be carried on the person without fear of self-infection. Moreover, there is no need for user-attackers to have an advanced understanding of the science of animal diseases.

C. SMUGGLING THE FMD VIRUS INTO THE UNITED STATES

Books and articles dealing with Foot and Mouth Disease generally fail to identify methods by which the FMD virus could be covertly brought into the United States for use as a terrorist bioweapon. Even the U.S. Department of Homeland Security's draft Universal Task List (UTL) (for response to weapons of mass destruction events) takes it for granted that terrorists will successfully transport the virus past officials at one of the nation's many points of entry. Universal Task List (UTL) Scenario XIV, "Foot and Mouth Disease" says, "In late October, UA teams enter the U.S. and risking detection, they infect farm animals at specific locations."¹⁶ It is understandable that the Federal government would not want to describe specific methods that potential terrorists could employ to thwart U.S. Agricultural and Customs Inspectors at ports of entry. However, it is equally important that lawmakers, policymakers, and responders understand that there is little likelihood that terrorists carrying the virus would be detected at our nation's borders. There is even less chance of being caught with the FMD virus while traveling throughout the interior of the country. Because the FMD virus is sub-microscopic, it is not easily identifiable except under the most exacting circumstances.

One such bioterrorism scenario would be for terrorists to drain the FMD contaminated liquid from vesicles (small blisters filled with clear fluid) from infected

¹⁵ Dr. Radford Davis, DVM, MPH, DACVPM and multiple other sources, although FMD is zoonotic, there have only been about 40 cases worldwide of people having contracted the disease.

¹⁶ Initial Draft Universal Task List, U. S. Department of Homeland Security, released for comments by state and local entities in August 2004. Newer versions of the UTL may not use the same scenario.

animals in one or more of the over 30 countries where FMD is resident.¹⁷ Placing the liquid with the FMD virus in a bottle labeled as a prescribed medicine in checked luggage, a disenfranchised American,¹⁸ foreign terrorist, or sympathizer, would likely pass inspection at a port of entry. Where numerous individuals are attempting to bring the virus into the United States for a combined coordinated attack, bottles would likely be labeled differently to ensure that there would be no common denominator for inspectors to look for at various entry ports. A small box with a dozen bottles containing FMD labeled as some non-suspicious product could be shipped through the mail system to introduce a sufficient supply of the virus for a nationwide attack. The only point being made here is that importing the Foot and Mouth Disease virus past U.S. Agricultural and Customs Inspectors is limited only by one's imagination. There is almost no chance of detection.

Attempts to develop screening tools for the detection of the FMD virus have not been particularly successful. According to research conducted by Kenneth Brian Whitt, "Tetracore Inc. has developed a PCR-based assay for FMD, in which the 3D-RNA polymerase gene can be amplified and detected within an hour.¹⁹ This may be helpful when transporting and importing live animals, but it would be of no value for detecting the FMD virus in checked luggage, air cargo, shipboard containers, or through the various mail or package delivery systems.

D. FMD DEPLOYMENT STRATEGIES

Food and agriculture were not designated as national critical infrastructure resources to be protected from terrorist attack until February 3, 2004 when the President signed Homeland Security Presidential Directive 9. The directive states "America's agriculture and food system is an extensive, open, interconnected, diverse, and complex

¹⁷ Presentation by Kendal Eyre, DVM, Veterinary Medical Officer, State of Idaho, October 1999.

¹⁸ The term "disenfranchised American" seeks only to explain that an individual attacker or supporter of a coordinated FMD attack need not be foreign-born. It is based in the belief that a citizen who is well engaged in the American dream would not be predisposed to conduct a bioattack on his/her country or community.

¹⁹ Kenneth Brian Whitt, *Terrorism: Foot and Mouth Disease as an Option*, U.S. Army War College, April 2002, pg 13.

structure providing potential targets for terrorist attacks.”²⁰ That description is an accurate portrayal of the enormous complexity that confronts planners tasked with designing emergency plans to protect the nation’s food supply. It would be virtually impossible to protect every farm and ranch in the nation. Understanding that terrorists would likely want to create geographically widespread infection among diverse populations of cattle and other animals, we may be able to formulate plans based on “network theory” to reduce the risk.

Terrorism analysts have developed a number of scenarios that outline the introduction of biological agents, including FMD, inside the United States. The one constant in each of the FMD scenarios is public access. In Volume One of his book “Critical Infrastructure Protection in Homeland Security,” Ted Lewis introduces the reader to the concept that “critical infrastructure can be understood, analyzed, and then protected using an approach called network theory.”²¹ Without going through the complexities of the analysis proposed by Dr. Lewis, it should be said that the greatest vulnerabilities to any networked infrastructure is where “critical links connect major pieces of a network to one another.” In the agriculture and food infrastructure (where the FMD virus might be used to attack susceptible farm animals) those critical links include feedlots and stockyards, and places to which the public has access such as fairgrounds.

Open fields and rangeland represent the highest potential because they are easily accessible with little chance that the attacker would be detected. But open fields also represent the lowest probability for a successful coordinated attack because (depending on their location) they may not produce the desired widespread infection within the required timeframe. The more isolated the herd, the more opportunity there is for stopping or limiting the infection to a particular geographic area. There is no guarantee that the targeted animals would wander into the infected area, especially on rangeland. In other words, you don’t get the most bang for your buck by infecting isolated fields. Stockyards and feedlots represent a much higher potential opportunity for successfully spreading the FMD virus because of the confluence of animals transported to and from

²⁰ Homeland Security Presidential Directive / HSPD-9, The White House, Office of the Press Secretary, February 3, 2004.

²¹ Ted G. Lewis, Ph.D., Critical Infrastructure Protection in Homeland Security: Defending a Networked Nation, Volume One, Naval Postgraduate School, Monterey, CA, 2003.

farms and ranches. Slaughterhouses and processing facilities are better protected from unauthorized entry and public access than they used to be. Sales barns, feedlots, fairs, and agricultural expositions, however, represent significant vulnerabilities.

There are literally thousands of fairs and expositions held throughout the United States each year. By personal observation, many fairground rules require animal owners to have someone remain with animals while there is public access to the fairgrounds and subsequently to barns and paddocks. However, also from personal observation, this rule is rarely enforced in the dog days of summer and in the last days of the fair or exposition. It would be easy for terrorists to visit selected fairs and animal expositions throughout the nation (within a five day window)²² for the purpose of sprinkling a pocket full of infected grain into feed troughs or on the floors of barns or pouring liquid extracted from infected animal vesicles into numerous water troughs in fairground barns and paddocks. Using the five day window to conduct attacks in multiple states would ensure that the disease would not be discovered until after the animals have been auctioned and sold (the general purpose for raising and exhibiting farm animals at fairs and expositions) or when they have been returned to their home rangeland, fields and pastures.

Because of the close association of animals in barns and paddocks during a fair or exposition, the airborne virus would affect a significant number of animals. People and animals tracking through barns and paddocks would similarly track the virus over an even wider area. Animal owners would unwittingly spread the disease as they display their animals and as they visit other sites on the fairgrounds. The public would similarly spread the virus through the fairgrounds as they visit animal exhibitions. Upon leaving the fair, they would carry the virus into communities, farms, and ranches.

Another scenario would have the attacker seek employment with the fair or exhibition as a grounds-keeper. Using a common sprayer (allegedly spraying for the control of flies) the terrorist could spray the FMD virus throughout barns, show areas, and paddocks without raising concern of the animal owners or fair management.²³

²² There is no special significance in using a five day window other to ensure that the infection would spread to different regions of the country simultaneously thereby requiring a massive expenditure of response resources at the local, state, and federal levels. A five day window is envisioned by the writer as providing a probability of maximum effect within a specified period of time.

²³ Scenario provided by Dr. Bruce Anderson, DVM, PhD., September, 2004.

E. TERRORISM, LIKE ANY DISASTER, IS A LOCAL ISSUE TOO

FMD is not a human killing machine as are smallpox and other types of biological and chemical agents. This is an extremely important point in the argument for the use of FMD as a terrorist bioweapon because, theoretically, some terrorist groups ultimately have political agendas. Davis and Jenkins wrote, “It must also be recognized that portions of the Arab-Islamic world have long lived with traditions in which power is fundamental and violence, including terrorism, is a routine part of gaining and maintaining power.”²⁴ However, terrorism is not limited to the Arab-Islamic culture. Davis and Jenkins also wrote, “In the future, the United States may be attacked by nonstate actors, such as émigrés with loyalties to their original nation...”²⁵ If terrorists are to win their political agendas, either within or outside of their nation states, they theoretically risk losing support base acceptance by using weapons of mass destruction that disfigure, maim, and kill large segments of national and international societies. For terrorist groups with political agendas, FMD is thus an ideal bioweapon for attacking local, state, and national economies.

F. THE TARGET IS THE NATIONAL ECONOMY

The primary purpose for the use of FMD as a bioweapon would be to attack the local, state, regional, and national economy.²⁶ In one swift blow, the U.S. would lose its FMD-free status, resulting in severe monetary consequences in the world’s marketplace. Such an attack would also seriously affect food-related businesses and employment within the United States.

In his book “Beyond Fear,” Bruce Schneier argues, “We must take the economic and social components of any (terrorist) attack into account when we try to understand the threats. And an actual terrorist attack isn’t even required: Even the vague threat of

²⁴ Deterrence & Influence in Counterterrorism, Davis and Jenkins, RAND Corporation, page 13.

²⁵ Ibid.

²⁶ Kenneth Brian Whitt, *Terrorism: Foot and Mouth Disease as an Option*, U.S. Army War College, 9 April 2002, pg 6.

terrorism is enough to cause some fear and affect the economy. The first time the U.S. threat level was raised to Orange, the stock market declined sharply.”²⁷

Peter Chalk noted that “Agriculture and the food industry in general are important to the social, economic and, arguably, political stability of the United States. Although farming directly employs less than 3 percent of the American population, one in eight people works in an occupation that is directly supported by food production... such as suppliers, transporters, distributors, and restaurant chains.”²⁸ Whereas the attacks on the World Trade Center and the Pentagon affected several thousands of people, an attack on the nation’s food supply using the FMD virus has the potential for directly affecting millions of U.S. citizens, as well as people, businesses, and industries around the world.

Kenneth Brian Whitt, while doing research on Animal Biological Terrorism (ABT) at the U.S. Army War College wrote, “The real threat to any state faced with ABT is the potential economic collapse of a locality, region, or even the entire country. How can this occur from FMD? The infection of a large number of cattle would threaten our very existence, not just our pocketbooks. The meat industry would be devastated. Each associated market, like trucking, meat packinghouses, wholesalers, retailers, tallow markets, leather markets, and exports, would have trouble or even complete disaster. Other secondary businesses and manufacturers like restaurants, shoes, clothing, automobile, fuel, and animal food manufacturers could crash.”²⁹

An attack using FMD need not intentionally target the economy, but the results of such an attack would nonetheless adversely affect the economy as if it were the primary target. Its motivation could be as simple as wanting the populace to stop eating meat. Leaders of the organization, People for the Ethical Treatment of Animals (PETA) greatly concerned public officials and angered many citizens in the United States in 2001 by saying that foot and mouth disease is “something we would welcome in this country for

²⁷ Bruce Schneier, “Beyond Fear: thinking sensibly about security in an uncertain world,” Copernicus Books, New York, 2003.

²⁸ Peter Chalk, *Hitting America’s Soft Underbelly: the potential threat of deliberate biological attacks against the U.S. agricultural and food industry* (The RAND Corporation, Santa Monica, California) 2004, pg 4.

²⁹ Kenneth Brian Whitt, *Terrorism: Foot and Mouth Disease as an Option*, U.S. Army War College, 9 April 2002, pg 6.

the positive effects on animals.” Andrew Butler, a spokesman for PETA, called farmers and ranchers “terrorists,” because of the way they earn their living. Butler said that since making the comment, Friedrich (who actually made the comment) and PETA have been labeled as terrorists, but the organization has no intention of committing any terrorist act that may endanger American livestock.”³⁰ Canadian citizens also took note when the Canadian news media reported that “Leaders of the world’s most vocal animal rights group say they hope foot-and-mouth disease infects North American herds...”³¹ Although PETA has stated that they would not commit such an attack, there is no guarantee that an anonymous, but more zealous individual member would be so restrained.³²

We dare not rely solely on the hope of an eventual political resolution. Since the attacks on the World Trade Center and the Pentagon, Bali and Spain, and now the killing of over 350 children and adults following a hostage-taking in a Russian school, some might argue that terrorists seem to have raised the ante. Muslim extremists have proven that not all terrorist groups are interested in a political resolution to what they perceive to be religious issues. We must be prepared to respond to all types of terrorist threats, no matter how unlikely the general public may perceive those threats to be at this time. That same general public will not be so forgiving of its officials and leaders if they are not prepared to respond to future attacks; either traditional or asymmetric.

G. TESTING THE IMPACT OF NEW RESPONSE PROGRAMS

It is important to understand the limitations that exist for preventing a determined individual or group from introducing the FMD virus into the United States. It is through that understanding that public and private entities can begin to facilitate new planning to

³⁰ Jason Pierce, *Ag Secretary “Disturbed” by PETA Remarks on Foot and Mouth*, CNSNews.com, August 28, 2001, www.cnsnews.com/ViewPrint.asp?Page=\Nation\archive\200108\NAT20010828a.htm accessed August 14, 2004.

³¹ Kelly Cryderman, *The Ottawa Citizen*, *PETA would welcome foot-and-mouth outbreak*, April 4, 2001, www.organicconsumers.org/madcow/4401cryderman.cfm, accessed August 14, 2004.

³² PETA believes that animals deserve the most basic rights—consideration of their own best interests regardless of whether they are useful to humans. PETA states that animals are capable of suffering and have interests in leading their own lives; therefore, they are not ours to use—for food, clothing, entertainment, or experimentation, or for any other reason. (About PETA, on-line at www.peta.org, accessed September 18, 2004).

improve prevention and readiness techniques. This chapter has endeavored to explain hypothetical scenarios that could be employed for a successful penetration of our nation's current preventive barriers. Until better prevention techniques are manufactured or developed, it is just as important (some would argue that it is more important) that entities develop adequate response and recovery plans and programs.

The U.S. Department of Homeland Security has, through the National Response Plan, the National Incident Management System, and the draft Universal Task List (UTL) assembled a response structure that incorporates the public and private sectors at the local, tribal, state and federal levels. In order to measure the impact of those programs on State and local entities, this thesis will drive response and recovery options by assuming the following elements: *terrorists' have infected five different fairs or animal expositions in five different regions of the United States with the FMD virus within a five day period in late August.*

III. COMPARING BVA LESSONS LEARNED WITH U. S. RESPONSE PLANS

A. EVALUATION METHODOLOGY

The writer identified at least 40 issues raised by the British Veterinary Association (BVA) in its publication of lessons learned.³³ Examining issues raised by the BVA allows U.S. emergency planners, responders, and policymakers the opportunity to determine how governmental agencies and private organizations might best meet similar challenges, should they occur in the United States.

Although the evaluation of British lessons learned can provide insight into their FMD response, it must be recognized that there are significant differences between the United Kingdom and the United States – differences that U.S. planners must consider when developing response policy. For example, there is the difference of size. The combined United Kingdom is about the size of the State of Oregon. Farms in the United Kingdom tend to adjoin one another, and the animals from one farm are usually in close proximity to animals of adjoining farms. Herds are generally separated by stone walls or fences. This “patchwork” of agricultural facilities creates an ideal setting for the aerosol transmission of the FMD virus.

Vast distances between herds in the Western United States provide some opportunity for isolating infected animals and eliminating the outbreak before its spread can become a nationwide epidemic.³⁴ However, isolation can only be effective if the disease is discovered before infected animals have been transported to feedlots, slaughterhouses, public exhibits, and other ranches or farms. Preventing the spread of the virus under these circumstances significantly depends on whether biosecurity measures were adequate at each facility.

While vast distances between herds would seem to be a planning strong point, it is also a weakness because if a regional outbreak should occur, a greater number of response resources would be required to deal with the disease over larger distances.

³³ “FMD: the Government publishes its evidence to the Lessons Learned inquiry as the BVA submits its own evidence,” News and Reports Section of *The Veterinary Record*, March 30, 2002, pg 390-392.

³⁴ Under the right conditions, one infected animal can result in a nationwide epidemic.

Those larger distances would also likely mean that more levels of government would be involved in response and recovery operations. Multi-jurisdictional response would facilitate the need for Unified Command and Multiagency Coordination, response management tools used in the National Incident Management System (NIMS) and National Response Plan (NRP). It is questionable whether state and local jurisdictions can actually implement either Unified Command or Multiagency Coordination, as described in NIMS, in a Foreign Animal Disease (FAD) eradication scenario.

B. EVALUATING BRITISH LESSONS LEARNED FOR USE IN U.S. PLANS

1. Preparedness

Of the issues that were raised by the BVA, many of the perceived failures were related in one way or another to preparedness. Specific issues (*boldfaced*) that were raised by the BVA include the following:

(a) **The State Veterinarian Service (SVS) will never be adequately resourced to cope with an outbreak of this scale (2001 FMD outbreak in Great Britain) unaided. The level of veterinarians to cope with the FMD outbreak was inadequate. Local veterinarian inspectors must be recruited and trained in case a FAD outbreak occurs. Recruitment procedures must be determined and rehearsed in advance of a disease outbreak.**

(1) The USDA's Animal and Plant Health Inspection Service (APHIS) and the Veterinary Service (VS) (the lead U.S. federal agencies for response and recovery from FAD outbreaks) will, like their British counterpart, the SVS, never be adequately resourced to cope with a catastrophic FAD outbreak unaided. Therefore, the U.S. must have a mechanism with which to quickly recruit, train, and deploy qualified personnel to manage and respond to a catastrophic FAD outbreak. A fundamental recruiting and training mechanism is currently in place at state and federal levels.

(2) Within the National Disaster Medical System (NDMS), a subdivision of FEMA in the U.S. Department of Homeland Security, resides the *Veterinary Medical Assistance Team (VMAT)* program. VMATs are volunteer teams of veterinarians, technicians, and support personnel, usually from the same region, who have organized a response team under the guidance of the American Veterinary Medical

Association (AVMA) and the NDMS, whose personnel have specific training in responding to animal casualties and/or animal disease outbreaks during a disaster.³⁵ VMATs were organized in the mid-1990's, mainly for response to natural disasters. However, a Memorandum of Understanding between the AVMA and the USDA allows VMATs to be used in response to FAD outbreaks, including a terrorist-introduced outbreak of FMD.

(3) In 1999, the USDA established the *National Animal Health Emergency Response Corps (NAHERC)* program as an adjunct emergency response supplementary program to work with federal animal health personnel during FAD outbreaks. NAHERC provides the basic framework with which to mobilize personnel (not just veterinarians) as temporary federal employees to respond to national and international Highly Contagious Disease (HCD) outbreaks, including FMD. NAHERC teams can also be activated and deployed to assist State Veterinary Reserve Corps programs.

(4) Some states, partially funded by USDA grants, have created *Veterinary Emergency Response Teams (VERTs)*, made up of private practice veterinarians and technicians to supplement state and federal response to animal health emergencies. In Idaho, volunteer team members receive training in a variety of subjects including the NIMS and response techniques for numerous animal health diseases. Idaho veterinarians and technicians are currently compensated for training from USDA grant funding. Also, training may result in credit as Continuing Education.

(5) Although the NAHERC program provides an avenue for recruiting, training, and deploying personnel for national and international response to Highly Contagious Diseases, it is doubtful that either the NAHERC or state level teams currently have an adequate number of qualified personnel to meet the requirements for

³⁵ Definition of a VMAT found at www.fema.gov/preparedness/resources/health_med/vmat.htm last accessed on December 24, 2004.

both response and recovery from a nationwide FMD outbreaks.³⁶ Furthermore, it is questionable how long Veterinarian Emergency Response Team members could afford to stay away from established private practices to aid state and federal responders.

(b) Private practitioners should be adequately recompensed for any assistance they provide to the government.

(1) According to the USDA's response strategies for the eradication of Highly Contagious Diseases (HCD), "The overall goal for response to an HCD is to detect, control, and eradicate the HCD agent as quickly as possible to return individual farms to normal production and the United States to disease free status. The response target time to accomplish this goal should be four months or less, as response efforts become more difficult to maintain after such a period of time. If the country cannot return to free status within 12 months of the start of the outbreak, then the focus of the response activities will switch from emergency eradication activities to a national disease elimination program similar to other domestic disease eradication programs (e.g., tuberculosis and brucellosis.)"³⁷

(2) VMATs are volunteer programs. However, during an animal health emergency, VMAT volunteers might be compensated under FEMA's Disaster Assistance Employee (DAE) program.³⁸

(3) Although there is currently no provision for compensating state VERT volunteers during an animal health emergency, the USDA could designate volunteers under the state programs to be compensated under the NAHERC program. NAHERCs were designed to recruit, train, deploy, and compensate volunteer members as

³⁶ On October 15, 2003, Dr. Peter J. Fernandez, Associate Administrator, USDA, APHIS, presented *APHIS Initiatives for Food and Agriculture Biosecurity – Homeland Security*, in which he states that "there is a cadre of over 500 foreign animal disease diagnosticians in the U.S..." A copy of the presentation was found on-line at <http://intlforum.tamu.edu/Fernandez.htm> which was last accessed on 1/15/2005. Like any program that uses volunteers, it is unlikely that all 500 diagnosticians would be available when called. Furthermore, it is unlikely that volunteers would be available from 4 to 12 months, which are the USDA defined target periods for recovery from Foot and Mouth Disease.

³⁷ "Response Strategies: Highly Contagious Diseases," National Animal Health Emergency Management Guidelines, U.S. Department of Agriculture, November 7, 2003, page 8.

³⁸ A Disaster Assistance Employee (DAE); is a nonpermanent, excepted service employee appointed under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended. Further information may be found at www.fema.gov/ehp/employopps.shtml, which I last accessed on January 18, 2005.

temporary federal employees during a national and international animal health emergency response, and as such, the mechanism for compensation is in place. It is unknown whether the USDA or APHIS has actually considered incorporating and compensating State VERT members as NAHERCs.

(4) Contact with APHIS indicates that a newly licensed veterinarian would be paid at grade GS-9 while an experienced veterinarian would be paid at the GS-13 grade level.

(5) Within each grade there are stepped increases. A GS-9 typically would start at step one (\$35,519 annually in 2003) but that could be increased to any one of ten steps with a pay of over \$46,100 according to the 2003 Pay Schedule. An experienced veterinarian at GS-13 step one would be paid \$61,251 annually, but that rate could be raised by steps up to step ten at a wage grade level of over \$79,600 annually according to the 2003 Pay Schedule.³⁹ It is expected that the 2005 Pay Scale would be slightly higher.

(6) Even with compensation, it is questionable whether private practice veterinarians could afford to be away from their practices from four to twelve months.

(c) **Levels of expertise should be employed where they can be most effective.**

(1) U.S. plans at the federal level do not currently identify the level of skills that would be needed to adequately manage and staff HCD response and recovery activities for a period of 4 to 12 months.

(2) A review of numerous state plans indicates that they do not identify levels of skills that could be filled with adjunct veterinary staff for prolonged HCD response and recovery operations at the state or local level.

(d) **There should be a Territorial Army-style reserve.**

(1) The British Territorial Army is similar to the U.S. Army National Guard. It has roles both in “defense of the nation as an element of the British

³⁹ The Federal Pay Scale was viewed on-line at www.jobsfed.com/ipaysched.htm, which was accessed on December 28, 2004.

Armed Forces and it serves local communities in times of need.”⁴⁰ The BVA recommended that Great Britain create a veterinary reserve corps based on the Territorial Army model to deal with the logistics requirements of a widespread FMD response.

(2) The U.S. has a system in place to deal with response and recovery for major emergencies and disasters, including animal health emergencies, that incorporates the use of the military during state and federally declared disasters. The U.S. Army and Air National Guard can be used during a state-declared major emergency or disaster. Although a National Guard Unit could not fill a veterinary mission, many of the support roles, could be conducted by non-federalized (Title 32) National Guard units. Where VMATs, State VERTs, and NAHERC units would likely be the primary conduits to fill volunteer veterinary and technician personnel response requirements, the National Guard in most states can staff the State Emergency Operations Center, provide transportation for human and material resources and conduct on-scene security when requested by local law enforcement. These are traditional missions for the National Guard in a state-declared emergency or disaster. Under Department of Defense (DOD) Directive 3025.1, Military Support to Civil Authorities, the Secretary of Defense can order the use of federal DOD personnel to assist states in a federally-declared disaster.⁴¹

(3) On March 17, 2003, using resources within her own department, (those of the U. S. Forest Service) USDA Secretary Ann Veneman directed all agencies of the USDA to implement the National Interagency Incident Management System (NIIMS), which is commonly known in the emergency management and wildland fire circles as “the two-eyed NIIMS.”⁴² The two-eyed NIIMS was born out of the need for interagency and logistical coordination during wildfires in the Western United States. It was created by participating fire agencies, including the U.S. Forest Service, through a project known as Firescope (**F**Irefighting **RES**ources of **C**alifornia **O**rganized for **P**otential

⁴⁰ An explanation of the British Territorial Army can be found at www.ta.mod.uk/ta_what_is.html, which was last accessed on December 24, 2004.

⁴¹ DOD Directive 3025.1, Military Support to Civil Authorities (MSCA) 01/15/2993, may be viewed on-line at www.dtic.mil/whs/directives/corres/html/30251.htm. The directive was viewed on-line on January 18, 2005.

⁴² Ann M. Veneman, Secretary of Agriculture, *Department-wide Implementation of the National Interagency Incident Management System*, Secretary’s Memorandum 1800-1, dated March 17, 2003.

Emergencies).⁴³ Firescope specifically provides a mechanism for interagency and logistical coordination and management known as the Incident Command System (ICS), which along with the NIIMS Multiagency Coordination System (MACS), has been adopted by many of the nation's firefighting agencies.

(4) A year later, on March 1, 2004, the U.S. Department of Homeland Security mandated the use of the National Incident Management System (NIMS), known to many as the "one-eyed NIMS." It contains slightly different ICS and MAC models, providing "a consistent nationwide template to enable Federal, State, local and tribal governments and private-sector and nongovernmental organizations to work together effectively and efficiently to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity, including acts of catastrophic terrorism."⁴⁴ Coupled with the National Response Plan (NRP), which was implemented in January 2005, the two national plans are designed to fill the interagency and logistical coordination and management voids reported by the BVA as a result of the 2001 FMD outbreak in the United Kingdom.

(5) Prior to the requirement for all U.S. agencies and organizations to use NIMS and the NRP as an interagency and logistical coordination management tool, the USDA created AERO, Animal Emergency Response Organizations. The concept for the AERO was developed out of the National Animal Health Emergency Management System (NAHEMS), which was established in 1996. AEROs were designed to "expand the ability of the APHIS to respond to any animal emergency by developing locally based, nationally coordinated Animal Emergency Response Organizations (AEROs) at the State Level."⁴⁵ AEROs were specifically designed to manage a FAD response using the NIIMS ICS program for interagency and logistical coordination and consequence management. Now that the NIMS and NRP are for all intents and purposes the law of the land, USDA – APHIS and their state counterparts are working to develop an AERO

⁴³ See Firescope on-line at www.firescope.org/history.htm, which was last accessed on January 15, 2005.

⁴⁴ U.S. Department of Homeland Security, *National Incident Management System*, dated March 1, 2004, pg ix.

⁴⁵ U.S. Department of Agriculture, National Animal Health Emergency Management System Guidelines dated 11/06/2003, Administrative Procedures Guidelines, *Animal Emergency Response Organizations: Roles and Responsibilities*, produced by the Veterinary Services Unit of the Animal and Plant Health Inspection Service, pg 10.

Incident Management Team (AERO-IMT) in each state. Under State Veterinarian/USDA oversight, the role of the local veterinary volunteer is being expanded through County Animal Response Teams (CART) as well as the State VERTs.

(e) DEFRA needs to ensure that it has developed a sound relationship with private practitioners if volunteer practitioners are to assist the government in the future.

(1) Unlike the United Kingdom, the U.S. has a level of veterinarian programs at the state level which, along with the APHIS Veterinarian Service, maintains a close working relationship with local veterinarians. Both APHIS and veterinarians from state agriculture departments provide regular updates on pertinent animal disease issues and participate in state veterinarian association meetings.

(2) A closer relationship is developing between state and local veterinarians because of the infrastructure and training that states provide to Volunteer Emergency Response Teams. Volunteer programs and veterinarian association meetings provide the basis for sound relationships between private practice and governmental veterinarians, as recommended by the BVA.

(3) However close relationships may become, they will nonetheless be strained as governmental “stamping out” decisions impact the livelihood of affected meat producers and private veterinary practitioners during a widespread FMD response.

(f) Basic training in large animal disease management should be available for potential Temporary Veterinarian Inspectors (TVIs) from small animal practices at all times.

(1) Large animal emergency disease management is provided through the VERT program. In Idaho, that training is made available two or three times a year through the Idaho Department of Agriculture, Animal Industries Division and through APHIS as part of its veterinary accreditation training, and through other local training.

(2) Each VERT member (in Idaho) receives a USDA-produced set of Compact Disks (CDs) which provides information for recognition and response to FADs. The CDs are available if not actually provided to VERT members in other states

as well. Furthermore, training is available through association meetings. Whether a veterinarian chooses to take the small or large animal training is up to the individual veterinarian. On the national level, animal health emergency management is a common training topic at meetings of the American Veterinary Medical Association.

(g) The Government failed to understand the structure and nature of the livestock industry and their influence on the spread of the disease.

(1) The livestock industry in the U.S., like much of U.S. agriculture, has consolidated into large agri-businesses since the early 1900's. Although fewer people actually work in agriculture, more people derive an income from agricultural products and services. This is in contrast to the farms in Great Britain, many of which had not seen a veterinarian in years prior to the 2001 outbreak of FMD. U.S. agribusiness, especially in the livestock arena, is dependent on healthy animals; therefore, livestock producers remain in close contact with state and federal veterinarian services.

(2) USDA and State Departments of Agriculture are very aware of the structure and nature of the livestock industry and the influence that the industry, including individual producers, would have on the spread of FMD, should an outbreak occur.

(h) Contingency plans need to consider and plan for every eventuality. They must be reviewed on a regular basis and need to take into account changing legislation. Plans need to operate on two levels – national and local.

(1) USDA Emergency Management and APHIS have a number of plans for dealing with Foreign Animal Diseases including FMD. Those plans, just to name a few, include:

- Thinking Synergistically: A Multiagency Approach to Emergency Response
- Response Strategies: Highly Contagious Diseases
- Response Strategies: Vector-borne Diseases
- National Animal Health Emergency Response Plan For an Outbreak of Foot and Mouth Disease or Other Highly Contagious Diseases (NAHERP)
- The National Animal Health Emergency Management System (NAHEMS)
- Operational Guidelines: Emergency Communications Plan

- Draft Operational Guidelines: Biosecurity
- Draft Operational Guidelines: Personal Protective Equipment in Biologically Hazardous Environments
- Draft Operational Guidelines: Quarantine and Movement Control - Highly Contagious Diseases
- Draft Operational Guidelines: Appraisal and Compensation
- Operational Guidelines: Disposal
- Administrative Procedures Guidelines: Leaders Guide for Conducting Animal Emergency Response Using the Incident Command System
- Standard Operating Procedures: APHIS Emergency Operations Center
- Emergency Management Response System (EMRS)
- Facilities Guidelines: Zoos: Foot-and-Mouth and Other Highly Contagious Diseases
- Draft Dairy Industry Facilities Manual
- Radiological Emergency Manual for Livestock, Poultry, and animal products

(2) This list of plans is not exhaustive, nor does this list include those plans that have been classified For Official Use Only, Confidential, Secret, or Top Secret by the federal government. USDA emergency response plans are generally thorough and comprehensive. If there is any possible complaint about USDA – APHIS emergency planning, it would be the large number of plans that are published for response and recovery from a FMD outbreak. Personnel from other agencies, especially those agencies that would support a Foreign Animal Disease response, are not likely to have a working knowledge of many of the USDA – APHIS emergency plans and would therefore be overwhelmed by information overload during the initial response. It is difficult to believe that agencies outside the USDA are regularly reviewing each of the USDA – APHIS emergency plans as recommended by the BVA.

(3) The BVA was concerned that British planners did not consider changes to legislation. In the U.S., legislative changes can occur annually although not all levels of government commonly address legislation about animal health disease response. Casual interviews with emergency planners at the local, state, and federal levels failed to find anyone who consciously examined new laws and statutes to determine whether emergency plans should be altered for response to FMD.

(4) The BVA recommended that plans need to operate on two levels; national and local. In the U.S., plans need to operate on five levels; federal, state, local, regional, as well as international. Federal planners seldom consider state and local needs. They expect that state and local planners will tailor federal plans to meet their needs. However, such planning expectations breed misunderstandings because each jurisdiction has plans with different operational expectations. State and local plans are almost never sent to federal agencies for review. If they were, the federal agencies would have to consider revising their plans for each of the fifty states and seven trust territories.

(5) Even though the National Response Plan treats tribal governments as “local” jurisdictions, many tribal governments retain sovereignty and may therefore choose to deal with the federal government as a sovereign nation. This is especially true of a response and recovery in which the Stafford Act has been implemented through a federally declared major emergency or disaster.⁴⁶ Accordingly, tribal participation in a coordinated FMD response may require participating agencies and personnel to consider the tribe to be either a local entity or a seemingly international entity, based solely on the decision of tribal leaders.

(i) **Contingency plans were not effective; they** (the British Government) **underestimated the scale of the problem that FMD could cause.**

(1) USDA, APHIS and Veterinary Services personnel thoroughly understand the threat posed by a nationwide outbreak of FMD. They also understand that because the United States has not had an outbreak since 1929, there is little understanding on the part of state and local emergency planners, responders, and policymakers with respect to the economic implications of a widespread, terrorist-introduced FMD attack; nor do state and local personnel, outside of the veterinary profession, readily understand the resource requirements that would be needed to dispose of millions of animals; including some resources which may not be available in the affected state.⁴⁷ This lack of understanding (or the belief that such an attack is unlikely) at the policymaker level seriously affects appropriations for response agencies. Without appropriations to

⁴⁶ U.S. Department of Homeland Security, *National Response Plan*, dated December 2004, “Federal agencies can work directly with the tribe within existing authorities and resources,” page 9.

⁴⁷ As an example, coal is not a common resource in Idaho, but it is required for burning infected bovine.

adequately staff federal, state, and local emergency management offices, planning and preparedness are, by necessity, restrained to those hazards that occur more commonly within the jurisdiction.

(2) FMD scenarios similar to that used in this thesis are beginning to show up in various venues such as "Exercise High Stakes" and "Exercise High Plains Guardian," which were conducted by the National Agricultural Biosecurity Center at Kansas State University. However, an on-line state-by-state and a random community review of emergency plans revealed that only a few states and virtually no local entities have up-to-date plans for response to FMD.⁴⁸ Occasional exercises will not likely result in the level of planning that is needed to adequately respond to HCD outbreaks. In this regard, state and local entities are likely no better prepared than was Great Britain. Some states still allow high risk activities, such as feeding garbage to pigs; the alleged cause of the 2001 FMD outbreak in Great Britain. Although those inappropriate high risk activities potentially endanger the entire United States, a USDA source says that making those activities unlawful would merely drive the practice underground.

(j) **Legal powers to enter premises and slaughter animals must be clarified.**

(1) U.S. legal authorities were clarified by the Congress on May 13, 2002, by repeal of previous Animal Health and Quarantine laws and passage of Public Law 107 – 171, the Farm Security and Rural Investment Act of 2002, 116 Stat. 134.

(2) The new act gives the Secretary of Agriculture and the USDA broad authority and discretion to prevent, detect, control, and eradicate diseases and pests of animals.⁴⁹

2. Movement Control

(a) **The Government should have immediately implemented a countrywide ban on the movement of animals when the disease was discovered.**

⁴⁸ Many states have removed emergency response plans from the public view for security purposes.

⁴⁹ National Response Plan, Emergency Support Function 11b, Annex A.

Movement of cattle and sheep without a nationwide quarantine period was unacceptable.

(1) Clearly the principle issue raised by the BVA for response to the FMD outbreak was the need for an immediate nationwide stop movement of all animals once the initial case of FMD was confirmed. USDA personnel state that they recognize the need for a nationwide stop movement of animals in the initial stage of a response to FMD. They are predisposed to recommend that the Secretary of Agriculture issue such an order following the Plum Island confirmation of the presence of FMD anywhere in the nation.

(2) A review of U.S. Codes indicates that the Secretary of the Agriculture has the necessary authority to implement a nationwide stop movement of animals as a result of a HCD outbreak.⁵⁰ However, the Secretary has no personnel with which to implement and enforce such an order on the nation's highways or local roads. He/she must rely on other federal agencies, states, and even local law enforcement and transportation agency human and material resources to implement the USDA-issued stop movement order.

(3) Casual discussions with state and local law enforcement officials and transportation personnel regarding the implementation of a USDA-imposed nationwide stop movement order indicate that state and local entities are neither prepared nor ready to implement such an order. Most states and local entities have not anticipated the scope or cost of implementing a nationwide stop movement order, even for only 72-hours.

(b) (The Government should have) **Discouraged the large number of animal movements through the markets, both official and unofficial movements. Also, there were livestock movement issues once the nationwide ban was put in place.**

(1) A stop movement on all animals nationwide will affect thousands of sales barns across the country simultaneously. The cost to industry and state and local entities would be enormous; most likely in the millions of dollars, even for

⁵⁰ U.S. Code 8305 authorizes the Secretary of Agriculture to prohibit or restrict the interstate movement of any animal, article, or means of conveyance to prevent introduction or dissemination of any pest or disease of livestock.

just three days. Using the thesis scenario, it would be necessary to establish regional stop movement operations for extended time periods at a likely cost of billions of dollars in trickle-down effect.

(2) The Veterinarian Services component of APHIS conducts a National Accreditation Program, which authorizes local veterinarians to sign animal health and movement papers if they meet certain qualifications. Training provided by APHIS and State Departments of Agriculture encompass the entire emergency response including the authorization of moving animals, when authorized by USDA, during a FMD response operation. This is not likely practiced at the local volunteer veterinary level. The author could find no evidence that movement authorization forms, specific to animal movement during a FMD response, are pre-scripted or pre-staged at any level of government.

(c) **There were different rules for livestock movements in England, Scotland, and Wales.**

(1) While the United Kingdom is moving towards becoming a federalist nation-state, there were differences in stop movement rules between member countries. All U.S. states are guided by laws and rules set forth by the federal government regarding the movement of livestock when a federally-declared disaster results in a stop movement order.

(2) Although some states may not have FMD response plans, the federal rules for stop movement would apply uniformly across state boundaries. How the states would implement such a stop movement order within state boundaries might be left open to interpretation thereby increasing the probability of misunderstandings. Local entities would be most affected because of the cost of enforcing the stop movement order. One important effect would be the loss of patrol personnel to do routine police work within the jurisdiction. State and local officials might need to prioritize personnel requirements to staff stop movement patrols with law enforcement assistance calls within the community and county. Prudence would require that local and state entities determine in advance how they would implement a nationwide stop movement order so that they do not have officers from one state facing personnel from another state doing the exact same job at state ports of egress and entry.

(3) To reduce the potential for international misunderstandings in response to an animal health emergency, the U.S. periodically participates in planning and exercise workshops with Canada and Mexico. The Tripartite Functional Exercise of 2000 is one such example.⁵¹

3. Vaccination Issues

(a) Probably no single issue was so misunderstood by the public during Great Britain's FMD 2001 outbreak as was the issue of vaccination. It generated volumes for the print media and a substantial amount of air time for the electronic media. In a FMD outbreak, the use of vaccination does not mean that animals would not have to be euthanized. Rather, vaccination is a tool to contain the disease to a particular area. Once the virus has been contained, and it can be determined that disease is no longer spreading, all of the animals, those with the disease and those that were vaccinated, would be destroyed.

(b) On a national level, the decision regarding whether vaccination should be used as a tactic to eliminate FMD is currently based on economic recovery issues rather than medical/veterinary factors.

(1) There are two categories of FMD free status including: "FMD free country where vaccination is not practiced" and "FMD free country where vaccination is practiced."

(2) Should a FMD outbreak occur within the United States, it is the USDA's overall goal "to detect, control, and eradicate the HCD agent as quickly as possible to return individual farms to normal production and the United States to disease free status."⁵²

(3) In order to regain FMD free status following an outbreak, a nation that does not use vaccination as part of its response program must declare to the World Health Organization's Office of International Epizootics (OIE) that for a period of

⁵¹ "Tripartite Exercise 2000: Preliminary Report of the Functional Exercise, November 6-9, 2000" found on-line at www.nasda-hq.org/FMD/TestExerciseReport.pdf (NASDA is the National Association of State Departments of Agriculture) accessed on January 17, 2005.

⁵² "Response Strategies: Highly Contagious Diseases," National Animal Health Emergency Management Guidelines, U.S. Department of Agriculture, November 7, 2003, page 8.

12 months, there has been no FMD outbreak, no evidence of the FMD virus anywhere in the nation, and that no vaccination against FMD has been carried out.⁵³

(4) For a nation that does practice vaccination as a method of controlling FMD, that nation must certify that there has been no FMD outbreak for 24 months, no evidence of the virus anywhere in the nation for 12 months, and documented evidence that surveillance for FMD and the FMD virus and regulatory measures for the prevention and control of FMD have been implemented.⁵⁴

(c) Based on the above stated requirements, it would take an additional 12 months for a country that does practice vaccination to regain its FMD free status as compared to a country that does not use vaccination. In the world's marketplace, animals certified with FMD free status bring more money. People are reluctant to buy beef that is vaccinated with the FMD virus even though the virus used in vaccination is dead. In an industry where vaccinated beef can result in the loss of millions of dollars in exports in just one day, an extra 12 months would be devastating. Billions of dollars are at stake within those 12 to 24 months.

(d) In his paper "Agroterrorism: Betting Far More than the Farm," Dr. Roger Breeze, former Associate Administrator, Agricultural Research Service, USDA, states, "It is important to appreciate that government policies on how to respond to FMD are... purely financial and based on the estimates of the lowest costs that will ensure for animal agriculture as a whole (not for the whole rural economy). In the past, the U.S. and other FMD-free countries have rightly calculated that their greatest profit could be obtained by not vaccinating their herds against FMD, because this allows producers free access to world markets with their most profitable products and handicaps other countries that use vaccines." ⁵⁵

⁵³ Office International des Epizooties, Terrestrial Animal Health Code, 11th edition – 2003, Article 2.1.1.2 "FMD free country where vaccination is not practiced," found o-line at www.oie.int/eng/normes/mcode/A_00030.htm, which was accessed on September 7, 2004.

⁵⁴ Office International des Epizooties, Terrestrial Animal Health Code, 11th edition – 2003, Article 2.1.1.3 "FMD free country where vaccination is practiced," found o-line at www.oie.int/eng/normes/mcode/A_00030.htm, which was accessed on September 7, 2004.

⁵⁵ Roger Breeze, BVMS, PhD, MRCVS, *Agroterrorism: Betting Far More than the Farm*, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, Volume 2, Number 4, 2004 found on-line at www.biosecurityjournal.com/PDFs/v2n404/breeze.pdf, which was accessed on January 10, 2005.

(1) Dr. Breeze outlines another aspect of using vaccines to respond to FMD by saying, “There are seven different types of FMD virus and some 70 subtypes; thus, a vaccine against one virus type does not protect against another type, and even among the members of one type there may be sufficient differences that multiple vaccines are needed. In short, to protect against all FMD viruses, seven vaccines are insufficient and 70 would be too many. ...However, the U.S., which has no capability to manufacture FMD vaccines, faces the threat of deliberate introduction of any of up to 70 different viruses.”⁵⁶

(2) Dr. William White, at the Foreign Animal Disease Diagnostic Laboratory (FADDL) in Plum Island, says that while it is true that the U.S. relies on commercial overseas companies to manufacture killed FMD antigen vaccines, “Plum Island is also working on some very interesting adenovirus vectored vaccines with and without interferon that have been shown experimentally to work very well. When ready to go, these vaccines can be produced off Plum Island in the United States.”⁵⁷

(e) Regarding vaccinations, the BVA (in its lessons learned publication) stated, **the Government needs to develop marker vaccines to differentiate between infected and vaccinated animals.**

(1) As nations assess their FMD response and recovery programs, they are looking for ways to eliminate the FMD virus without having to destroy large numbers of animals, especially those that are not infected but which are in close proximity to known infected animals. However, the question of market value still looms large for vaccinated beef verses beef that is FMD free without vaccination.

(2) The position of the British Government regarding the use of vaccination in the 2001 outbreak was, “Vaccination has never successfully been used to respond to an outbreak of this scale anywhere in the world, and, if used widely, would have been a vast logistical exercise, and would have required greater stocks of vaccine

⁵⁶ Roger Breeze, BVMS, PhD, MRCVS, *Agroterrorism: Betting Far More than the Farm*, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, Volume 2, Number 4, 2004 found on-line at www.biosecurityjournal.com/PDFs/v2n404/breeze.pdf, which was accessed on January 10, 2005.

⁵⁷ Email from Dr. Brad R. LeMaster, USDA, APHIS Regional Coordinator, dated January 13, 2005.

than were, in fact, available.”⁵⁸ Bowing to public pressure, the decision was made to use vaccination to help control the virus in one section of Great Britain, but only on the condition that sectors affected by the disease concurred with its use. Failing to obtain the requested consensus, vaccination was not used.

(3) Subsequent to the 2001 FMD outbreak in Great Britain, Dr. Dirk Werling, at the Royal Veterinary College reported that he has “devised a novel vaccine delivery system for the vaccination of domestic animals, in particular cattle.” He stated that “the system specifically targets antigen-presenting cells thus making vaccination more effective.” He reports that “the system also enables the distinction between vaccinated and naturally infected animals.”⁵⁹

4. Euthanasia and Depopulation

(a) No issue was more emotional during the 2001 FMD outbreak in Great Britain than was the news media accounts of animals being destroyed. News media pictures of burning pyres flashed around the world for weeks. Dr. Breeze, former USDA Associate Administrator for the Agricultural Research Service, says that “traditional government responses to such an event – sweeping quarantines, mass slaughter and burning or burial of millions of carcasses under the ceaseless eye of television – together with staggering financial losses triggered by international trade embargoes are exactly what terrorists want to see and what makes these viruses potential biological weapons in the first place.”⁶⁰

(1) Dr. Breeze maintains that “as American agribusiness has industrialized, animal health officials have stubbornly clung to 18th century ideas of epidemic disease control, despite abundant recent evidence from overseas that in the American context, such medicine would guarantee catastrophe.” He continues by saying, “If we try to counter deliberate assaults the same way, after a successful attack it will be

⁵⁸ “FMD: the Government publishes its evidence to the Lessons Learned inquiry as the BVA submits its own evidence,” *The Veterinary Record*, News & Reports Section, pp 390-392, March 30, 2002.

⁵⁹ The Royal Veterinary College, University of London, *Novel Marker Vaccine Delivery System*, found on-line at www.rvc.ac.uk/Services/Commercialisation/Available_Technologies/Novel_Marker..., which was accessed on January 18, 2005.

⁶⁰ Roger Breeze, BVMS, PhD, MRCVS, *Agroterrorism: Betting Far More than the Farm*, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, Volume 2, Number 4, 2004, page 1, found on-line at www.biosecurityjournal.com/PDFs/v2n404/breeze.pdf, which was accessed on January 10, 2005.

the U.S. government, not a terrorist gang that is killing, burning, filling mass graves, and wreaking economic havoc nationwide.”⁶¹

(2) He also contends that, “Terrorist attacks on U.S. agriculture are not about imperiling our food supplies: they are about terror, money, mass slaughter, and funeral pyres all day every day on CNN and al Jazeera.”⁶² He recommends that the U.S. change its animal health emergency response strategy and methods. However, until response methods are changed, state and local governments and private organizations must be prepared to implement the strategies and methods in use today.

(b) The BVA reported that **the speed of slaughter is partially governed by the disposal process. The rationale on contiguous cull was not always clear. Policy on contiguous cull resulted in more animals being slaughtered than was necessary. The effectiveness of culling was hindered by the scale of the number of animals involved, legal challenges, and the lack of flexibility in the application of response plans. Increased rendering capacity must be made available. Modeling cannot be applied across the board to all situations. The Government must consider local knowledge and circumstances and veterinary considerations.**

(1) The dictum regarding the speed of slaughter provided by the BVA applies equally to the United States, but with the benefit of hindsight, state and local jurisdictions can prepare for the disposal process by mapping (with the aid of Geographic Information Systems) those areas where mass burial can be accomplished without affecting ground water. The USDA has done some mapping for just such a contingency; however, moving slaughtered infected animals’ over long distances to USDA-mapped and approved sites represents additional hazards. Having state and locally generated maps and pre-approved burial sites would aid in the speed of the disposal process.

(2) Mapping potential burial sites requires the collaboration of state and local officials from various agencies including the Departments of Agriculture,

⁶¹ Roger Breeze, BVMS, PhD, MRCVS, *Agroterrorism: Betting Far More than the Farm*, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, Volume 2, Number 4, 2004, page 1, found on-line at www.biosecurityjournal.com/PDFs/v2n404/breeze.pdf, which was accessed on January 10, 2005.

⁶² Ibid.

Environmental Quality, Health and Welfare, the Military Division, and emergency management. Due to continuing development, such mapping requires periodic reevaluation and revision of plans. Local and tribal input and consensus is essential to a satisfactory mapping project for mass burial of infected animals.

(3) The USDA has been looking at a number of programs that would increase rendering capacity including the use of portable rendering machines; however portable rendering machines present many problems, not the least of which are safety and training. Rendering requires skilled personnel. Portable machines have not yet answered the need for increased capacity.

(c) Contiguous culling was an emotional issue for both producers and private practice veterinarians in the United Kingdom. There was widespread belief that many more animals were slaughtered than was necessary. This perception led to the axiom, “carnage by computer.”

(1) Dr. Breeze notes, “The significance of FMD for the U.S. in 2004 is that we have some 100 million cattle, 70 million swine, 10 million sheep, 4 million goats, and about 32 million wildlife species at risk. All these animals are totally susceptible to FMD: there is no innate resistance, and none have been vaccinated.”⁶³

(2) Merely drawing a five-mile circle around an infected premises and killing all animals susceptible to FMD would likely be an extremely emotional issue in the United States too. The USDA is working to develop better computer models with which to make culling decisions. However, until better models are devised, federal officials will have to work closely with state and local officials to devise plans leading to the swift disposal of infected and culled animals or, as in Great Britain, the process will likely become ensnared in the judicial system. The “stamping out” policy worked in Great Britain only when animals could be destroyed within 24 hours and burned or buried within 48 hours after the infection was discovered. Having to wait for court decisions, which could take weeks or months, is counterproductive to the response and recovery process in a FMD outbreak.

⁶³ Roger Breeze, BVMS, PhD, MRCVS, *Agroterrorism: Betting Far More than the Farm*, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, Volume 2, Number 4, 2004, page 2, found on-line at www.biosecurityjournal.com/PDFs/v2n404/breeze.pdf, which was accessed on January 10, 2005.

5. Biosecurity

(a) Strangely, the BVA made no reference to biosecurity in its first publication of lessons learned although the subject was discussed in prior chronicles. Specifically, the divisional veterinary manager for north Wales stated that, “although the disease was under control, outbreaks would continue to arise”. He emphasized “the need for farmers to maintain strict biosecurity”.⁶⁴

(b) Biosecurity practices in the U.S. are being upgraded due mainly to the lessons learned in the United Kingdom as a result of the 2001 FMD outbreak. As the U.S. livestock industry continues to consolidate into increasingly larger agribusinesses, managers are able to enforce more stringent biosecurity measures on employees and people visiting industry facilities.

(c) The single most gaping hole in U.S. biosecurity is not within large complexes of the livestock industry. Rather, biosecurity vulnerabilities loom largest on the properties of the weekend farmer and the single-animal producer. Like their small-farm producer counterparts in Great Britain, biosecurity measures are likely to be viewed more as a bother than as a necessary process in the production of farm animals for the nation’s food supply. However, they are not the only modes of entry for FMD.

(d) Looking at the farm-to-table process for the beef industry, that is from farm, to sale barn, to feedlot, to slaughterhouse, to processing facility, to rendering plant, to distribution warehouse, to wholesalers, to retail stores, to consumers, and to the table, “there are opportunities for terrorists to introduce animal or plant pathogens. These opportunities or ‘entry-points’ in the food chain have varying levels of risk. For example, the average distance one pound of meat travels from farm to table in the U.S. is 1,000 miles, presenting a number of entry points located over a large geographical area. Some of the entry points are regulated or supervised by government agencies, but others are not – for example, stockyards, processing plants, and slaughterhouses are relatively open.”⁶⁵

⁶⁴ BVA Council, “Foot-and-mouth disease: lessons for the future.” *The Veterinary Record*, London, England, May 26, 2001, page 648.

⁶⁵ O. Shawn Cupp, David E. Walker II, and John Hillison, “Agroterrorism in the U.S.: Key Security Challenge for the 21st Century,” *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, Volume 2, Number 2, 2004, Mary Ann Liebert, Inc., page 98.

(e) Education programs for youth livestock exhibitors are an important tool for teaching biosecurity. With literally thousands of fairs and animal exhibitions nationwide taking place each year, there are literally thousands of potential entryways for an agricultural bioattack. Teaching biosecurity practices to single animal-producing youth is an essential biosecurity tool for the prevention of the spread of animal diseases including FMD.⁶⁶

6. Detection

(a) **Diagnostic testing for FMD must be refined, improved, and validated. The Government needs to develop “on-farm” tests for FMD. The tests need to be tested under “field conditions” where an epidemic is (currently) located. The BVA calls for increased surveillance.**

(1) According to Dr White at USDA’s Plum Island laboratory, the USDA is using cutting edge diagnostic tools and vaccines, but they still need work and tweaking. There is no portable diagnostic test that can be given to untrained Veterinary Medical Officers that would result in a reliable FMD diagnosis in the field. Portable PCRs are available, but they require specialists to run them.⁶⁷

(2) Numerous countries are working on better tests for FMD. However, the issue of detecting the FMD virus at our borders will still remain a problem because field tests that are being developed are for testing live animals. There remains no quick way to test the fabric of people’s clothing, the soles of their shoes, and the contents of medicines that people carry into the country. The FMD disease virus as used in this thesis would not be detected at our nation’s borders or within the interior of our country unless officials knew that they were looking specifically for the FMD virus. As a tool of

⁶⁶ William P Shulaw, DVM, and Gary L. Bowman, DVM, “Biosecurity for Youth Livestock Exhibitors,” *Ohio State University Extension Fact Sheet*, Veterinary Preventive Medicine, Columbus, Ohio, pp 1 and 2, found on-line at <http://prevmed.vet.ohio-state.edu/docs/youthexh.pdf>, and accessed January 25, 2005.

⁶⁷ PCR is closely patterned after the natural principle of DNA replication. It is a three-step process, referred to as a cycle, that is repeated a specified number of times. One PCR cycle consists of denaturation, annealing, and extension. This process takes place in a thermal cycler, an instrument that automatically controls and alternates the temperatures for programmed periods of time for the number of PCR cycles. Found on-line at www. Roche-Diagnostics.com/ba_rmd/pcr_explained02.html, accessed January 25, 2005.

terrorism, the FMD virus is not detectable when being carried into the country by a person or when it is sent through the mails or shipped by any one of a number of shipping organizations.

7. Communications

(a) Communications need to be improved between DEFRA to farmers, DEFRA to divisional offices, the media and public health.

(1) Communications with the media and the public are the two most important communications issues in an FMD-disease bioterrorism attack. Explaining response and recovery strategies in terms that the public can understand is as much an art form as a public sector necessity. There is a dire need for pre-scripted media messages so that state and federal agencies can rapidly assist the public and the media with understanding what the governments must do to rid the nation of the disease and restore farms and the economy to predisaster conditions.

(2) The U.S. has a level of government practicing veterinary medicine that adds extensively to communications with farmers and ranchers; the states. Working together, APHIS and the State Departments of Agriculture can reduce the barriers that were faced during the 2001 FMD outbreak in the United Kingdom.

Author's Note: There were a few of the forty issues raised by the BVA that clearly had no application in the United States; therefore they were not included in this chapter.

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IV. EXERCISING THE RESPONSE TO FMD

A. BACKGROUND

A theoretical terrorist-induced FMD bioattack scenario was used to measure the potential impact that the National Incident Management System (NIMS) and the National Response Plan (NRP) might have on state and local jurisdictions. The FMD scenario was used because it is the one hazard that would affect every hamlet, township, and every city, county and state simultaneously. Following a federally declared “extraordinary emergency,” a nationwide “stop movement” order would almost definitely be issued.⁶⁸ Failure to do so could result in the spread of the FMD virus to unprecedented levels as was seen in Great Britain during the 2001 FMD outbreak.

On any given day, there are thousands of vehicles moving animals along the field-to-table processing and marketing chain. Suddenly having to stop all movement of livestock from interstate travel would place an unusually heavy burden on literally every jurisdiction in the nation—a burden for which jurisdictions have neither planned nor budgeted. Nevertheless, this initial phase is considered by knowledgeable emergency planners to be the easiest phase to implement in the entire FMD response sequence.

During a stop movement order, live animals would still have to be fed and watered. There would be a need to remove the animals from truck trailers and allow them to exercise. Where live animals are removed from a number of trucks, there is a need to retain load integrity. Stockyards and fairgrounds are the most likely areas in which to retain live animals during a stop movement order. Trains with live animals would also be subject to the stop movement order. All these issues fall squarely on the shoulders of state and local officials, and there is not likely to be reimbursement.⁶⁹

A nationwide stop movement order would also necessitate simultaneously implementing Unified Command at the state and local levels initially with Area and National commands to follow at the regional and federal levels. The Multiagency

⁶⁸ National Animal Health Emergency Management System (NAHEMS) Guidelines “Quarantine and Movement Control: Highly Contagious Diseases,” Draft Operational Guideline dated 5/08/03, page 26.

⁶⁹ Questions as to exceptions to a stop movement order, such as can animals continue to travel within the state to slaughter, would be determined by the USDA Area Veterinarian in Charge.

Coordination (MAC) system would not need to be activated initially since it is presumed that state and local law enforcement and transportation authorities are capable of conducting a nationwide stop movement without the aid of regional and federal material resources. However, MAC systems would soon have to be activated to deal with the FMD outbreak especially if it were to become a nationwide epidemic.

A tabletop exercise was held from 9:00 AM to 4:00 PM on November 19, 2004, at the Idaho State Police complex in Meridian, Idaho, for the purpose of exploring response requirements and likely impacts to the State of Idaho and its political subdivisions. The exercise was developed based on prior experience of the writer as an antiterrorism emergency response planner and Physical Security Officer for the United States Navy.⁷⁰ Participants for the tabletop exercise were selected based on their experience and positions of response authority in their respective agencies. They included members of both the public and private sector who would be key players in a response to FMD. Invited tribal and local government representatives were unable to participate in the exercise..

The exercise scenario assumes that five terrorists successfully infected five state fairs in selected localities throughout the United States during a five-day period between August 20 and September 5, leading to an eventual national epidemic.⁷¹ The tabletop exercise was designed to identify agency disparities in response and recovery plans, to consider public and private sector expectations, and to examine how the implementation of the NIMS and the NRP could affect an operational response at the state and local levels.

Dr. Kendal Eyre, DVM, Veterinary Medical Officer for the State of Idaho introduced exercise participants to issues surrounding a FMD response through a Power

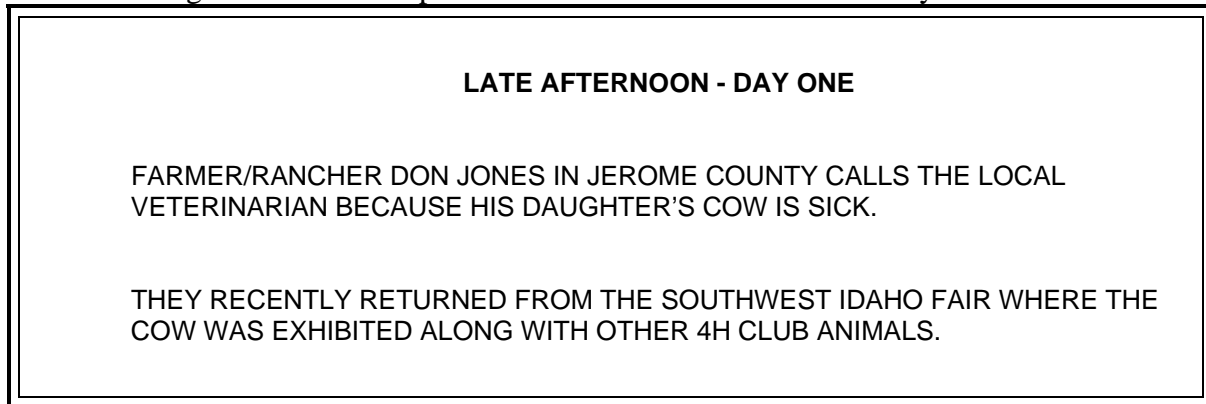
⁷⁰ The writer was the U.S. Navy's first designated Physical Security Officer (649X). He was responsible for managing military law enforcement, physical security, and antiterrorism programs for naval commands at sea and ashore in the United States and abroad, including the Persian Gulf Region where FMD outbreaks regularly occur. The use of a Foot and Mouth Disease scenario was developed in relation to the animal health annex of the command's Emergency Operations Plan for Commander, Naval Base, San Diego dated June 1991. The writer retired from naval service as a Lieutenant Commander in July 1993 and was appointed as the Director of the Idaho Bureau of Disaster Services in May 1995.

⁷¹ The number five holds no special significance for the scenario. The original scenario that was developed in 1991 used ten terrorists at ten different localities to ensure success of the terrorist mission.

Point presentation. After the presentation, discussions centered on awareness, prevention, and preparedness issues. The response phase was exercised in the afternoon.⁷²

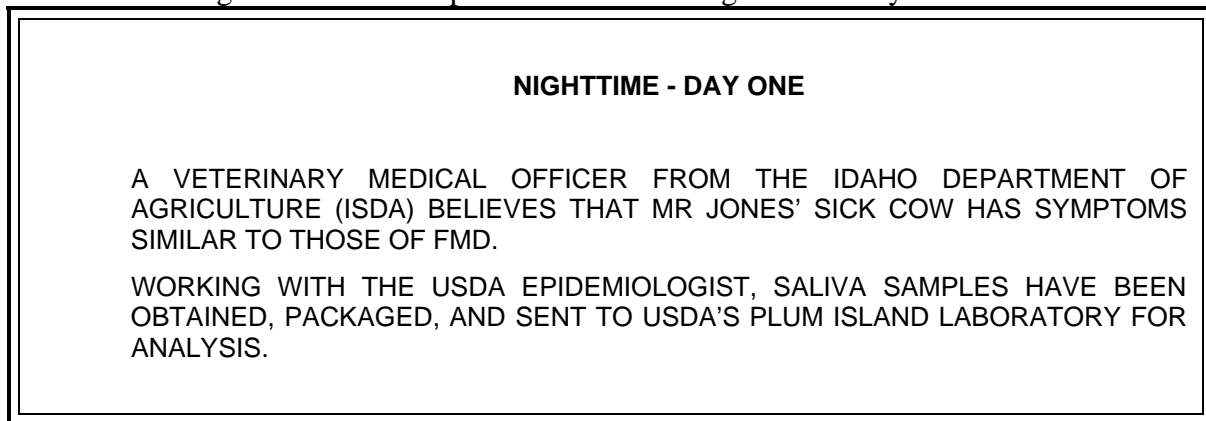
B. BIOATTACK ON THE U.S. USING FMD; A TABLETOP EXERCISE

Figure 1. Tabletop Exercise Slide - Late Afternoon – Day One



Exercise Discussion: Veterinarians in private practice may not know what FMD symptoms look like since other diseases have the same symptoms. FMD cannot be diagnosed on-site. When a veterinarian sees blisters or vesicles, he/she should call the State Department of Agriculture. The producer (farmer/rancher) should ensure that livestock are not moved from the premises and that increased biosecurity procedures are immediately implemented. NIMS would not be activated at this point.

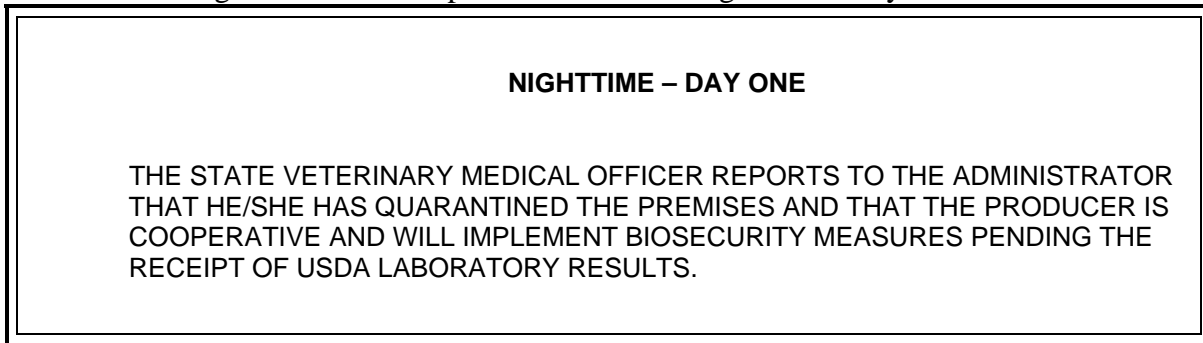
Figure 2. Tabletop Exercise Slide – Nighttime – Day One



Exercise Discussion: Analysis at USDA's Plum Island laboratory can usually confirm or refute the presence of the FMD virus within 24 hours.

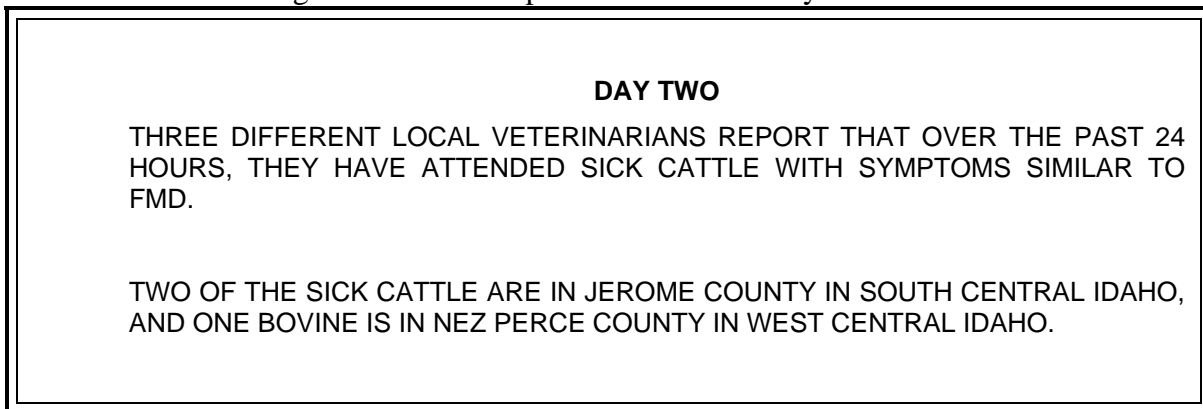
⁷² The exercise facilitator used Power Point slides to express the conditions under which the exercise would progress. Those slides are represented by frames in this chapter. Exercise interplay, in this chapter, reflects only the most salient points.

Figure 3. Tabletop Exercise Slide – Nighttime – Day One



Exercise Discussion: The Veterinary Medical Officer would brief the Sheriff, who would be expected to place a patrol at the entryway to the premises to ensure that livestock were not moved. There would not likely be any reimbursement for local law enforcement. NIMS would not be implemented. However, there is a general understanding that the State Veterinary Medical Officer would likely become the Incident Commander should ICS be activated at the local level. Nationally many law enforcement agencies have not adopted ICS, and law enforcement personnel may not be ICS trained.

Figure 4. Tabletop Exercise Slide – Day Two



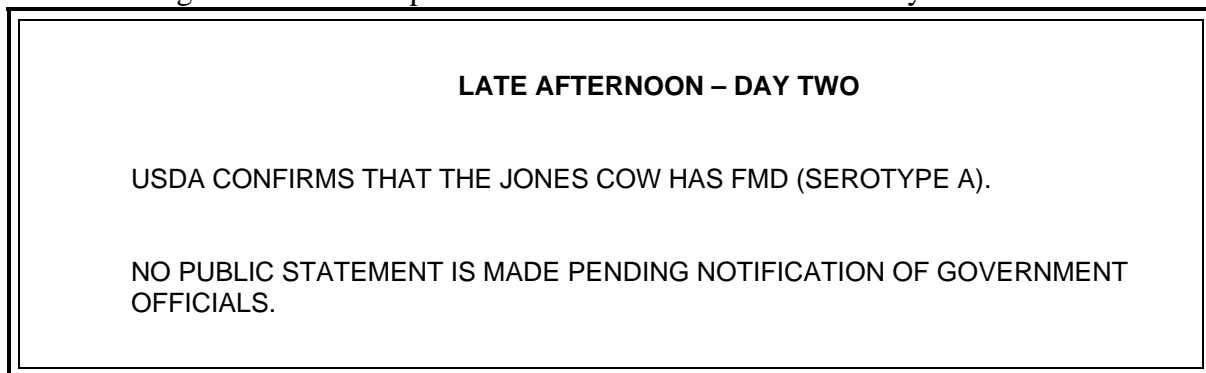
Exercise Discussion: State and USDA veterinarians would replicate the procedure of visiting each of the premises where they would conduct a Foreign Animal Disease Investigation and gather saliva samples from the sick cattle for analysis at Plum Island. Even at this point the Director of the Department of Agriculture would not likely request that the Governor declare a disaster emergency. However, the Governor would

be advised that an emergency declaration and activation of the State Emergency Operation Center (EOC) might be required within 24 hours.⁷³

From a producer perspective, it is important that effective communications be established between the State Veterinary Medical Officer, the USDA Epidemiologist, and the producer. It is equally important that state officials not prematurely announce the possibility of FMD before there is have a confirmation from Plum Island. The consequences to industry can be dire.

Careful consideration must also be given to the types of communication devices used when discussing the potential spread of disease. Wireless telephones, for instance, are routinely monitored by elements of the general public even though such monitoring is unlawful. Radio frequencies too are typically monitored by the general public and by the news media. It was determined by consensus among participants that the FBI would not be notified until the FMD virus was confirmed by the USDA laboratory at Plum Island.⁷⁴ NIMS would not be activated yet.

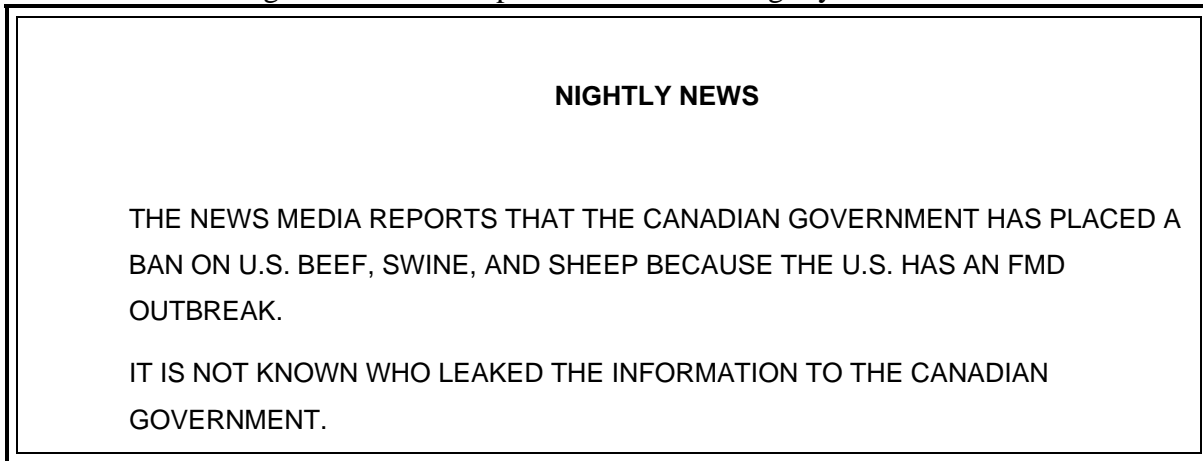
Figure 5. Tabletop Exercise Slide– Late Afternoon – Day Three



⁷³ Several states currently have animal disease plans appended as an annex to their State Emergency Operations Plan. It is anticipated that all states will soon be required to have an animal disease annex under the requirements of the National Response Plan using ICS and the NIMS protocols.

⁷⁴ Dr. Peter Chalk, an analyst for The RAND Corporation who has been called to testify before the Congress about agroterrorism notes that it is now USDA policy to assume that a FMD outbreak in the U.S. would be considered a deliberate act until proven otherwise, and the FBI needs to be involved right away.

Figure 6. Tabletop Exercise Slide – Nightly News



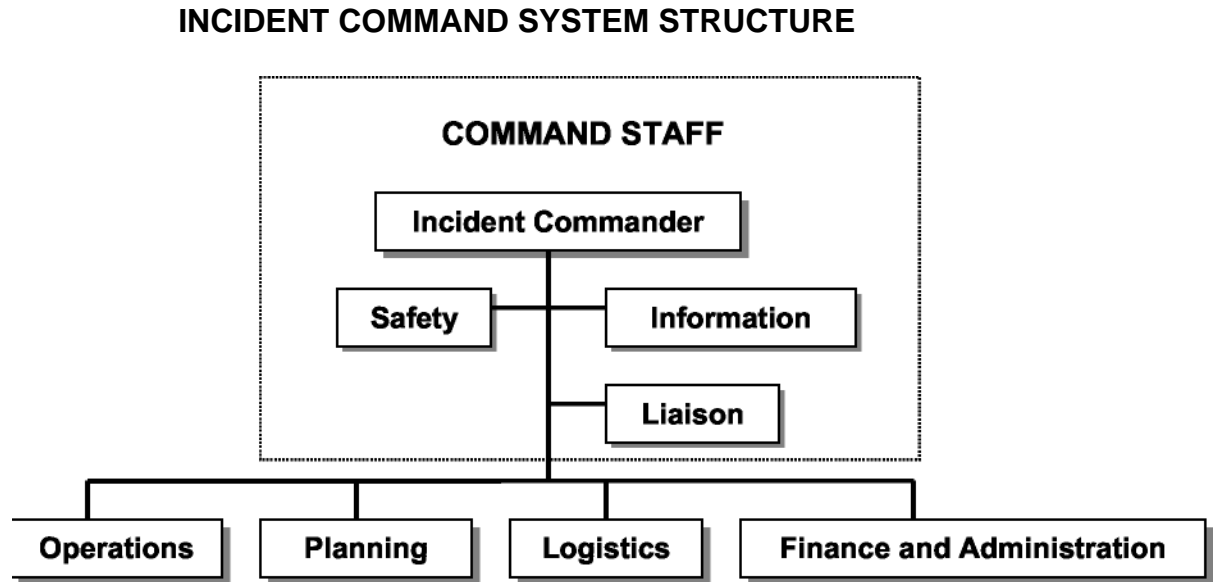
Exercise Discussion: The information that the sample was positive for FMD would be reported directly to administrators of USDA, APHIS, and Veterinarian Services in Washington D.C. Their first reaction would likely be to declare an extraordinary emergency.⁷⁵ Within a few minutes of the declaration, the Idaho Department of Agriculture Director and/or Animal Industries Administrator would be notified. USDA would order a nationwide stop movement of all livestock.

Using the ICS format, the USDA Area Veterinarian in Charge would designate a command staff, and appoint personnel to staff Finance, Logistics, Operations, and Plans (FLOP) Sections pending the arrival of teams that have been designated by USDA Headquarters. “And that’s when USDA would probably mobilize to the extent possible to Idaho as many people as thought they could get by with, knowing full well that this (FMD) could be breaking out in another state at any point in time.” In Idaho, the USDA Area Veterinarian in Charge does not have a pre-designated response staff. He/she might consider implementing a Unified Command because of the number of jurisdictions that will soon become involved in the response. (See Figures 7 & 8).⁷⁶

⁷⁵ The Secretary of Agriculture may declare an Extraordinary Emergency to pay compensation and to allow for the use of federal authorities to take action within a state if the affected state is unable to take appropriate action to control and eradicate the disease, Emergency Support Function 11, *The National Response Plan*, U.S. Department of Homeland Security, December 2004.

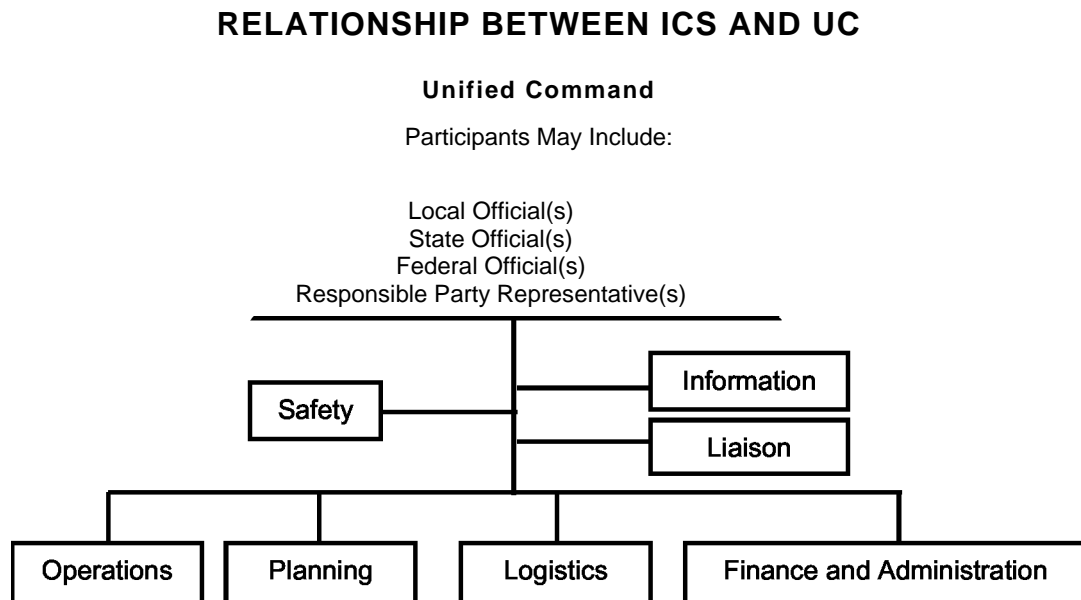
⁷⁶ Comments made by Dr. Cynthia Gaborick, USDA, during the Tabletop Exercise of November 18, 2004.

Figure 7. Diagram of Basic ICS Positions



Note: The Operations, Planning, Logistics and Finance and Administration positions are known as the "General Staff."

Figure 8. Diagram of Basic Unified Command Positions



Author's Note: USDA Headquarters would notify the Homeland Security Operations Center (HSOC). HSOC personnel would notify its component element, the National Response Coordination Center (NRCC). The Homeland Security Secretary would likely designate the outbreak as an “Incident of National Significance” and appoint a Principal Federal Official (PFO) to represent the Secretary of Homeland Security as the lead federal official to ensure overall coordination of federal domestic incident management and resource allocation activities, including the seamless integration of federal activities in support of and in coordination with state, local, and tribal requirements. The PFO is also charged with facilitating interagency conflict resolution.⁷⁷ Once Emergency Support Function (ESF) 11 of the NRP is activated, the national response would be coordinated by USDA from the NRCC.

Numerous federal agencies would send representatives to staff the federal EOC until the Joint Field Office (JFO) is established including:

- Various component parts of the Department of Agriculture
- Department of Commerce
- Department of Defense (when requested by USDA)
- Department of Energy
- Department of Health and Human Services
- Department of Homeland Security (DHS/EPR/FEMA ERT-A Team)
- Department of the Interior
- Department of Justice
- Department of State (if international border issues arise)
- Department of Labor
- Department of Transportation
- Environmental Protection Agency
- General Services Administration
- U.S. Postal Service (if requested by USDA)
- American Red Cross

With only one confirmed case of FMD and more tests yet to be conducted, it is questionable whether the White House would activate the Interagency Incident Management Group (IIMG) until more definitive threat information is available.

⁷⁷ National Response Plan, December 2004, page 33.

With the confirmation of FMD, USDA and the State Veterinarian would contact the local office of the FBI. Although there is currently no evidence of terrorism, a preliminary investigation would be initiated with the USDA and state and local officials. FBI Headquarters may activate the Strategic Information and Operations Center (SIOC) to serve as the focal point and operational control center for all federal intelligence, law enforcement, and investigative activities while the preliminary investigation is being conducted to determine whether or not the incident is an act of terrorism.

FEMA Region Ten would likely activate the Regional Operations Center (ROC) in Bothell, Washington in preparation for handling requests for human and material resources. They would also likely send a Liaison Officer to work in the State EOC. A deployed Emergency Response Team (ERT-A) would help to set up and staff the JFO.

The Director of the Idaho Department of Agriculture would likely recommend that the Governor sign a disaster emergency proclamation, which requires the activation of the State Emergency Operations Center and authorizes the use of state agency personnel, including the Idaho National Guard, to support emergency response and recovery operations. The emergency proclamation is drafted by the Idaho Bureau of Homeland Security with the assistance of State Agriculture Department personnel; however, it is more likely that the Governor would not sign the declaration until the next morning. The urgency of the situation is such that the Director of Agriculture, the Adjutant General and the Director of the Idaho Bureau of Homeland Security (or some combination thereof) would talk with the Governor by phone when a verbal declaration would be issued. Once the Governor issues an emergency disaster declaration, the Bureau of Homeland Security is required by policy to notify all state agencies and by law to notify the news media.

The Idaho Military Division's Public Information Officer (PIO) also serves as the PIO for the Bureau of Homeland Security. Working with the Office of the Governor, the PIO for the Idaho Department of Agriculture and USDA, a media release would be drafted for release by the Office of the Governor. The Office of the Governor may decide to have the Adjutant General and the Agriculture Director release a joint statement; however, any statement to the press released by the State of Idaho would be

crafted with USDA to ensure that both levels of government are providing the same information. Continuing to work with USDA, the Military Division PIO would activate a Joint Information Center (JIC).

Exercise Discussion (continued): There was a lengthy discussion on how the USDA Veterinarian in Charge would implement ICS initially, understanding that USDA Headquarters-designated teams would eventually arrive in Idaho. However, arrival of the teams would be determined largely by travel conditions, including weather. The initial ICS assignments are crucial to how well the initial response phase will be handled.

From the State Veterinary Administrator's perspective, the stop movement order would become political within 24 hours or less. There would be a great deal of pressure on the Governor to open the transportation corridors for livestock movement because of the economic impact. The purpose of the stop movement order is to prevent the spread of the disease and to identify where potentially infected animals have been moved through a trace back operation. The trace-back operation will not likely identify where potentially infected animals have been shipped within 72 hours. It may take longer, which means the stop movement order would take longer than the initial 72 hours used as a planning expectation.

There will be animal welfare issues that must be dealt with. "There's going to be animals dying... there's going to be a lack of feed – feed won't be where you need it to be – feed trucks won't be moving because they may be infected. Milk is going to have to be dumped. Milk is normally picked up by trucks going from dairy to dairy on a day by day basis. All of this will happen because we can't identify where potentially infected animals are located. We don't have the type of trace back operation that we need today. Every minute that goes by is a million bucks. Once the Federal Government declares an extraordinary emergency, the State Veterinarian has no authority to revoke the stop movement order; it's all in the hands of USDA. If no extraordinary emergency is declared at the federal level, then the authority rests with the state, including the authority to issue and revoke a stop movement order within the state"⁷⁸.

⁷⁸ Comments made by Dr. Clarence Siroky, Administrator, Division of Animal Industries, Idaho State Department of Agriculture, made during the Tabletop Exercise of November 19, 2004.

Author's Note: In an effort to determine the impact of a nationwide stop movement order on the State of Idaho, Dr. Eyre developed the following information, which was included in his presentation to participants at the beginning of the tabletop exercise.

The State of Idaho uses two scenarios to determine potential cost: FMD is detected outside of the State of Idaho, and FMD is detected inside the State of Idaho. There are 44 counties and 200 incorporated cities with a population of 1.3 million people, not counting visitors. In Southern Idaho, there are 14 major roads, about 20 secondary roads, and a whole plethora of little county roads that only the sheriff's office and cattle traders know about. For the initial response, it would take about 300 people to staff check points to stop livestock movement. It would take an additional 400 to 500 people to rotate the schedule for support personnel; that is for examination, decontamination, and getting the livestock in and out of the area.

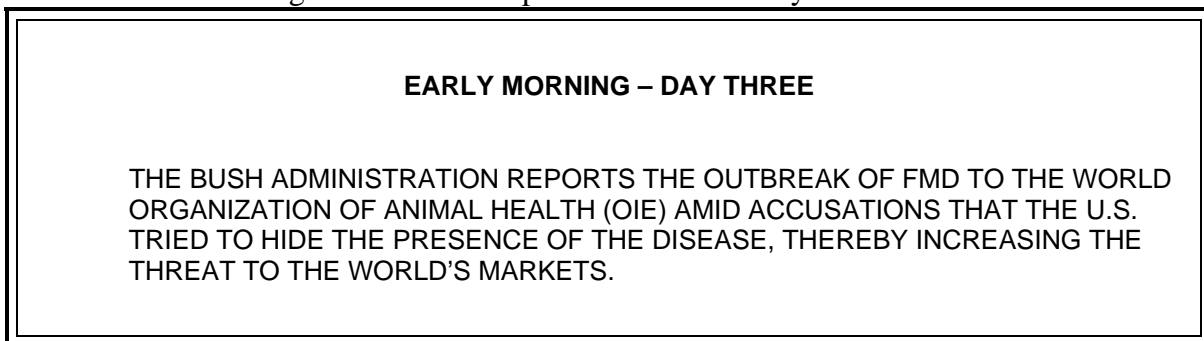
In Northern Idaho it would take another 300 people working around the clock. Estimates are that the situation would require approximately 1,100 people working around the clock for about four months. These personnel would only conduct border control and inspection. This estimate does not include response and recovery personnel.

The predicted cost to the State of Idaho for stop movement alone would be about \$228,000 a day or about \$27 million for the entire stop movement project, and that would be just to keep FMD out of Idaho. It does not cover the cost for responding to a FMD outbreak in Idaho. Were there to be a FMD outbreak within Idaho, the costs for response and recovery would be (depending of the number of infected premises and animals that had to be depopulated, including wildlife) in the high millions to contain the disease. Response, recovery, and remuneration for just one 50,000 animal feedlot alone would likely cost about \$48 million. If the disease "got away from us", then figures would in billions of dollars.

Exercise Discussion (continued): The private sector needs to be involved in pre-disaster planning and training. Industry representatives do not understand the ICS program and have no knowledge as to where they fit in. The private sector has the potential for being a "voice of reason" to private sector businesses who most likely will

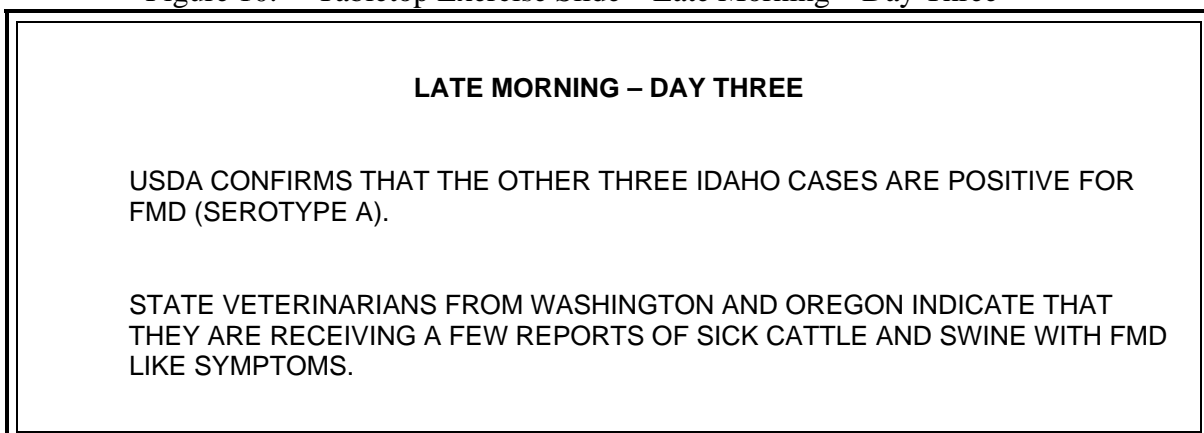
not understand the needs of government. It is probable that they would feel threatened by the momentum with which response operations would need to be implemented. In the livestock industry, Idaho is fortunate to have private sector companies with large corporate structures that could act as Liaison Officers in the ICS format in a Foreign Animal Disease response. A private sector branch, division, group, or task force could work with each affected private sector element of the beef industry including producers, dairies, packers, processors, feedlots, sales barns, transportation, and feed suppliers. Idaho has some excellent private sector livestock resources including the Idaho Cattle Association, Idaho Wool Growers, the Idaho Farm Bureau, and even local associations. All of these groups would need to be involved early on in the response to FMD.

Figure 9. Tabletop Exercise Slide –Day Three



Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 10. Tabletop Exercise Slide – Late Morning – Day Three

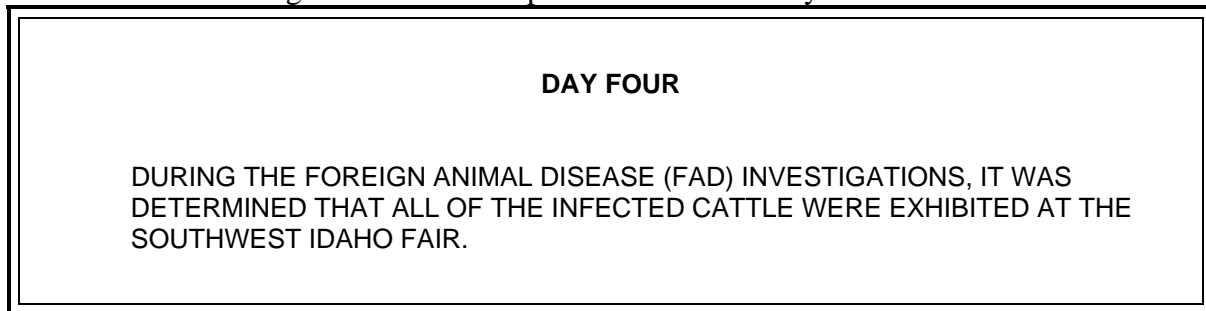


Exercise Discussion: With more states reporting possible (unconfirmed) FMD, the USDA would likely activate an Area Command for Idaho, Oregon, and Washington States. The Area Command is designed to look at strategy and tactics that are common

and pertinent to all three states. The Unified Command in Idaho would remain in place. Area Command does not replace the on-the-ground Incident Management Team. The roles of the counties and the State of Idaho would remain the same.

Representatives from local governments would be expected to participate in the Incident Command Post in their counties and in the JFO. They might even need to have representatives in the State EOC from time to time. Law enforcement personnel at the local levels might be required to participate in the FBI's Joint Operations Center (JOC). It may be necessary for some local governments to help staff the Joint Information Center (JIC). Even if they did not have a representative in the JIC, they would be asked to coordinate media releases with state and federal officials. As the response moved into recovery, and depending on how many people had been displaced (living in shelters and being fed by the American Red Cross and other National Volunteer Agencies Active in Disasters (NVOAD), local governments would have to provide personnel to work with federal Community Relations personnel to provide information about assistance programs, especially if the Robert T. Stafford Act should be activated through a Presidential disaster declaration.⁷⁹

Figure 11. Tabletop Exercise Slide – Day Four



Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

⁷⁹ Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Public Law 106-390, October 30, 2000, *United States Code*, Title 42, Chapter 68, found at www.fema.gov/library/stafact.shtm, which was last accessed on January 29, 2005. The act provides federal assistance to states for response and recovery during a Presidential declaration that specifically authorizes its use.

Figure 12. Tabletop Exercise Slide – Day Four – News Media

DAY FOUR - NEWS MEDIA

LITERALLY HUNDREDS OF NEWS MEDIA PERSONNEL ARE ARRIVING IN JEROME COUNTY.

HOW WILL LOCAL GOVERNMENT HANDLE THE NEWS MEDIA?

NATIONAL TELEVISION IS DEVOTING SEVERAL HOURS EACH DAY TO BROADCASTING PICTURES OF BURNING PYRES FROM GREAT BRITAIN'S 2001 FMD OUTBREAK. THROUGHOUT THE NATION, THE PUBLIC IS BECOMING INCREASINGLY VOCAL AGAINST BURNING AS A STRATEGY TO ERADICATE THE DISEASE.

Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 13. Tabletop Exercise Slide – Day Four – Follow-Up Investigation

DAY FOUR - FOLLOW-UP INVESTIGATION

A USDA/ISDA FOLLOW-UP INVESTIGATION REVEALS THAT A SEASONAL PART TIME EMPLOYEE (JACK FRY) HAS NOT RETURNED TO WORK SINCE THE CLOSURE OF THE FAIR.

WHILE MR. FRY'S FAILURE TO RETURN TO WORK IS NOT PARTICULARLY SUSPICIOUS, A CO-WORKER NOTED THAT JACK SEEMED TO BE OBSESSED WITH CONTROLLING FLIES IN THE BARNs DURING THE FAIR. IN FACT, JACK VOLUNTEERED TO SPRAY THE BARNs TO ERADICATE FLIES; HE WAS ALMOST INSISTENT. YET FRY HAS NEVER BEFORE BEEN KNOWN TO VOLUNTEER FOR EXTRA WORK.

USDA/ISDA PERSONNEL PROVIDE THIS INFORMATION TO THE FBI.

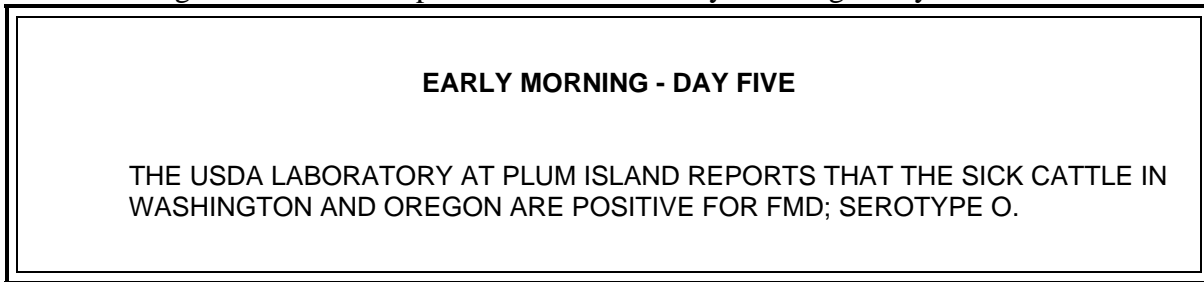
Exercise Discussion: There was a great deal of discussion concerning the fact that FAD investigators would be looking for information about diseases and animals. They most likely would not recognize that a part-time employee spraying for flies could be the cause of a FMD outbreak. They would not even record that information in their notes, and thus they would not be likely report this to the FBI. Other exercise participants indicated that it would be important for FAD investigators to know and

understand that FMD could result from an act of terrorism and that they would need to be especially cognizant of possible causes other than a natural outbreak.

Regarding the FBI investigation, even though three weeks would have passed since the fair took place, the barns would likely be designated as crime scenes. Although the FBI would be looking more closely at documentary evidence (i.e., who were the employees, did they have criminal records, etc.), they would also want to take physical evidence from the crime scenes. Field agents would need to rely on a veterinarian or epidemiologist to help determine what samples might be most useful. The FMD virus is known to remain alive for up to a month or more, so samples from the crime scene might help determine how the virus got there in the first place. One epidemiologist noted that she only analyses animal blood, spit, and tissue and would be unable to conduct analysis of soil, air, and residue samples. Questions arose as to what agency would be best suited to analyze physical evidence that did not come from an animal. The USDA laboratory at Plum Island, the EPA, and the State Department of Environmental Quality were all mentioned as possibilities.

A more practical solution under ICS and NIMS guidelines might be to recognize and accept the fact that the agencies mentioned do not have an investigative “silver bullet”. None of them would be able to make any real progress without help from the other agencies, and thus it might be more productive to form an investigative task force. Normally a task force of this nature would be assigned to the Operations Section. However, the FBI would most likely be reluctant to work under the Operations Section, so the joint task force might be better placed in the FBI’s JOC so that they can control the investigation, the information, and the evidence. It would also be necessary for state agricultural personnel participating in the investigation to have a security clearance of a sufficient level so that they would have access to investigative information and participate in classified meetings. This is not just an investigatory issue; animal health personnel should be working with the Joint Terrorism Task Force (JTTF) before an incident occurs. This is a preparedness issue for both bioterrorism and agroterrorism.

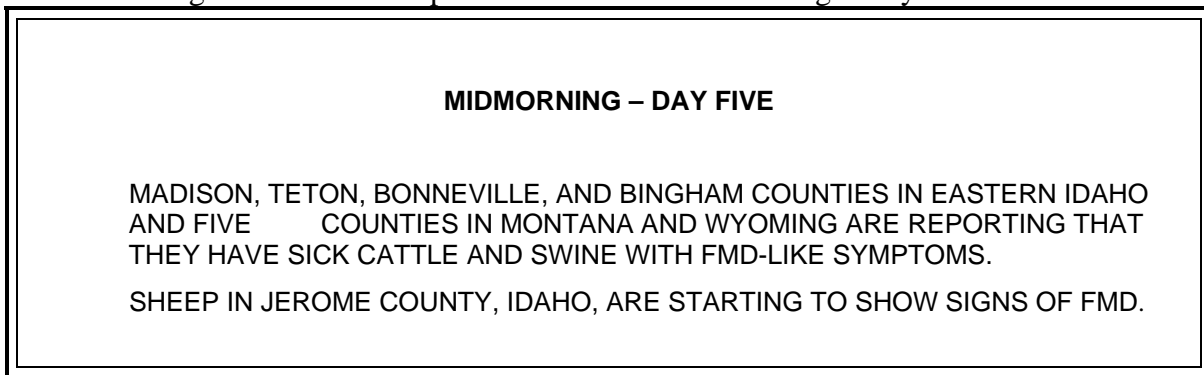
Figure 14. Tabletop Exercise Slide – Early Morning – Day Five



Exercise Discussion: With the discovery of FMD of more than one serotype during a single incident, investigative agencies would focus more on bioterrorism as a cause. Because particular FMD serotypes generally tend to be found in specific areas around the world. (serotype A is usually found in Asia; serotype O comes from South America), seeing two different serotypes crop up in a single outbreak would be highly unusual and thus raise the suspicion of infection through means other than a natural occurrence,

The question arose as to how discovery of more than one serotype would affect the use of vaccination as a response strategy. The North American FMD Vaccine Bank has a critical mass of antigen for all serotypes. As soon as Plum Island classifies a serotype, the Vaccine Bank begins to gear up and to make up the number of doses required for each serotype.

Figure 15. Tabletop Exercise Slide – Midmorning – Day Five



Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 16. Tabletop Exercise Slide – Midmorning – Day Five

MIDMORNING – DAY FIVE

THE CHIEF VETERINARIAN FOR THE SAN DIEGO ZOO REPORTS THAT TWO ELEPHANTS ARE SICK AND ARE EXHIBITING FMD-LIKE SYMPTOMS.

Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 17. Tabletop Exercise Slide – Noon – Day Five

NOON – DAY FIVE

YELLOWSTONE NATIONAL PARK

PARK SERVICE OFFICIALS ARE CONCERNED THAT BISON AND OTHER WILDLIFE ARE AT RISK FROM THE FMD OUTBREAK BECAUSE OF THE CLOSE PROXIMITY TO RANGE CATTLE.

Exercise Discussion: Yellowstone Park Service officials would be referred to the Area Command for Montana and Wyoming. Their concerns would be reported to Idaho’s Area Command.

Figure 18. Tabletop Exercise Slide – Late Afternoon – Day Five

LATE AFTERNOON – DAY FIVE

ALASKA OFFICIALS REPORT THAT THEY HAVE SICK CATTLE WITH SYMPTOMS SIMILAR TO FMD.

OFFICIALS FROM IOWA, NORTH CAROLINA, MISSOURI, MISSISSIPPI, ALABAMA, AND ARKANSAS REPORT THAT THEY’ RE BEGINNING TO EXPERIENCE CASES OF SICK CATTLE, SWINE, AND SHEEP. FMD IS SUSPECTED.

Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 19. Tabletop Exercise Slide – Early Morning Day - Six

EARLY MORNING – DAY SIX

USDA'S LABORATORY AT PLUM ISLAND REPORTS THAT THE EASTERN IDAHO, MONTANA AND WYOMING CATTLE AND SWINE HAVE TESTED POSITIVE FOR FMD; SEROTYPE C.

ALASKA CATTLE ARE POSITIVE FOR THE ASIA 1 STRAIN OF FMD

THE ELEPHANTS AT THE SAN DIEGO ZOO HAVE TESTED POSITIVE FOR THE SAT 2 STRAIN OF FMD

Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 20. Tabletop Exercise Slide – Midmorning - Day Six

MIDMORNING – DAY - SIX

FMD HAS SPREAD TO GOODING, LINCOLN, TWIN FALLS, MINIDOKA AND BLAINE COUNTIES AND SHEEP IN BLAINE COUNTY, IDAHO, ARE NOW SHOWING SIGNS OF FMD

Exercise Discussion: There was a great deal of discussion as to how ICS would be restructured to handle the response for the eleven counties in Idaho plus the outbreaks in Wyoming, Montana, Oregon, Washington, Alaska and San Diego, almost all of these localities being faced with different FMD serotypes. With another six states reporting sick livestock not yet confirmed positive for FMD, the picture would shift from one of an isolated FMD outbreak to more of an epidemic situation.

Exercise participants reviewed the situation by saying that while initially a single ICS incident management team would have been activated to handle the outbreak with a couple of divisions or branches implemented to respond to Jerome and Nez Perce counties, with the other states reportedly infected, there would now be hundreds if not thousands of people involved. The question was asked what would our response strategy be for day seven and beyond. Would we initiate a depopulation scheme that would result

in the slaughter of livestock in twelve or more states? Would we continue to create multiple ICS organizations when in fact we would have reached a point where we were probably going to be unable to staff the existing structure?

It is recognized that Idaho would be in competition with other states for federal resources, and while we might never have the kind of ICS organization that we would like to deal with, it would still be necessary for Idaho to contain the disease and to begin setting priorities in light of the emerging economic situation. Resource requirements for all the states would be handled by a Multiagency Coordination (MAC) system. Also, there would need to be a reassessment of what the situation would mean to the nation as a whole. There was also some offline discussion regarding how easy it would be to lose the participation of small towns and counties in such a dynamic organization, and how hard it would be for small towns and counties to staff positions within that organization.

Concerning the use of vaccination as a response strategy for a widespread infection, it was determined that the OIE requirement for a five year FMD-free status before meat products could re-enter the world marketplace probably would have no effect on the scenario because our five year markets “would be toast” anyway.⁸⁰ Strategies would have to change in this kind of situation. Some felt the state and nation would likely be faced with a ten-year (at least) downturn in the economy with probably depression-like repercussions ongoing. Not all exercise participants agreed with that assessment. Some believed that there was a chance to save portions of the FMD-free status through regionalization similar to what some nations in South America have done. Regardless, it was generally agreed that a nationwide FMD bioattack that infected livestock in numerous states would adversely affect the U.S. economy for many years. It was noted that as the disease spread, and as our meat products were banned from the world marketplace, eradication costs would increase exponentially and that there would be fewer tax dollars for state and local governments to employ people to contain the disease.

⁸⁰ On further review, Dr. Radford Davis, Assistant Director, Center for Food Security and Public Health for the College of Veterinary Medicine, Iowa State University stated that according to OIE policy, if we used vaccine and didn't slaughter all cases, it would take 18 months before our products could re-enter the world market after the last case of FMD. (This could take years). It would be only 6 months after we identify our last case if we vaccinated and slaughtered cases. http://www.oie.int/eng/normes/mcode/en_chapitre_2.2.10.htm.

With examination of recovery issues, discussion turned to exports. Seed stock, embryos, meat, and everything associated with meat products would not be exportable. Although the nation as a whole would eventually recover over time, an individual 5,000 cow dairy would most likely be fairly highly leveraged. If FMD entered their production facility, their production would decrease by about 60 percent. Over time production might improve but unfortunately not enough for them to be able to make their payments. The business would fail. The question arises of what happens to the cows. Consumer confidence would become a huge issue.

With FMD, producers will have sick animals. Consumers will not eat sick animals. That's just going to blow consumer confidence. You have never seen anything like an animal with FMD. They can't move. It's unreal. They don't eat; they won't be able to walk to the feed bunk for months. When the top of their tongue comes off, they won't eat for three weeks. They don't recover.⁸¹

Figure 21. Tabletop Exercise Slide – Noon – Day Six

NOON – DAY SIX

INVESTIGATION REVEALS THAT WITH THE EXCEPTION OF THE ELEPHANTS AT THE SAN DIEGO ZOO, ALL OF THE INFECTED ANIMALS HAD BEEN EXHIBITED AT FAIRS AS FOLLOWS:

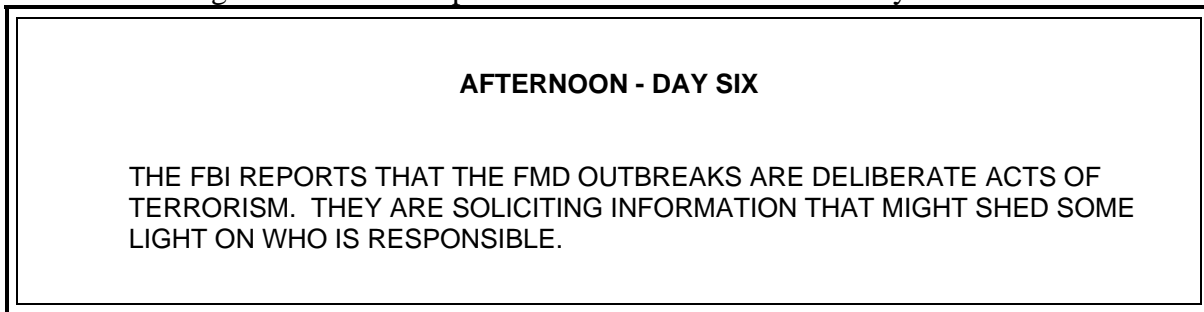
SOUTHWEST IDAHO FAIR (AUGUST 20 – 28)
OREGON STATE FAIR (AUG 25 – SEP 05)
NEVADA STATE FAIR (AUGUST 25 – 29)
WYOMING STATE FAIR (AUGUST 14 – 21)
ALASKA STATE FAIR (AUG 25 – SEP 05)

Exercise Discussion: The fair dates listed in the slide frame are real fair dates for 2004. They are just a small sample of the hundred of fairs that take place around the nation each year. Most fairs that exhibit animals take place from May through October. The highest density period occurs from May through September. It would be a relatively

⁸¹ Comments made by Dr. James England, DVM, Ph.D., Caine Veterinary Research and Training Center, Caldwell, Idaho, made during the Tabletop Exercise of November 19, 2004.

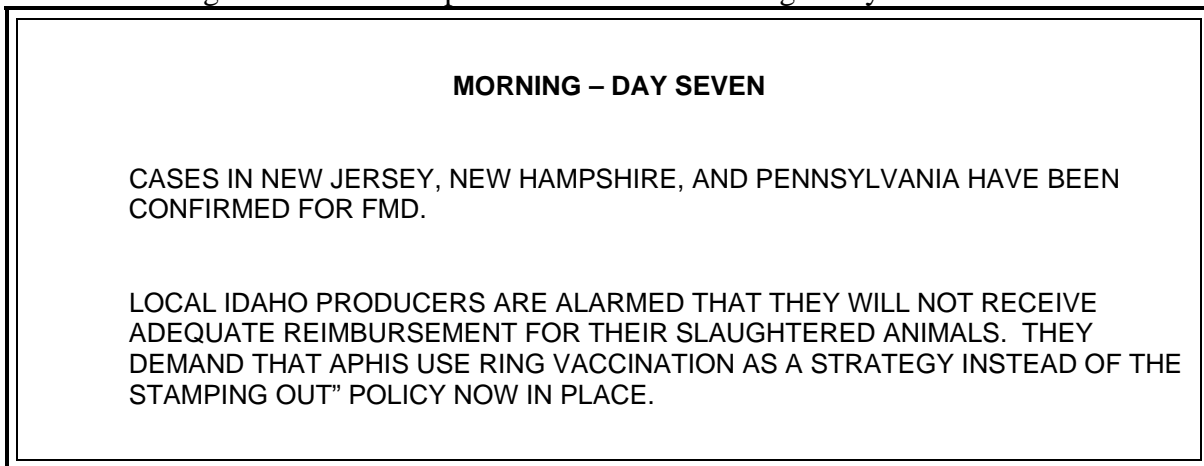
easy task to target five fairs or exhibits in five different states within a five-day period as was used in this thesis scenario.

Figure 22. Tabletop Exercise Slide – Afternoon – Day Six



Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

Figure 23. Tabletop Exercise Slide – Morning – Day Seven



Exercise Discussion: None. To conserve time, exercise participants continued without commenting on this slide.

C. LESSONS LEARNED (AS DETERMINED BY EXERCISE PARTICIPANTS)

1. Awareness

a. The state should work with Fair Boards and exhibition groups in a “crime stoppers” program for prevention of the introduction of FMD.

b. Fair Boards should be apprised of the need to conduct employee background checks even on temporary and part-time employees.

c. The use of private sector associations for increased awareness could be helpful especially as it applies to employees for large businesses and small producers. The use of occasional laborers in such venues provides an avenue for infection. It would be useful to ask whether the laborer been in an infected country within the past few weeks. ⁸² Associations would likely be the best vehicle to get the word to producers and others in the animal industry. The issue should be covered in Standard Operating Procedures.

d. County Extension personnel could be very helpful in increasing agroterrorism awareness communications among producers.

e. In a very positive step, the Idaho Cattleman's Association, through its Beef Quality Assurance Program, recently added bioterrorism to its program guidelines.

f. Implementation of a national animal identification capability is essential to trace-back operations. An animal identification program would increase the effectiveness of biosecurity and help limit bioterrorism. The greatest protection is the producers themselves.

g. It would be useful to publish biosecurity pamphlets in Spanish so that dairy-owners, feedlot owners, and others in the industry could hand them out to employees. Additionally there is a wealth of information for producers, including pamphlets, available from the USDA web site.

h. Trade associations could participate by sending out biosecurity information to their membership via email.

2. Prevention

a. Producers need to increase biosecurity on their premises.

b. Once animals have been sold at fairs, sold animals need to be isolated before being moved to new premises during the (five day) incubation period. Although this is not feasible for many people and circumstances, there should be a five day waiting period before an animal is allowed to go to the next fair or exhibit. Whether

⁸² It was noted that a terrorist would not be likely to tell you if he/she had traveled through an infected country. This recommendation is aimed at the laborer who has no terrorist designs.

the animals were isolated at the existing fair grounds or at the home premises, animals that have been to a fair should be isolated from other FMD-susceptible animals for at least five days.

c. Another prevention tool would be simply paying attention/being aware of what is happening in fair barns and pens. Having fair employees pay attention is an important preventive tool.

d. Home study courses are available on compact disc and on-line from Idaho State University. These cover many of the topics discussed during this exercise. One such CD is entitled “Agroterrorism Awareness – Safeguarding American Agriculture. There are many others. Better awareness is better prevention.

e. It will be important to put technology to work to enhance prevention. Cameras and VCR or CD recorders in fair barns might help deter someone from a conducting a bioattack for fear of being identified.⁸³

f. There is a need to improve trace-back capability through technology. A single cow can have contact in 26 states in one week. The biggest issue remains who pays the costs of such an identification system. Currently it is the producer. Planners are still trying to determine whether the use of technology to identify animals should be mandatory (by law) or whether it could be voluntary.

3. Preparedness

a. Continued NIMS training and education for local officials. An important part of the NIMS is knowing the people who you are working with. Local officials must understand that they are partners with other communities as well as state and federal agencies which will be activated to manage an incident that will impact their community.

⁸³ It was noted that cameras might be more of an investigatory measure for law enforcement rather than a preventive strategy. Participants generally believed that the use of cameras would be both a deterrent and a method of after-action identification.

b. The State of Idaho needs to determine whether plans made for the security and dissemination of drugs from the national stockpile can be applied to the use of vaccines for foreign animal diseases if and when such animal vaccination is used as a response strategy.⁸⁴

c. States need to coordinate stop movement plans to minimize duplication of effort so that we don't have law enforcement, transportation, and other personnel from one state doing the same job as their counterparts just a few yards away across the state line. Emergency management must ensure that these plans are incorporated into each state's emergency operation plan.

d. States need to identify in advance the types of resources that will be required for both response and recovery. The inventory of such resources must be precise (i.e., not just a "broom" but what kind of broom and with what kinds of bristles). Planners should not be making those types decisions at the same time they are deploying personnel for depopulation, cleaning, and disinfecting. This inventory should be coordinated with the NIMS National Incident Management Resource Typing System. USDA, as the experts on response to a foreign animal disease, should take the lead for resource typing and submit resource lists to DHS to be included in the system.

4. Response

a. Responders need a quick way to test animals for FMD on premises. Congress should fund USDA to develop accurate testing devices. Over the longer term, research should be conducted to develop technology so that screeners at our nation's borders have a way of testing the air for both chemicals and viruses.

b. State and local governments need to credential personnel for the NIMS positions that they would logically have to fill. There is a great deal of training and certification required for some of these positions, such as Incident Commander and Section Chief. It is important that each level of government develop sufficiently trained

⁸⁴ On further review, Dr. Davis of Iowa State University, College of Veterinary Medicine said, there is a move now for developing a stockpile for livestock. He doubts that the Strategic National Stockpile will ever be tapped for animal use – it would be too expensive and the public health folks would not likely agree to such a use.

and certified personnel to handle any type incident, not just an FMD outbreak, and that there be back-up personnel ready to fill the personnel void when vacancies occur.

c. Media relations/public communication is one of the most important parts of response. While this exercise did not allow the time for a formal discussion of this issue, participants agreed that there was a need to consider and even prepare in advance prototypical media releases as a preparedness measure, leaving blanks to be filled in when an outbreak occurs.

5. Recovery

It was decided not to discuss recovery lessons learned so that more time could be spent on response lessons learned.

Exercise participants concluded that to properly exercise a nationwide FMD scenario would likely require at least one or two weeks, with participants working around the clock and with well over a hundred people participating. However, they also noted that even the one-day tabletop exercise of November 19 increased awareness of the issues that would have to be faced during a terrorism-induced FMD outbreak in the State of Idaho.

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V. FINDINGS AND RECOMMENDATIONS

A. POLICY CONSIDERATIONS FOR IMPLEMENTING THE NRP AND NIMS

1. Summary

When this project first started in September 2003, neither the National Response Plan (NRP) nor the National Incident Management System (NIMS) officially existed except in draft form. However, the drafts of these two plans made it clear that they would be mandated for use by states, tribal and local entities, volunteer agencies, and private sector organizations. Although the U.S. Department of Homeland Security (DHS) did invite stakeholders to make comments before the two plans were published, no one asked whether small local entities could actually implement the plans. Rather, the requirement in effect became the law of the land, followed by a “carrot and the stick” approach to implementation; that is, no implementation means no federal funding for preparedness and response resources for use in major emergencies and disasters, including terrorism.

Because of the “carrot and the stick” approach to implementation, the question is no longer whether NRP and NIMS should be implemented at the state, local, tribal, and private sector levels. Rather, the question now is, *“how can the two national plans be implemented in under-developed Indian country, counties, and communities that typically have small part-time governmental staffs and volunteer responders?”*

Borrowing from the thesis work of Ellen Gordon, who was then the nation’s senior state emergency management director, we may be able to fashion an implementation strategy and policy considerations for smaller public and private entities. Although Ms. Gordon wrote specifically about the need for “states” to formally work together, the idea can also be applied to tribal and local entities, volunteer agencies, private sector organizations, and volunteer response agencies and organizations and not only for incidents involving agroterrorism, but for all major emergencies and disasters.

Gordon's thesis argues that "multiple state partnerships are critical to defeating this (agroterrorism) threat as well as providing a robust response to an attack."⁸⁵ She says that "states can further their ability to combat attacks on agriculture actively by demonstrating leadership in administrative agreements and ultimately adopting compact(s) between states as well as with the private sector." Local jurisdictions must similarly take advantage of agreements and compacts if they are to successfully implement the NRP and NIMS.

2. The Positional Diagram; a Tool for Determining Staffing Needs Under NIMS

NIMS staffing requirements for ICS and jurisdictional response plans provided in the NRP-formatted EOP are inseparable. As such, it is necessary to use an interagency approach to first build the EOP, and then determine staffing and material resource needs for the jurisdiction using the NIMS ICS format. The EOP needs to be the jurisdiction's interagency plan rather than a series of individual agency plans stitched together by the emergency manager.

The Chief Executive Officer (CEO) of a tribe, county, or community must develop and chair an emergency management planning team. This planning team is the CEO's action team formed for the purpose of developing the jurisdiction's EOP and then ensuring that the plan adequately reflects planning assumptions, roles, and responsibilities; concept of operations; incident management actions; and plan maintenance instructions. The team also reviews community preparedness, response, and recovery shortfalls to determine human and material resource needs.

At the county level, the emergency management planning team must be comprised of all elected officials in the county including city mayors and/or city managers, county department heads, selected appointed officials and leaders of business, industry and volunteer agencies. Cities that are similarly forming such a planning committee should emulate the team composition described above with city personnel.

Planners must be made to understand that the EOP is a legal document. As such it can be used by the jurisdiction to prove that agents and officials of the jurisdiction were

⁸⁵ Ellen Gordon, "Multi-state Initiatives – Agriculture Security Preparedness," Naval Postgraduate School, Monterey, California, June 2004.

not negligent in the performance of their duties while responding to and recovering from major emergencies and disasters. This is especially important in those situations where private property must be destroyed for the survival of the community.⁸⁶

Similarly, the EOP can be used against a jurisdiction to prove that officials did not follow the plan (thereby alleging that officials acted unreasonably) while engaged in response and recovery activities which resulted in personal injury and/or damage to private property. Having no plan may be viewed as a *quid pro quo* that the jurisdiction acted recklessly. This is especially important when entities must take private property for easements to conform to federal recovery funding requirements. The plan should state that the Incident Commander, Unified Commanders, and elected officials have the option to deviate from the plan when, in his/her/their expert opinion(s), such deviation is necessary to safeguard the lives of responders and/or the public, or to protect property of the community. The fact that the EOP is a legal document requires the jurisdiction's attorney to be a member of the emergency management planning committee.

Since the attacks on the World Trade Center and the Pentagon on 9/11, numerous states (including Idaho) have enacted laws that exempt emergency plans from public disclosure.⁸⁷ Jurisdictions should write the EOP in such a manner as to allow the basic plan to be open to public scrutiny, while the Appendixes and Annexes remain exempt. In this way, the jurisdiction's basic plan can be published on the jurisdiction's web site giving the public access to planning assumptions, roles, and responsibilities; concept of operations; incident management actions; and plan maintenance cycle instructions while simultaneously safeguarding incident response methods and techniques.

The planning team must design response options for each hazard and threat around requirements for handling the situation, not around the number of personnel that are physically available in responder agencies. This is a change in planning philosophy. In the past, plans were centered on the number of personnel that were available for

⁸⁶ In one Idaho flooding situation, it became necessary to destroy a house that was about to be carried away by flood waters. Had the house remained intact as it floated downstream, it would have slammed into and damaged or destroyed a bridge that was the only remaining bridge into and out of the community. The house was destroyed before floodwaters carried it away. Owners were reimbursed from state and federal recovery program funding.

⁸⁷ Title 9, Section 340A, Exemptions to the Public Records Law, Idaho Code.

response. The Positional Diagram Method is used to determine the number of people required for a response so that agreements with other jurisdictions can be formulated to fill staffing and material resource shortages. To accomplish this requires that interagency response plans be written first, followed by the determination of staffing requirements for each required ICS position, and finally, the material resources necessary to overcome the threat or hazard.

The essence of this planning process is to determine how far the jurisdiction must reach out to obtain needed human and material resources with which to build an organization that can provide the levels of response and recovery necessary to overcome each threat and hazard. Having city, tribal, and county elected officials on the planning team makes it easier to form agreements because they all participated in identifying the needs. When personnel, skills, and material resources are not available within the county, including the private sector, the CEO can then reach out to surrounding counties and even to state and federal agencies to formulate agreements to fill vacancies.

3. Alternative Mechanisms for Staffing ICS

Some tribes, counties, and communities may find that they cannot meet the personnel requirements of NIMS and ICS for response to any major emergency or disaster or to a particular type of incident such as FMD. When they consistently cannot meet staffing requirements of ICS, they may want to consider a more consolidated approach such as responding to major emergencies and disasters (or specific incidents) through the use of an interjurisdictional Unified Command. Although such a course of action would limit the autonomy of an individual jurisdiction, the use of Unified Command from the beginning of an incident would increase the number of personnel available for response while simultaneously preparing participating jurisdictions to meet the threat or hazard. Jurisdictions also need to consider how they will implement NIMS and ICS for recovery operations being aware that long-term recovery can take years.

Whether a jurisdiction decides to retain its response autonomy or chooses along with other jurisdictions to form a more regional approach to implementing NIMS, it should also consider a time frame for implementation of ICS. It will be difficult for jurisdictions to transition from routine protocols of everyday life to ICS protocols during an emergency or disaster; especially when volunteers are the main staffing source of

response agencies. Because major emergencies and disasters seldom occur, knowledge of/familiarity with procedures for implementation of ICS protocols will tend to weaken over time. This tendency was highlighted during the FMD Tabletop Exercise that was held in conjunction with this research project on November 19, 2004.

Mr. Steve Raddatz, a federal firefighter who is an expert in managing firefighting response under the Incident Command System, was asked to attend the exercise and to provide the researcher with his observations. Following the exercise, Mr. Raddatz forwarded the following remarks from the perspective of applying NIMS and the ICS to a bioterrorism incident.

“I’m worried about how well a response would be organized. I am concerned that officials within primary agencies involved know of ICS, but they don’t really *know* ICS. Training has exposed many of these players to (the doctrine of) ICS, but they are not yet practitioners. ...People know their technical jobs very well, but a real incident may be seasoned with needless self-induced chaos as the players fumble through trying to learn and apply an ICS organization during the pressures of a real-time incident.”

“It takes experience and practice to become adept at using the Incident Command System to manage incidents. I think back to the first large incident managed under ICS, the Pacoima Fire on the Angeles National Forest in 1974, and remember the organizational confusion. Talented fire professionals suddenly did not understand their roles and relationships. These people from various agencies, who had worked together on the fire-ground for years, initially fumbled like amateurs. It took working together on several large incidents before people became expert in organizing and managing (an incident response) under ICS. I suspect that it will take the same kind and level of experience before players in a bioterrorism scenario become proficient in applying ICS and NIMS.”⁸⁸

Mr. Raddatz’s comments mirror my own observations. Although exercise participants had a knowledge of ICS, they were not comfortable with its implementation. They demonstrated familiarity with the concept of ICS Command Staff but completely

⁸⁸ Comments of Steve Raddatz following the FMD Tabletop Exercise held in Meridian, Idaho, November 19, 2004.

misidentified positions on the General Staff. The Command and General Staffs are the most basic positions in the ICS organization. Transitioning to Unified Command did not pose a problem for exercise participants. However, no one demonstrated an understanding of how the Multiagency Coordination System would be implemented in an FMD response. The NIMS portion of the exercise fell apart when asked how they would implement MACS.

The exercise also demonstrated that the private sector does not understand ICS, Unified Command, or the Multiagency Coordination System. Representatives of the animal industries most impacted by an outbreak of FMD stated that they did not know how they would participate in ICS. Industry representatives have not been trained in ICS or NIMS procedures.

Jurisdictions need to recognize that ICS is as much an operational philosophy as it is a response tool. Therefore it is recommended that emergency services and the EOC should be managed under the ICS protocols on a daily basis, not just during major emergencies and disasters. Requiring agency officials to adopt ICS principles for everyday emergency preparedness activities will ensure that personnel will become capable practitioners of ICS when the protocols are most needed. This philosophical policy shift will be incredibly difficult to implement. It will take considerable time for agency leaders and employees to become comfortable with its application. It will require a considerable amount of planning and training before ICS can be implemented on an everyday basis throughout the jurisdiction.

Programmatically, the nation's responders and public officials need some type of training facility/institution where they can experience in a realistic manner the stress of implementing ICS, Unified Command, and MACS but without the inherent dangers. This program should not be merely a computer generated exercise. Just as the National Training Center trains and tests U.S. Army personnel in the field, a National Training Center for ICS, Unified Command, and MACS should be developed to train and test responders and public officials in the use of NIMS. It is suggested that classes work around the clock for at least three days, reserving the first day for administrative functions and the last for graduation and the departure of students. Although response

activities could be computer assisted, classes should be structured so that the stress of implementing ICS, Unified Command, and the Multiagency Coordination System can be experienced in a practical way. The institution must be able to train and test personnel using different terrorist and natural disaster scenarios such as FMD.

B. POLICY CONSIDERATIONS FOR RESPONDING TO FMD

1. Summary

FMD is an ideal bioweapon with which to attack the United States and its economy primarily because the FMD virus cannot be detected at our nation's borders nor can it be detected while it is being transported for deployment at various sites throughout the nation. Technology does not currently support detection of the FMD virus in the field except in live animals.

The only way to prevent an attacker from transporting the virus into or throughout the U.S. is to develop specific intelligence that identifies the individuals who are transporting the virus, the date(s), and the method(s) by which the virus will be concealed and transported. There are too many ways to infiltrate the United States without having to pass through an inspection checkpoint; and, the virus can be shipped by commercial carrier disguised as a product that would not raise suspicion. Even if the container were opened, it is unlikely that the presence of the virus would be recognized or detected without some prior knowledge or reason for suspicion. There is a low probability that federal agents and/or inspectors would be able to deter, preempt, interdict, or disrupt a terrorist-induced FMD bioattack based solely on the presence of the FMD virus.

An attack on the national economy using FMD would be effective. The U.S. General Accounting Office estimates that the direct costs of controlling and eradicating an outbreak of FMD in the U.S. could be as high as \$24 billion. Exports could be affected in amounts of as much as \$6 to \$10 billion per year until such time as the World Health Organization, Office of Animal Health should certify the U.S. to be FMD free. It would take several years to receive such a certification.⁸⁹ Indirect costs would affect employment, agricultural businesses, and business and industries that are agriculture-

⁸⁹ U.S. GAO Report entitled "Foot and Mouth Disease – To Protect U.S. Livestock USDA Must Remain Vigilant and Resolve Outstanding Issues," Washington D.C.

dependent. The overall cost could be in the trillions of dollars by the time full recovery occurred. Yet an attack using FMD remains underappreciated at the local, state, and federal levels. The evidence that supports this claim is based on the funding, personnel, and authorities that are not being provided.

2. Recommendations for Preparedness and Response to an Attack Using FMD

The American Veterinary Medical Association (AVMA) should take the lead to better educate and inform specific members and committees of Congress and the administration as to the threat and potential consequences of FMD specifically and to agroterrorism generally. The AVMA should approach related industry organizations (cattle, swine, sheep, transportation, rendering, and other associations) to form an industry coalition of lobbyists as a joint-education and awareness lobby. The lobbies already exist. Industry lobbyists should to be directed by their organizations to make Members of Congress aware of the needs of agriculturally-based business and industry to prevent agroterrorism as both an industry survival tool, and as a public service. The awareness program must include a list of needs, recommendations, and suggested actions to be taken by Congress and the administration.

The awareness program should not become a media “event”. Rather, there should be a private sector led education and awareness program to assist members of Congress with decision making related to funding and authorization for agriculturally-based antiterrorism programs. While it must be recognized that the USDA is an agency of the administration and is therefore in direct competition with other federal agencies for obtaining funding, personnel, and authorities; such awareness should not lead to USDA-bashing but to a search for ways and means to allow the USDA and other federal agencies to better protect agricultural industries in a global marketplace.

Congress and the administration must be made to understand that introducing FMD into the United States as an act of terrorism is not detectable and therefore not preventable without specific information about persons, locations, and dates of an attack. As the Congress reforms the nation’s intelligence apparatus, the USDA, Customs, and the Department of State must play a more direct intelligence role specifically in anti-agroterrorism. Those agencies must be directed to develop better intelligence lines of

communications with agriculture inspectors and analysts who occupy State Department positions in foreign countries. Intelligence analysts must be better educated about agroterrorism.

State governors, through the National Governors Association, and state agriculture department directors, through the National Association of State Departments of Agriculture, must be made aware that agroterrorism is just as dangerous and important as other forms of terrorism and therefore requires time and energy for its prevention. The local Office of the U.S. Attorney should extend an invitation to the Governor of each State to have a State veterinarian or epidemiologist representative on the Joint Terrorism Task Force (JTTF). The Governor should direct the state's agriculture director to appoint a veterinarian or epidemiologist to the JTTF and also provide authorization for that appointee to take the necessary time to fully participate in antiterrorism programs and investigations. The state's primary point of contact for the U.S. Department of Homeland Security must ensure that the state's veterinarian or epidemiologist appointee has the appropriate security clearance in order that he/she may fully participate in classified meetings and conferences in the JTTF.

State agriculture departments should work with county fair boards to develop methods to enhance awareness and prevention of agroterrorism. These could include biosecurity awareness classes for the prevention of FMD and other diseases at venues where animals are being exhibited. The use of cameras and recording equipment in barns and show areas of fairs and animals exhibitions could also be implemented as a deterrent as well as an investigatory and public safety tool. County fair boards should be encouraged to work closely with local law enforcement for the purpose of conducting employee name checks, and as necessary, background investigations based on information provided by criminal and terrorism indices checks of local, state, and federal investigative agencies. Terrorist indices checks are especially important prior to the hiring of transitory part-time and temporary personnel for events that will attract large concentrations of the general public. State agriculture departments should work with fair boards, exhibitors, and industry personnel to develop methods and regulations to restrict the movement of FMD-susceptible animals. Restrictions should include a five to ten day isolation of FMD-susceptible sold animals and animals that will soon be exhibited at

other fairs around the country. Such measures will not be popular with exhibitors or buyers, but they are an effective tool in the prevention of FMD.

State agriculture departments must develop awareness programs specifically for non-commercial producers (the weekend farmer/rancher) which address agroterrorism issues and explain biosecurity methods. Individual producers must be made to understand that the implementation of biosecurity measures is their primary contribution to anti- agroterrorism efforts. State agriculture departments, in consultation with commercial and privately-owned producers, should develop a system of phased biosecurity standards that increases biosecurity measures by commercial and privately-owned producers when the threat of agroterrorism increases in specific areas. State agricultural departments should work closely with both commercial and privately-owned producers to explain the need for and solicit participation in national trace-back programs.

C. CONCLUSIONS

This thesis examines in depth the impact of implementation of the NRP (and subsequently NIMS, ICS, Unified Command and MACS) on agriculturally-based state and local jurisdictions in response to a terrorist-induced FMD attack. States are currently incorporating the requirements of the NRP because to fail to do so would result in the loss of millions of federal dollars in Homeland Security Equipment Grants, Emergency Management Performance Grants, Public Health preparedness grants, and USDA preparedness grants. The greatest impact on the states centers on staffing for all the necessary planning, training, exercises, and providing assistance needed by local entities in meeting federal mandates and administering Homeland Security and natural disaster preparedness programs. Homeland Security Grants do not provide funding for full-time permanent employees. Some states including Idaho have not provided additional personnel or funding to adequately meet the requirements of state-administered national antiterrorism initiatives. State emergency management offices in numerous states throughout the nation have shouldered the lion's share of the planning, preparedness, and program administrative activities. Many have done so despite a lack of adequate permanent staffs.

The DHS philosophy which states that preparation for acts of terrorism also prepares entities for response to natural disasters does not hold up to scrutiny or at least not yet. What the author has observed is that previously understaffed emergency management offices at the state and local levels have postponed/put off natural disaster preparedness activities for Homeland Security program requirements because that's where the money/funding is.

State and local responders for terrorist incidents are the same responders that will meet the requirements for natural disasters, public health emergencies, and agroterrorism incidents. They are all members of the same manpower pool. The fact that three different federal agencies require training, certification, and exercises is creating an energy drain on state and local responders and emergency managers. As natural disasters occur, preparedness and responder agencies at the state and local level must of necessity direct their attention to emergency needs and consequently there will be tendency for them to fall behind in developing and maintaining Homeland Security programs.

The inevitable reduction or elimination of federal funding will ultimately eliminate the use of full-time temporary personnel who have been hired to implement Homeland Security programs at state and local levels. The states will be left with enormous program requirements and few personnel with which to administer and conduct those federally mandated programs. Whereas the federal government has developed and employed an army of personnel to implement the Homeland Security Program, the states have not. As such, states generally are perceived by Congress to be the "bottleneck" in distributing the financial resources to local governments.

The impact of the NRP and NIMS on local government include all of the above and in addition the potential loss of their political voice during an actual response, especially if the incident should be designated by the Secretary of Homeland Security as a Significant National Event. Just as in nature, federal agencies abhor a vacuum. If state and local officials are unable to adequately staff positions equal to those of federal agencies, then local governments will be overwhelmed and may lose their voice altogether. (Because of the State Coordinating Officer position, the state is able to retain its voice in federally declared response and recovery activities.) This is not mere

supposition. Rather it is based on the writer's personal experience during numerous federally declared natural disasters.

Well-meaning federal response and recovery personnel (often numbering well over a hundred individuals in some cases) arrive and spread throughout the disaster area to deal with the victimized public. As they relate the federal message to victims, messages of the state and local jurisdictions frequently get lost or garbled. Often federal employees may unwittingly make promises that state and local jurisdictions cannot keep. Under Stafford Act declarations, state and local jurisdiction are responsible for funding an average of 25% of the recovery costs for many of the services that federal agencies say that victims will receive. State and local entities may not be able to match federal funding. Such conflicting messages often result in situations where victims become angry upset with state and local officials, conditions that can easily become ballot box issues in future elections.

Training, skills certification, and exercises are important preparedness tools in the Homeland Security response program. However, agriculturally-based communities rely on volunteers to fill many of the emergency response functions within the community. Training volunteers is difficult because volunteers cannot easily take time away from professional and job-related responsibilities. Small communities are now discovering that there are fewer people volunteering for critical jobs, such as firefighter and emergency medical services technician, because of increased training and certification requirements. Training for volunteers must be tailored to meet their needs through the use of home study and on-line tools. Certification activities must be scheduled on weekends and during evening hours when volunteers are more likely to be able to participate in the certification process. Remuneration of volunteers undertaking training, exercises, and certification would likely entice people to volunteer for critical emergency response positions that have Homeland Security training, exercise and certification requirements.

Concerning an outbreak of FMD (as an act of terrorism or as a natural outbreak), states need to decide how they would implement a nationwide stop movement order. Will they have state law enforcement from one state facing officers from another state

doing the same job? As the situation stands today, they certainly would, or they would at least until someone decided that the states could be more effective by working together. Stopping the movement of susceptible animals is an important first step in isolating and eliminating the disease. State agencies, not just animal health agencies, must plan and prepare for agroterrorism, especially FMD.

Congress through its lawmaking authority or the administration through executive order should streamline and adequately fund the ability of the USDA to quickly recruit, train, and deploy veterinarians and technical personnel to assist state and federal animal health officials in the response to agroterrorism, including FMD. The use of VMATS, State VERTS, AEROs, and NAHERC could be consolidated under USDA into a single program with a single funding stream. FEMA would still receive the benefits of the VMATS during federally declared disasters through the National Response Plan.

USDA should consolidate FMD response and recovery instructions into a single instruction similar to that of the new British model, VIPER (Veterinary Instructions, Procedures and Emergency Routines) which outlines each phase of response and recovery as a result of an outbreak of FMD. Furthermore, VIPER identifies the position and duties of personnel in each of the required functions.

The Science and Technology Division of the U.S. Department of Homeland Security should be funded to conduct research to develop tests and devices to alert inspectors as to the presence of the FMD virus and other agroterrorism pathogens. Tests that can be conducted in the field could eventually be placed at fairs and in the barns of producers, sale barns, slaughterhouses, and packing plants to better protect the food chain, and to identify the presence of FMD before its spread becomes an epidemic.

The failure of governments at all levels to recognize and prepare for the dangers associated with the use of FMD as a terrorist bioweapon could result in the loss of trillions of dollars, causing irreparable damage to the national economy. The impact to state and local jurisdictions would be devastating. As businesses fail and close because of the effects of a FMD epidemic, state and local tax-bases would shrink, thereby affecting all functions of state and local government as well as those of the private sector.

The potential use of FMD as a bioweapon is greater today than at any time in our history. The capability and means with which to obtain, transport, and infect our nation's herds with the FMD virus have never before been so readily achievable. The motives for attacking our national economy have been clearly and repeatedly articulated by Osama bin Laden, who has demonstrated his ability to conduct attacks against free societies with non-traditional weapons. The desire to conduct such an attack was reportedly uncovered in Afghanistan where hand-written plans were discovered in caves outlining how to conduct such an attack. We know that the enemy has the means, the motive, the capability and the desire. How many more dots will be required before we as a nation begin to take agroterrorism and FMD seriously? An ounce of prevention really is worth a pound of cure.

APPENDIX: CHRONOLOGY OF THE FMD OUTBREAK OF 2001 IN GREAT BRITAIN

A. RESEARCH METHODOLOGY

In order to determine the likely effects of an outbreak of FMD in the United States, research for this analysis was conducted by reviewing news releases and records from the Ministry of Agriculture, Fisheries, and Food (MAFF)⁹⁰ and *The Veterinary Record*; a British veterinary journal that reported outbreak issues on a near-weekly basis as the outbreaks were occurring. Although a post-outbreak investigation might later determine differences from initial reports, the veterinary journals are the best representation of the real-time issues that were faced by the government, local veterinarians, and affected communities. Chronological information relevant to an outbreak in the U.S. was extracted from the veterinary journals for further evaluation to determine what lessons could be learned for use by U.S. planners, responders, and public officials. *Underlines* and **bolding** are mine, and are used for the sole purpose of calling the reader's attention to specific facts or conditions.

Before proceeding further, it must be reemphasized that the writer is not measuring FMD. Rather, the FMD scenario described at the end of Chapter II will be used to drive response options in a tabletop exercise that will be used to measure the impact of implementing the National Incident Management System (NIMS) and the National Response Plan (NRP) on state and local entities. However, because the U.S. has not experienced a FMD outbreak since 1929, it is prudent to review the British FMD outbreak of 2001 because it was the last "real world" outbreak to affect an entire nation. Although the British FMD outbreak was not an act of terrorism, the disease spread so quickly that some people did in fact initially question whether the outbreak could have been the result of terrorism. Emergency planners had generally believed that a natural outbreak would spread much slower than would multiple terrorism induced outbreaks.

⁹⁰ In 2001 the Ministry of Agriculture, Fisheries and Food (MAFF) became the Department for Environment, Food and Rural Affairs (DEFRA).

**B. REPORTS PUBLISHED IN “THE VETERINARY RECORD”
News and Reports Section, February 24, 2001**

Initially, no one knew how the outbreak occurred; only that it did. In a press conference held on February 21, 2001, Agriculture Minister, Nick Brown stated that “the situation was very serious; that quick action was required to identify the source of the disease by investigating the farms that had supplied animals to the abattoir” (slaughterhouse located in Essex England). Mr. Brown continued by saying that “movement restriction zones would be placed around farms suspected in being involved in the outbreak; infected animals would be slaughtered and their carcasses destroyed.” He reiterated that there was no danger to the public; that only livestock were at risk.

Chief Veterinary Officer, Jim Scudamore, reported that “two outbreaks had been confirmed, one in pigs at the abattoir, and the other in a bull on a nearby farm.” All the animals on the farm were destroyed and rendered. He continued by saying that while an investigation was being conducted to determine the origin of the outbreak, it would also be necessary to conduct a simultaneous investigation to “forward trace” the virus from the slaughterhouse to determine the spread of the virus. Restriction notices were being posted on farms where “cattle, sheep, goats and pigs” were being evaluated for the disease. Mr. Scudamore “pointed out that the disease could also be spread by airborne transmission and that computer modeling would be used to help identify the areas at risk.”

The Institute for Animal Health at Pirbright, England, confirmed that the infected animals had contracted the **type O FMD virus** which they described as “a pan-Asiatic strain... that appeared to have a **short incubation period**, with blisters appearing on infected animals within **two or three days.**”

On February 19th, a five mile restriction zone was placed around the slaughterhouse where FMD was suspected after vesicles (blisters) were discovered on 27 pigs that had been received from two farms. On February 20th, restriction zones were placed around the two farms; an inspection of livestock on the two farms failed to turn up any evidence of the virus.

On February 21st, Baroness Hayman, the Minister of State at MAFF addressed the House of Lords, where she indicated that although a five-mile zone restricting the movement of livestock had been placed around the Essex slaughterhouse, the plant received pigs from all over the United Kingdom, and therefore it could not be taken for granted that the disease started in Essex. Therefore, a wider infected area (restricted zone) is being imposed as a result of the “geography and the risks of airborne spread.” The Baroness went on to say that “when disease is suspected, the animals and other contacts are slaughtered, and full compensation is paid.”

The Baroness advised the House of Lords that “Foot and Mouth Disease is not a public health issue. ...although human infection of foot-and-mouth disease has been reported, cases are rare and of no health significance; the last report of human infection appears to have been in the 1960s. The Food Standards Agency has advised that there are no implications for the human food chain.”⁹¹

Comment Section, March 3, 2001

The Editorial Staff reported that within the seven days since their last journal publication, while an official Veterinary Surgeon was busy identifying the presence of the disease at the Essex slaughterhouse, the FMD virus had already spread to the “four corners of England and Wales, and possibly beyond.” The staff continued by noting that, “effective disease surveillance, and the control measures that depend on it, must start with the vet on the farm.”

The journal staff reported that resources were stretched so thin that Agriculture Minister, Mr. Brown, “was, in the short term, unwilling to allow further parliamentary debate on the subject (response to the FMD outbreak) as to do so would divert essential departmental resources from dealing with the disease itself.”⁹² The journal staff asked, “Shouldn’t there be a little more slack in the system?”

⁹¹ “Foot-and-mouth disease confirmed in UK,” News & Reports Section, *The Veterinary Record*, February 24, 2001, page 222.

⁹² Like Parliament, the U.S. Congress can summon leaders of the various federal departments. In the U.S., the Secretary of Agriculture could not stop Congressional debate by saying, “to do so would divert essential departmental resources from dealing with the disease itself.” This is but one of the differences between the two nations regarding response management at the federal level.

During the Parliamentary debate, Mr. Brown “emphasized the role of the media in making information known immediately. The journal staff noted that Mr. Brown had conducted numerous media briefings; however, they noted that there was “a degree of uncertainty about the precise role MAFF will be expecting private practitioners to play in helping deal with the outbreaks...””

Agriculture Minister Brown was also quoted as saying that “when the outbreaks had been dealt with, he would be asking his officials to examine the way in which the food chain works nowadays, with intensive farming and just-in-time delivery, and to consider whether that makes us more vulnerable to disease.” The editorial stated that the issues “might have a bearing on public policy,” and that “it will be clearly important to consider how the food chain works, not just in Britain, but in other countries of the EU and in the context of global trade.”

The editorial lamented about the “continuing restrictions on livestock movements” noting that the restrictions “will clearly cause animal welfare problems, particularly with the lambing season upon us, and the longer the restrictions continue, the harder the problems will bite.” However, the staff noted that MAFF was dealing with the problem by establishing a new “movement-to-slaughter scheme.”⁹³

News and Reports Section, March 3, 2001

Twenty-two confirmed outbreaks were reported in 10 different counties of England and Wales. Producers reported two cases, two were reported by local veterinarians, and five were discovered by official veterinarians working at slaughterhouses. “An outbreak was confirmed at a farm near Newcastle upon Tyne. The farm had supplied pigs to the Essex Abattoir on the Friday before. According to MAFF, the infection may have been present on the farm for two or three weeks... and MAFF was still working on the assumption that this farm was the likely source of the UK outbreaks.” Nearby farms were believed to have become infected as a result of “windborne spread of the virus” following the outbreak at the farm near Newcastle upon Tyne. The disease was confirmed in cattle in a nearby farm on February 23rd. On February 25th, “the disease was confirmed in sheep on a farm in Devon, England. The infected farm was

⁹³ “Responding to FMD,” Comment, *The Veterinary Record*, March 3, 2001, page 253.

“owned by a farmer with several premises in the area” of the Newcastle farm. Farms in other counties that contracted the virus reported a connection with the Devon farm. The government decided to slaughter all of the animals from the Devon farm, including those that had contact with Devon farm animals, but which had been shipped to different parts of the country.

“On February 23rd, a seven day ban on the movement of all livestock was imposed throughout Great Britain. On February 27th, the ban was extended for another two weeks. MAFF was reportedly developing a plan “that would allow limited movements of cattle and sheep under license and supervision direct from farms to abattoirs or through strictly controlled holding centers en route to the abattoir.” “Also on February 27th, the British Horseracing Board and the Jockey Club suspended racing for seven days.”

On February 26th, Mr. Scudamore reported to a press conference that “sheep from the Devon farm had been exported to Germany.” The sheep were located and slaughtered. Additional exports to other countries were being traced.

Agriculture Minister, Nick Brown stated, "We are very proud of our disease-free status. We haven't had foot-and-mouth disease in this country for 20 years. I want to get us back there, remorselessly, as quickly as we can. He reiterated his appeal, made on several occasions over the previous four days, for members of the public to help prevent the spread of the disease by staying away from livestock farms.

The Government “introduced new legislation enabling local authorities to order the temporary closure of footpaths and rights of way passing near farmland. By evening of February 27th, it was reported that Dartmoor National Park in Devon had been closed to the public. Elsewhere, other areas had been closed because of the outbreaks, including the Royal Parks and various zoos.⁹⁴

Officials contacted various other countries asking for veterinary assistance. One reason cited for bringing in veterinarians from other countries was that even though there

⁹⁴ Closures of popular public parks and zoos, along with fears about the food chain and spreading the disease to other countries would later have a tremendous economic affect on international tourism.

were sufficient people to deal with the outbreaks, they needed outside assistance to deal with other types of diseases that are commonplace to the normal operation of farming communities.

Local veterinarians were contacted to act as Temporary Veterinary Inspectors (TVIs); however, officials determined that “it was not felt appropriate (to use local veterinarians) as help would be needed on a full-time basis,” thereby taking local veterinarians away from their established practices.⁹⁵

News and Reports Section, March 10, 2001.

As *The Veterinary Record* went to press on March 6th, the British Veterinary Association (BVA) reported that there were 66 new outbreaks confirmed on March 4th and an additional 73 confirmed outbreaks on March 5th along with a case in Northern Ireland, and confirmed cases in Scotland.

Chief Veterinary Officer, Mr. Scudamore stated that “most of the (new) cases confirmed so far could be traced to previous outbreaks.” Many of the new cases were traced to a market in Cumbria, England. Mr. Scudamore stated that these cases “were due to either the movement of infected vehicles that carried animals, or the movement of infected animals (sheep) or people contact.” The article continued by saying that “other means by which the disease had spread were aerial infection (in cases where pigs had been involved) and lateral spread between contiguous farms.”

MAFF continued to emphasize the importance of the ban on animal movements in halting the spread of the disease, and pointed out that the outbreaks now being confirmed still appeared to be the result of the disease having spread before the nationwide ban was imposed on Friday, February 23rd.” The movements of over 100,000 sheep were being traced.

The Chief Veterinary Officer indicated, “...that at any one time, it was difficult to be precise about exactly how many animals had actually been slaughtered as animals first

⁹⁵ “Foot-and-mouth disease: efforts continue to stamp out the virus,” News & Reports, *The Veterinary Record*, March 3, 2001, pp 254 – 256.

had to be valued and then arrangements made for destroying the carcasses. On March 2, he indicated that “82,000 animals had (yet) to be slaughtered, and that 47,000 had been killed.”⁹⁶

Also on March 2nd, MAFF announced the “details of a licensing scheme intended to allow movements of animals from farms outside Infected Areas direct to abattoirs for slaughter, with a view both to allowing British meat back into the food supply chain and helping alleviate the animal welfare problems developing as a result of livestock having to be kept on farms. ...the volume of movement would be less than usual and strict conditions would have to be met. The scheme applies to cattle, sheep and pigs, and is being administered by local authorities.”

Once the animals arrived at the slaughterhouse, the animals had to be inspected and slaughtered within 24 hours. Farmers could not move the animals without first obtaining a license from local authorities. Applications for a license had to include “the place of origin, the destination, and the type and number of animals being moved.” Licenses were valid only for five days. On the day that the animals were to be moved, owners had to “sign a declaration to the effect that the animals are free of foot-and-mouth disease and confirming the booking at the abattoir, and the date of the most recent animal movement onto the farm.” Minister of State, Baroness Hayman reported that “on March 6, which some 40 abattoirs were already accepting animals under the scheme, and that 200 abattoirs had been approved” (to accept animals).

Asked about outside veterinary help, the Chief Veterinary Officer indicated that numerous governments had been contacted, and that Australia, the United States, New Zealand, Canada, the Republic of Ireland, and other EU veterinarians would join the 220 field vets, and 117 temporary vets who were on the MAFF books before the outbreaks began. MAFF reported that they had received 130 applications from local veterinarians (to be Temporary Veterinarian Inspectors) as a result of regional requests for assistance.⁹⁷

⁹⁶ Dr. Anderson, University of Idaho, Caine Center, reports that by the second week after the first FMD confirmation, there was a need to slaughter 80,000 animals from 110 farms.

⁹⁷ “Foot-and-mouth disease: two weeks and counting,” News & Reports, *The Veterinary Record*, March 10, 2001, pp 286 – 288.

News and Reports Section, March 17, 2001

By March 14th, over 200 outbreaks were confirmed in Great Britain. Since the beginning of the outbreaks, “135,000 animals had been slaughtered from 187 infected farms along with 34,000 animals from 146 in-contact premises.”

The journal reported that while government representatives “recognized and sympathized with the distress to farmers caused by the presence of carcasses on farms, the aim had to be to slaughter the animals as soon as possible to reduce the risk of the infection spreading. The priority was to slaughter the pigs first, because of their potential to spread the disease through airborne virus plumes, then cattle, then sheep. Once the animals were dead, the representative said, there was virtually no risk of spreading the virus.⁹⁸

“As far as destruction of the carcasses was concerned, three options were available: burning, burial, or rendering. Although burying was the simplest option, environmental considerations meant that it was often not possible, leaving burning and rendering as the only alternatives.”

The Chief Veterinary Officer, Jim Scudamore, said on March 13 that it was hard to say how long the measures currently in place to control the disease would have to last, as it looked as if the outbreaks had still to peak and, until they did, it would impossible to predict how long it would take for them to trail off.” The article continued saying. “Any idea that the outbreaks might be quickly curtailed was dispelled on Thursday, March 8, when MAFF reported that outbreaks, which hitherto largely had been confined to sheep, appeared to be spilling over into cattle.

“The picture then emerging was that infected sheep, having been moved around the country before the nationwide ban on livestock movements had been imposed on February 23, had been incubating the disease without showing obvious clinical signs, and then infected other sheep on the premises, leading to secondary, or even tertiary waves of infection in flocks under movement restriction. The disease was proving difficult to

⁹⁸ This statement does not address the fact that people working on infected farms could still spread the virus if biosecurity measures were not strictly enforced regarding people, clothing, and farm implements.

recognize in sheep, with sometimes as few as 5 per cent of animals in infected flocks showing any clinical signs. From sheep the disease had passed into cattle, where it was more easily recognized...”

“MAFF remained firm in its view that the disease was under control, in that it still had a coherent picture of the epidemiology of the disease, with most of the cases having arisen as a result of the movements of the sheep before the introduction of the movement ban, followed by localized lateral spread of the virus, mainly as a result of face-to-face contact between animals on neighboring farms, and the movement of people, vehicles and equipment, but also through limited windborne spread in some cases involving pigs. Spread of the disease through animal movements had been halted as a result of the movement ban; the problem was that it was still not clear where all the infected sheep might be.”

“An outbreak of foot-and-mouth disease among cattle on a farm at Mayenne in the north west of France was confirmed by the French authorities on March 13. A protection and surveillance zone had been placed around the farm and the 115 cattle on the premises had been slaughtered and incinerated. The farm was located some 500 meters (1640.42 feet or over a quarter mile) from a farm which had imported sheep from the UK on February 16; the sheep involved had subsequently been destroyed. The USA and Canada reacted to the French outbreak by banning imports of livestock and their products from EU member states.”

“Discussing the veterinary resources available for investigating farms involved in or linked to outbreaks, the Chief Veterinary Officer stated on March 8, that ...vets from overseas, temporary veterinary inspectors (TVIs) and others, MAFF had more than 500 vets at its disposal. Some 215 vets had applied for work as TVIs, in addition to the 115 or so already on MAFF’s books. The normal retirement age in MAFF was 60, and MAFF did not normally employ people over 65; however, provided applicants were fit and healthy, and could do the job, TVIs could be employed beyond that age if they wanted to do the work. What was needed was people who could be posted to offices in different parts of the country, to go out and inspect animals. ...any logistical problems, as far as the veterinary resource was concerned, involved organization and training rather

than numbers.” “...organizational difficulties could arise as a result of the time that had to elapse (five days) before a vet who had visited an infected premises could go onto a clean farm. However, the biggest logistical problems concerned the disposal of carcasses.

MAFF received more than 1000 reports of suspected disease, all of which required a veterinary visit, and there were other veterinary jobs to be done.” “...the aim was to get onto farms on the day the case was reported. Just how quickly the case was investigated would depend on the nature of the report. Again, work had to be prioritized, with absolute priority being given to reports concerning pigs, followed by cattle and then sheep. It was now three weeks since the first outbreak, and there was a need to look to people having two to three days off to recuperate.⁹⁹

Comment Section, March 24, 2001

“Up to the beginning of this week, MAFF had drawn attention to some of the logistical difficulties being encountered in valuing animals authorized for slaughter, and of disposing of their carcasses once they had been killed.” However, on March 20, it was noted that “a shortage of veterinary surgeons was now probably the single largest problem¹⁰⁰facing MAFF as it attempted to deal with the rising number of foot-and-mouth disease outbreaks and that more vets were urgently needed.

“Four weeks into the foot-and-mouth disease outbreak, the challenges presenting themselves are already considerable and they show no signs of lessening in the weeks ahead.”

News and Reports Section, March 24, 2001

As a result of an insufficient number of veterinarians to handle the outbreaks, “MAFF had approached UK veterinary schools to recruit final-year veterinary students to assist permanent veterinary staff or TVIs in investigating premises and confirming outbreaks. In addition to MAFF’s 220 veterinary field staff, there were currently more than 700 vets or final-year students working for the Ministry in attempting to control the disease – but more were needed. There were pay questions regarding the hiring of TVIs;

⁹⁹ “Foot-and-mouth disease: waiting for the peak,” News & Reports, *The Veterinary Record*, March 17, 2001, pp 322 – 325.

¹⁰⁰ In Great Britain, practicing veterinarians are often referred to as Veterinary Surgeons.

however the questions were left virtually unanswered with MAFF representatives saying only that they would look into the matter, but that they had to be fair to their full-time paid staff too.”

The journal reports that there was still no indication as to when the outbreaks would peak. By March 20, “a total of 378 outbreaks had been confirmed in Great Britain since the first cases were confirmed in Essex.” MAFF representatives said, “less than four weeks into the outbreak, more than 300,000 animals had either been slaughtered or authorized for slaughter in an attempt to control the disease.”

A new strategy was devised for dealing with the outbreak. “In the north of England and Southern Scotland, where large numbers of cases were occurring, with the potential for rapid spread to adjacent farms and further afield, the strategy would be to destroy animals within a 3 kilometer (nearly two mile) zone around Infected Areas on a precautionary basis. ...the preventive cull would apply to pig herds, and sheep flocks; cattle would be slaughtered only if the local risk assessment deemed this to be necessary.”

A new plan was announced for long-distance movement of non-infected animals where there was a “welfare problem arising as a result of animals being caught in the wrong place as a result of the movement ban...” “Control of the disease would remain the priority and such movement would have to be tightly controlled; the general principle would be that an animal could be moved within a currently controlled area, or within areas which were currently disease free, or into an area of higher disease risk, but not the other way around.”

The plan for long-distance movement “requires, among other things, certification by a private veterinary surgeon that there is a welfare problem which can most effectively be solved by moving the animals, and veterinary inspection of all animals on the holding before the movement takes place to confirm the absence of clinical signs of FMD and to check that the animals are fit to be transported. Journeys must take place in vehicles approved by MAFF as capable of being cleaned and disinfected at approved centers before and after the journey, and certified as clean by an inspector. Route plans have to be provided for the journeys which should be scheduled not to include a stop.” “The

scheme is being administered by Regional Service Centers, while the practical arrangements are being handled by the Meat and Livestock Commission.”

“...in cases where animals could not be moved, and the welfare problems could not be alleviated by husbandry, the animals could be disposed of at public expense. It would be up to the individual farmers to decide whether or not to offer livestock to the scheme, and acceptance would depend on certification by a vet that an insurmountable welfare problem existed or was about to emerge.”

Concerning continuing logistics problems, the journal continued by saying, “In addition to the options of disposing animals by burning, rendering and burial where possible, MAFF was investigating the possibility of using abattoirs within the Infected Areas for the slaughter of at-risk animals off-farm, with the meat produced being kept out of the food chain and disposed of later. Off-farm slaughter, it was pointed out, would be less distressing for the farmers involved, but the movement of animals to the abattoir would have to be strictly controlled to minimize any risk of spreading the disease.”

MAFF admitted, that “As far as on-farm slaughter and disposal of carcasses by burning was concerned, there were problems to overcome in terms of both organizing the teams of contractors in constructing the fires and obtaining the materials necessary, and it was hoped that the Army’s logistical expertise would help in this process.”

MAFF also admitted that “delays were being reported both in confirming outbreaks and slaughtering animals...” “...delays were occurring as a result of the time that had to be spent in valuing animals before slaughter...” MAFF reported that it “was looking for ways to streamline this procedure, possibly by means of yardstick valuations at agreed fixed rates.”

Also, “MAFF was looking at ways of, where possible, saving rare breeds and other valuable breeding animals from slaughter in areas where pre-emptive culling was necessary; however, ...stamping out the disease remained the priority and this would not be an option if the animals had the disease.”

MAFF “highlighted the fact that a shortage of vets was now causing difficulties and more were needed to cope with the spread of the disease in the worst affected areas.”¹⁰¹

Special Article, March 24, 2001

In a Special Article published by *The Veterinary Record*, “Joe Brownlie, Professor of Veterinary Pathology at the Royal Veterinary College, discusses the options available with regard to vaccination, and their applicability to the current situation in the UK.” The following are excerpts from that Special Article that might have applicability in the United States.

“There is increasing pressure for a vaccination program to control the current outbreak of foot-and-mouth disease (FMD). At its simplest, this would appear to be an obvious and supportable request. However, for some diseases, there are strategic decisions that need to be considered before embarking on national vaccination.”

“There are a number of FMD vaccines, and this partly reflects the need to provide protection against all serotypes of the virus. There are seven serotypes: A, C, O, Asia 1, SAT1, SAT2, and SAT3, within the A, C, and O serotypes having the widest distribution. Within each serotype, there is a spectrum of strains, which can be grouped together according to their genomic relationship.”

“All vaccines are derived from viruses grown in tissue culture, chemically inactivated and adjuvanted (prepared from ultra-light oils). ...it is important to know the strain of virus used in the vaccine... This allows decisions to be made that match the most appropriate vaccine (that is, the one providing the closest antigenic homology) to the outbreak strain. However, in countries where more than one serotype circulates, the bi- and trivalent vaccines are used...”

“There is some variation in the reported composition and duration of immunity following vaccination between the commercial vaccines available... FMD vaccines require a primary injection with a booster injection after one month, followed by booster inoculations every six months.”

¹⁰¹ “Foot-and-mouth disease: MAFF calls for more vets as the number of outbreaks continues to rise,” News & Reports, *The Veterinary Record*, March 24, 2001, pp 354 – 356.

“There has been some recent field evidence that partial vaccine breakdowns have occurred even when vaccines containing the appropriate serotype have been used. This has been reported recently in the present FMDV O PanAsia pandemic where cattle in Saudi Arabia had oral FMD erosions even though they had been vaccinated with serotype O vaccines. A colleague in the Middle East recently wrote: “We fight FMD all the time in this part of the world and despite awesome herd security and what is probably the most vigorous vaccination schedule in the world, we have had two outbreaks in the three years since I arrived. In 1999, we suffered with type O... and last year with SAT2.””

“There are internationally agreed definitions for the designation of FMD freedom for countries and zones. They are encapsulated within the Articles of the Office International des Epizooties (OIE). Thus the criteria, agreed internationally, clearly state that to achieve FMD-free country status, we must wait three months after the last clinical case where there is a stamping out policy. However, new proposals currently being considered would extend the time period to two years if all vaccinated animals were not slaughtered. In counties where vaccination is regularly practiced, it could take two years to reestablish freedom.”

“It is difficult to imagine how long it would take to clear FMD without a “stamping out” policy but it would not be unreasonable to predict that FMD, once endemic, would take a decade or longer to eliminate. Vaccination may shorten this period but we would still have to return to “stamping out” in order to achieve FMD freedom.”

“It is evident from experimental work that ruminants (cud-chewing hoofed mammals having a stomach divided into four (occasionally three) compartments)¹⁰² that have contact with live virus can become “carriers” of FMD; for cattle it is for periods up to three years and for sheep up to nine months. There is also field evidence, although no experimental studies, to indicate that carriers can precipitate new outbreaks. Vaccination can reduce this number of carriers by reducing the general level of virus in the field, but vaccinated animals that have contact with live virus are just as likely to become carriers as animals that have recovered from clinical disease. Thus, vaccine can reduce disease

¹⁰² *World Net Dictionary*, found on-line at www.webster-dictionary.org/definition/ruminants accessed on November 29, 2004.

but does not prevent infection; this means that the virus can circulate sub-clinically. Thus, any animal with antibodies must still be considered as having been potentially infected. Such animals are not acceptable for importation into FMD-free countries.

“In any new outbreak, there is always the possibility, if not pressure, for ring vaccination around infected zones to prevent further transmission. Ring vaccination has been used before in outbreaks (though never in the UK) and has been considered a successful adjunct to control in local areas. Obviously, it takes two or three weeks after the first vaccination to initiate protective immunity. With the use of high potency vaccine, immunity to aerosol challenge can occur within four days. This immunity is temporary and needs a booster inoculation at three to four weeks to provide a longer term protection. Thus, for ring vaccination, a single inoculation may be sufficient.”

“It is clear that ring vaccination can only be effective in containing the outbreak if there is no animal movement beyond the area of ring vaccination.” “...outbreaks in the first seven days in Essex could not have controlled this national spread of virus; it is already clear from MAFF reporting that widespread sheep movements and marketing have been central to the epidemiology. It would be difficult to see where ring vaccination could have helped in the initial phase of this outbreak.”

“There may still be a case for strategic vaccination of endangered animals (for example ...zoo animals); however, the political consequences may be prohibitive. The value of selective vaccination around or downwind of large pig units may also be suggested.”

“Thus, it appears once again that the essential elements to control the FMD outbreak are the availability of professionals in the field, the rapidity of diagnosis, informed policy and courage at the top.” ¹⁰³

¹⁰³ “Strategic decisions to evaluate before implementing a vaccine programme in the face of a foot-and-mouth disease (FMD) outbreak,” Special Article, *The Veterinary Record*, March 24, 2001, pp 358 – 360.

(NOTE: What was not clearly stated in this Special Report is that after ring vaccination successfully contains the virus to a specific locale, and there is no indication of a spread of the disease, the inoculated animals would then be destroyed to retain a country's FMD-free status.)¹⁰⁴

News and Reports Section, March 31, 2001

It was announced that as of March 27, 2001, “668 cases of the disease had been confirmed in Great Britain since the first outbreak was confirmed on February 20, together with one case in Northern Ireland (confirmed on March 1). Out of a total UK livestock population of more than 55 million animals, 697,500 animals had been authorized for slaughter and 423,000 of these had already been killed.”

MAFF reported that it would be “introducing two new steps to help reduce report-to-slaughter times. The first would enable vets receiving a telephoned report of a suspected foot-and-mouth disease outbreak to take a slaughter team with them when they visited the farm to confirm the outbreak, if the disease seemed likely on the basis of the farmer's description.” The second new step included compensating farmers for the loss of their animals “according to a schedule of generous fixed rates, although they (farmers) would have the option of having their animals independently valued if they wished.”

It was also announced on March 22, that the “Welfare of Livestock (Disposal) Scheme, intended to pay for the transport, slaughter and disposal of animals trapped on farms because of the continuing nationwide ban on the movement of animals and which are suffering serious welfare problems as a result.”

“On March 23, MAFF gave a presentation outlining the preliminary results of three epidemiological analyses, conducted independently... who had been asked to predict the future course of the epidemic. The analyses were based on mathematical models, using data recorded by MAFF up to March 19th ...” “The results of the three models indicated that, in the absence of further control measures, Britain was in for a very large epidemic which would grow quickly in the next few weeks and continue for many months. Estimates varied from 70 cases a day over the next two weeks, to more

¹⁰⁴ Information provided by Dr. Kendal Eyre, DVM, Idaho Department of Agriculture, Animal Industries.

than 4000 cases by June 2001, with one model suggesting that, left unchecked, the epidemic would double in size every eight days.”

“MAFF reported that the models suggested that speedier slaughter of infected animals would help to reduce the transmission, but that this would need to be accompanied by the immediate slaughter of all susceptible species around infected farms or the final number of cases would be very high; depending on the extent of the interventions, the combined strategy could reduce the epidemic substantially.”

“The Government’s Chief Scientific Advisor, Professor David King, said on March 23, that models indicated that the disease was not under control at present on the basis of current report-to-slaughter times. However, if report-to-slaughter times could be reduced to 24 hours, the disease could be brought under control quite quickly.”

“MAFF would continue to adopt a regional strategy, appropriate to local circumstances.” While intensifying its efforts to control the disease, “MAFF would in the future assume that animals on farms immediately adjacent to infected premises were infected, and slaughter those animals on a precautionary basis.”

The Agriculture Minister, Nick Brown, said “he was reluctant to resort to vaccination in heavily infected areas, but not ideologically opposed to it, and would consider using it if it could make a positive contribution to resolving the crisis.”

“MAFF continued to face problems in disposing of the carcasses of animals slaughtered as a result of its control efforts, but on March 24, reported that logistical support from the Army was proving helpful in this. On March 25, it was reported that a disused airfield... was being prepared as a burial site for up to 500,000 sheep; the first carcasses were buried at the airfield on March 26 and plans were also in hand to transport live, non-infected animals to the airfield for slaughter and burial on site. Efforts to find further sites for the disposal of carcasses were continuing.”

By March 31st, it was reported that “more vets were coming from overseas, and more had been recruited as TVIs, with the result that more than 1100 vets were now working for MAFF.” Answering questions about the lack of veterinary resources, the

Agriculture Minister stated that “the previous Government had “reduced the size of the SVS (State Veterinary Service) substantially.””

“The Government’s strategy remained focused on three priorities: first, culling all animals (cattle, sheep, and pigs) on infected farms within 24 hours of the report of infection; and secondly, culling all animals on contiguous farms within 48 hours. Thirdly, it was concentrating its effort in... creating a firebreak south of the worst affected area.”

“780 soldiers (were) being deployed at MAFF’s request to help with the logistical operations. The Army’s role... was to enhance command and assist in the disposal of carcasses,” allowing vets to concentrate on veterinary matters. **“The total number of vets in the SVS tackling the diseases was by now 1235 and the Government was looking to increase the number still further.”**

“Two outbreaks of foot-and-mouth disease were confirmed in the Netherlands on March 21. On March 22, a case was confirmed in the Republic of Ireland, in sheep 7 kilometers from the farm in Northern Ireland where a case was confirmed on March 1.” “The European Commission reacted to the Dutch and Irish outbreaks by banning exports of live animals which are susceptible to the disease from anywhere in the two countries, as well as exports of milk, meat, meat products from the affected regions.”

With regard to vaccination, the Agriculture Minister stated that “national vaccination was not a policy adopted or favored by any EU member state, or by the European Commission. It was, however, accepted that vaccination could play a role in controlling foot-and-mouth disease, either to establish protection zones between Infected Areas and the rest of the country, or to reduce the number of cases in disease “hot spots.” The Commission had already agreed to the possible temporary use of vaccination in such circumstances by the Dutch authorities.” It was pointed out (again) “that vaccination was no easy option. It would be expected to delay full return to international trade...”

The Agriculture Minister shed some light on the origins of the outbreak by saying, “the likely source farm for the outbreak (the fourth infected premises to be discovered) was a farm... where suspicious lesions had been found in pigs on February 22. The farm was licensed to feed swill to pigs, and lesions in the pigs suggested that they had been

incubating the disease for at least two, and possibly up to three weeks. From the source farm, the disease spread to other farms... around the country through hundreds of sheep movements, through various markets, at a time when MAFF was still unaware of the disease.”¹⁰⁵

News and Reports Section, April 7, 2001

“The number of outbreaks of foot-and-mouth disease (FMD) in Great Britain had exceeded 1000 (cases) and the number of animals authorized for slaughter as a result of efforts to control the disease was more than 1 million.” Locations of the affected premises were published on MAFF’s website report that by April 3, “about 1,010,000 animals had been authorized for slaughter and that the information available indicated that just under 631,000 of these had already been killed. A total of 192,000 carcasses still had to be disposed of.”

“By the morning of April 4, the Government had still to announce its decision on whether or not it would be vaccinating any animals in attempting to control the disease, although permission for limited vaccination had been obtained from the European Commission: the EU’s Standing Veterinary Committee had agreed that emergency vaccination of cattle could be carried out in Devon and Cumbria, if the Government decided it was required.”

“On April 2, the Prime Minister, Mr. Tony Blair, announced that, as a result of the disease, he would be postponing Britain’s local elections until June 7 – the first time the elections had been postponed since the Second World War.”

“On March 30, MAFF issued “urgent advice” to farmers, recommending that they take the following action “to help prevent the spread of foot-and-mouth from the heavily infected sheep flock to cattle”:

- Keep cattle housed as long as possible;
- Do not graze cattle and sheep together;
- Do not graze cattle in fields next to sheep;
- Keep hill sheep on the hills. Do not bring them down to lowland for lambing unless there is a disease risk on the hill;

¹⁰⁵ “Foot-and-mouth disease: MAFF targets report-to-slaughter times in attempting to bring the disease under control,” News & Reports, *The Veterinary Record*, March 31, 2001, pp 390 – 393.

- Keep up biosecurity measures, such as disinfection.

“Most (**more than 95 per cent**) of disease confirmations were being made on clinical grounds, without resorting to laboratory tests.”

“MAFF also reported on March 30 that it was bringing more and more vets “into the front line.” At that stage there were 1313 vets working in the State Veterinary Service in tackling the disease, including 112 from countries outside the UK, and MAFF was looking to increase the number still further.”

“...MAFF pointed out that non-government veterinarians wishing to apply for TVI work should have, “at a minimum good communications skills and a good command of English; preferably experience of working with livestock; and a degree that registered with the Royal College of Veterinary Surgeons”. In the meantime, MAFF said that it had put senior officials in place as directors of operations (in outlying areas) to release senior vets for veterinary work.”

MAFF reported on March 30, that because of the existence of BSE, “we do not consider it appropriate to bury any cattle at the current time – all slaughtered cattle are burnt or rendered.”¹⁰⁶

News and Reports Section, April 14, 2001

“The Government’s Chief Scientific Advisor, Professor David King, expressed “cautious optimism...” that the Government’s policies... were working.” Professor King’s comments were made on the basis of epidemiological modeling of the disease based on information supplied from the field...” “Professor King said on April 11, “The flattening out of the epidemic has now been confirmed, and the data even shows a possible downward trend since the end of March. The average number of new cases per day was 32 for the week ending April 8, compared with 43 for the previous week...”

“ Asked... whether the latest developments would affect the Government’s position on vaccination, Professor King replied that vaccination represented an additional option for controlling the disease, not an alternative.”

¹⁰⁶ “Foot-and-mouth disease: outbreaks exceed 1000,” News & Reports, *The Veterinary Record*, April 7, 2001, pp 422 – 423.

Minister of State at MAFF, Baroness Hayman on April 11, announced that the Government would take “measures that would allow farmers in Great Britain who were on premises that were not infected, but within zones that were still controlled, to move animals into the food chain through slaughterhouses located within the same Infected Area. It was expected, she said, that this would probably become operational on April 23, and it is hoped that it would take pressure of the Government’s welfare disposal scheme.”

Referring to short-distance movement licenses, Baroness Hayman said that about 50,000 licenses had already been issued. However, she said, there had been some concern that the procedure should be simplified and made quicker and easier to operate, particularly in provisionally free areas where there had not been any cases of the disease. MAFF was therefore looking into the possibility of using local vets to issue the licenses...¹⁰⁷

News and Reports Section, April 21, 2001

“The Government had still firmly to announce whether it intended to make use of vaccination in attempting to control foot-and-mouth disease... At a press briefing on April 18, the Government’s Chief Scientific Advisor, Professor David King, and the Chief Veterinary Officer, Mr. Jim Scudamore, told journalists that vaccination of housed cattle in Cumbria, and possibly Devon, represented an attractive option in controlling the disease by protecting those animals once they were turned out to grass. They still had to persuade farmer’s leaders of this, however, and would be meeting with them immediately after the briefing to try to convince them of the merits of this strategy.” Professor King stated that “more than 60 per cent of the farmers in the region would have to “buy into” the policy.”¹⁰⁸

Comment Section, April 21, 2001

An editorial published in the “Comments Section” says, “From the start, the Government (or MAFF, since that is where most of the current opprobrium [a state of

¹⁰⁷ “FMD: chief scientist expresses ‘cautious optimism’ that the controls are working,” News & Reports, *The Veterinary Record*, April 14, 2001, pp 458 – 459.

¹⁰⁸ “Foot-and-mouth disease: the Government moves towards limited vaccination,” News & Reports, *The Veterinary Record*, April 21, 2001, pp 490 491.

disgrace as a result of public abuse]¹⁰⁹ seems to be directed) was faced with an impossible situation, in that, by the time the extent of the problem became clear, the disease was already so widespread that the classical approach to containing it – isolating affected premises, and slaughtering and destroying infected animals as well as their contacts – was already a hugely difficult task. Yes, the disease should have been spotted sooner – and it might have been if vets had better access to farms, and the State Veterinary Service had not previously been cut to the bone. And yes, having embarked on such a policy, the Government should have implemented it more quickly.” “One might argue that contingency plans should have been in place in readiness for a worst case scenario...”

The editorial concluded by saying, “Once the crisis is over, the long-term challenge for politicians is to devise, with appropriate advice, a system for agriculture in which society’s food requirements can be balanced with the need to control disease and protect animal welfare, and for which common sense, rather than the aim of producing food at the lowest possible price, is the driving force.”¹¹⁰

Comment Section, April 28, 2001

“Veterinary practices are making a substantial contribution to the efforts being made to control foot and mouth disease, and will continue to do so for as long as the crisis continues. However, the disease is evidently having an impact on practices as well as their farming clients and many of those currently involved in helping to deal with the outbreaks are understandably concerned about what the future holds.”

“The government appeared last week to be backing away from proposals to employ limited vaccination in attempting to protect cattle against foot and mouth disease in heavily infected areas, after signs that its culling policies were bringing the disease under control and in the light of continuing resistance to its proposals from farmers.”

“MAFF recorded that, on April 23, a total of 2,206,000 animals had been authorized for slaughter since the outbreaks began; 1,974,000 of these had already been killed and 204,000 carcasses still had to be disposed of.”

¹⁰⁹ *World Net Dictionary*, found on-line at www.webster-dictionary.org/definition/ruminants accessed on November 29, 2004.

¹¹⁰ “Politics and FMD,” Comment, *The Veterinary Record*, April 21, 2001, page 489.

“MAFF announced on April 20, that infected area restrictions were being lifted in two areas, releasing more than 1000 farms from the infected area restrictions that had previously applied there. On April 22, it's similarly announced that infected area restrictions were being lifted releasing a further 2600 farms from the restrictions. On April 24, it was announced that infected area restrictions were also been lifted in the Brentwood area of Essex, where the first outbreaks of the disease were confirmed on February 20.”

“On April 23, MAFF announced that the first animals caught up in foot and mouth disease surveillance zones imposed as a result of the outbreaks had been sent for slaughter for use in the human food chain. This had been made possible as a result of changes in the restrictions applied to farms in the surveillance zones, allowing farms in those areas to send animals for slaughter to abattoirs within the same surveillance zone. This scheme is being administered by local authorities. Movement can only take place under license and local veterinary inspectors will be required to inspect animals and certify them as being free of foot and mouth disease less than 24 hours before they're loaded for transport direct to the abattoir. More than 100 abattoirs have been approved under this scheme and MAFF estimates that it will make an additional 7 million sheep, 750,000 pigs and 1.5 million cattle available for slaughter.”

“In a further attempt to alleviate some of the animal welfare problems occurring on farms, MAFF announced that farmers would be able to move animals between their own premises in a wider range of circumstances. All movements would continue to require a license, but these licenses would be issued by LVIs “on the ground.”

“With regard to the government's livestock welfare disposal scheme, Baroness Hayman acknowledged on April 20 that the scheme had got off to a slow start but said that, in the preceding week, substantial progress has been made in increasing its capacity. The current slaughter rate was around 30,000 animals per day and growing, with a total of more than 300,000 animals having been slaughtered under the scheme by April 19.”

“The President of the Royal College of Veterinary Surgeons, Mr. Roger Eddy, has written to the Prime Minister, Mr. Tony Blair, calling for greater account to be taken of

local circumstances when deciding on which animals should be included in the continuous cull in attempting to halt the spread of foot and mouth disease.”

He said, “...the current policy of culling all livestock on premises contiguous to farms where foot and mouth disease is confirmed is causing “extreme distress to a large number of veterinary surgeons... It would appear, he says, that the definition of contiguous premises is “made centrally with no local assessment being made of the actual risks involved.” This policy has “undoubtedly resulted in thousands of healthy animals being slaughtered unnecessarily when there has been little or no risk of them being infected,” and he urges that, following a local risk assessment, divisional veterinarian managers within MAFF should be allowed to make decisions on which contiguous premises are slaughtered out. He concludes by saying, “I am very concerned that the large army of volunteer veterinary surgeons currently working as TVIs are becoming disillusioned at the centralized decision-making processes, many of which are not made by veterinarians, and that MAFF is in grave danger of losing this goodwill, which is so freely given.”¹¹¹

News and reports section, May 5, 2001

“Refinements to the Government's Policies for Stamping out Foot and Mouth Disease, allowing greater scope for local veterinary judgment in determining which animals should be included in the contiguous cull, were announced by the UK Agriculture Minister on April 26.

“Government policies of slaughtering animals on infected premises within 24 hours, and on contiguous premises within 48 hours had been crucial in controlling the disease. “The scientific advice was that the single most important action, we should take against the spread of the disease was to reduce the time between report and slaughter to 24 hours. However, in view of the developing disease situation, the government was now able to announce “a broadening of the areas of discretion for local veterinary judgment.” This does not represent a relaxation of the government's policy; rather, its purpose is to improve the achievement of the policy by refining the instructions given to staff in the field.”

¹¹¹ “FMD: current and future concerns,” Comment, *The Veterinary Record*, April 28, 2001, page 517.

MAFF would continue to kill all susceptible animals on infected premises, as well as all animals which were dangerous contacts; this would include animals on a significant number of neighboring farms, and also beyond. It would also kill susceptible animals on other contiguous premises. Cattle might be spared if there was adequate biosecurity. This would be a matter for local veterinary judgment, taking account of all the circumstances. While these refinements might be expected to provide some release from the automatic slaughter of cattle, they would not lead to a change in the policy of culling pigs and sheep on contiguous premises; pigs posed a high disease risk and could spread the virus, while sheep could carry the disease without showing symptoms, thereby causing further undetected spread.

“...the government had given serious consideration to a strategy of vaccinating cattle in north Cumbria and possibly Devon, in view of the intensity of infection in certain areas, and also the forthcoming turnout of cattle from indoor housing to outdoor grazing. The government... accepted the case for vaccinating cattle in these areas, but only if the vaccination program was supported by a substantial majority of the farming community, veterinarians, the wider food industry and consumers. However, the necessary level of support is simply not there and the signs were that it would not be achieved.”

A total of 1481 cases of the disease had been confirmed since the first outbreaks were confirmed on February 20. From the highest point of 43 cases per day, on average, in the week ending April 1, the average daily number of cases had fallen to 16 in the week to April 22.” “...since the start of the outbreaks, more than 2 million animals had been slaughtered for disease control purposes, of which 75% were sheep, 20% were cattle and 5% were pigs. A further 475,000 animals at been killed under the Government’s welfare slaughter scheme. ...according to the latest figures, 152,000 animals were awaiting slaughter and 218,000 carcasses still had to be disposed of. ¹¹²

Comment Section, May 5, 2001

An editorial published in the “Comments Section” of *The Veterinary Record* presented the following information. “Judging by the relative dearth of reports in the

¹¹² “Foot-and-mouth disease: MAFF refines its policy on the contiguous cull,” News & Records, *The Veterinary Record*, May 5, 2001, pp 550 – 552.

national media earlier this week, one might be forgiven for thinking that the foot-and-mouth disease (FMD) crisis was over. This is patently not the case, although... there are grounds to be cautiously optimistic about the future course of the epidemic. The average daily number of confirmed new cases of the disease has been declining since the beginning of April and, overall, the cumulative epidemic curve is flattening. Nevertheless, as the Government's Chief Scientific Advisor pointed out a few weeks ago, it seems likely that Great Britain is in for a long and bumpy ride before the disease can be said to be eliminated, and there could all too easily be a resurgence in the number of new cases if the control efforts are relaxed. Problems can still be anticipated as housed cattle are turned out to graze and strict adherence to the biosecurity measures advocated by the British Cattle Veterinary Association and others will be vital."

"In the meantime, MAFF continues to face difficulties in disposing of the carcasses of animals slaughtered as a result of efforts to control the disease..." "Environmental objections to the methods being used continue to mount..." "With FMD, as was the case with BSE, carcass disposal has proven highly problematical and this, together with the public's reaction to the sight of thousands of animals being slaughtered on farms, is likely to be a driving force for changing control strategies in the future."

"What has come to be described in Great Britain as an FMD epidemic is, in fact, a group of epidemics, seeded by the movement of infected sheep into different parts of the country. The course of the disease in different regions has inevitably been affected by local circumstances and, in this respect, Mr. Brown's announcement that the Government "would be broadening existing areas of discretion for local veterinary judgment" in applying the contiguous cull is to be welcomed. This "refinement" of the Government's policy, brought about at least in part by pressure from vets working to control the disease in the field, should help to reduce the number of cattle slaughtered in attempting to stop the disease spreading."

"A notable feature during the present epidemic is that the Government's policies seem largely to have been driven by the results of epidemiological modeling. Epidemiological modeling represents an extremely valuable tool in disease control, and is

likely to become even more useful as the models become more sophisticated. However, the result obtained can only be as good as the models and the data on which the forecasts are based; it is important also to make use of other sources of information and veterinary judgment must continue to play an important role in the decisions made.”

“Having indicated just over two weeks ago that it hoped to introduce a cattle vaccination strategy in Cumbria and possibly Devon, the Government seemed last week to be backing further away from that proposal, in view of a lack of support for the idea from farmers and the continuing decline in the number of new cases. Vaccination has never presented the simple option for controlling the disease that some people have claimed. However, having itself argued firmly against vaccination early in the epidemic, it seems a little bit rich for the Government now to be passing the buck for the decision on to farmers.”¹¹³

Special Report, May 12, 2001

“Considerable interest and concern have been expressed both in the media and within the veterinary community that the burning of infected carcasses on open pyres could spread foot-and-mouth disease (FMD) virus, resulting in breakdowns of disease downwind of pyres.” “While it has been established that the amount of virus released from an infected animal is greatly reduced after its death (Sellers and others 1971), there are no experimental data available concerning the quantity of virus emitted when infected carcasses are burned.”

“...based on the assumptions outlined in the (preliminary investigation by MAFF and the Institute for Animal Health) early results indicate that breakdowns due to virus dispersion from pyres are unlikely to occur in general, and the pyres analyzed to date have shown no evidence that breakdowns due to this cause have occurred.”

¹¹³ “ ‘Cautious Optimism’ on FMD,” Comment, *The Veterinary record*, May 5, 2001, page 549.

“It is readily recognized that there are a number of other studies currently investigating aspects of animal pyres,¹¹⁴ and it is hoped that all interested parties will be able to work closely together to establish, definitively, the full risks involved in the burning of animal carcasses on open pyres.”¹¹⁵

News and Reports Section, May 12, 2001

“The scale of “combating foot-and-mouth disease (FMD) has far exceeded the logistical demands of the (first) Gulf War,” according to Britain’s Prime Minister, Mr. Tony Blair.” “...Mr. Blair described the operation as “the biggest peacetime logistical challenge the Army has ever faced.” “He described FMD as “an unpredictable and rampant virus that has been extremely difficult to control, ”which was why the Government had had to put in place “an extraordinary operation – logistical, scientific, strategic – to deal with it,”” “...we are now getting the disease under control.” “However ...it is not over yet. We cannot in any way be complacent and it is essential we remain fully vigilant.”

The government “...would continue with its policy of culling susceptible animals on contiguous premises; culling animals at risk on neighboring premises; rigorous tracing and swift action to eliminate dangerous contacts; a rapid disposal of carcasses; and the careful disinfection of premises.” The UK Agriculture Minister indicated “that there were likely to be sporadic outbreaks, and these would have to be dealt with vigorously right up to and including the very last case.”

“By May 3, the weekly average number of new cases was eight infected premises per day, compared with 16 on April 22 and 32 on April 8.”

“In a statement in the House of Commons on May 3, Mr. Brown updated MPs on progress in tackling the disease and reported that “there is no longer any backlog of

¹¹⁴ Champion, Gloster, Mason et al, submitted a paper based on further research, which was published in the “Papers & Articles Section of *The Veterinary Record* on November 16, 2002. According to their paper, “An atmospheric dispersion model was used to predict the airborne spread and concentrations of foot-and-mouth disease virus within the plumes generated by 11 pyres built to burn infected carcasses during the epidemic of 2001 in the UK. On the basis of assumptions about the quantity of virus emitted during the three hours after the pyres were built, and the threshold concentration of virus required causing an infection in cattle, it was concluded that none of the disease breakdowns which occurred under the plumes was due to a spread of virus from the pyres.”

¹¹⁵ “Spread of foot-and-mouth disease from the burning of animal carcasses on open pyres,” Special Report, *The Veterinary Record*, May 12, 2001, pp 585 – 586.

animals awaiting disposal, anywhere in Great Britain.” This achievement had been the result of a concerted effort over the past few days and weeks, using all the disposal methods -- rendering, burning, incinerating, landfill and burial -- according to need as appropriate in the local circumstances.”

“MAFF’s refined policy on the contiguous cull had been generally welcomed by farmers, as had a move toward making special arrangements for rare breeds of sheep and hefted flocks.”

“Mr. Brown also announced that, following its consultation on proposals for a ban on pig swill, the government would be banning the feeding as swill to livestock of catering waste which contained, or had been in contact with, meat. The ban would include poultry and fish waste and would come into force on May 24.

“Mr. Brown “also gave details of the steps being taken by the Government to tighten controls on illegal imports of meat and meat products into the UK. These would include pooling information within Government about known or suspected illegal imports to help the authorities to target their activities effectively, as well as a publicity campaign to ensure that travelers were aware of what could and could not be brought into the country.”

“MAFF’s web site reported on May 9 that a total of 1569 cases of foot and mouth disease had been confirmed in Great Britain since the first outbreaks were confirmed on February 20. On May 8, a total of 2,609,000 animals have been slaughtered or identified for slaughter since the outbreaks began. Of these, 2,522,000 and already been killed and 58,000 carcasses still had to be disposed of.”¹¹⁶

News and Reports Section, May 19, 2001

“...UK agriculture Minister, Mr. Nick Brown, last week highlighted the need for continued cooperation between farmers and veterinary surgeons in combating foot and mouth disease. He also emphasized the need for farmers to continue to take care not to spread the disease through movements and farming operations.”

¹¹⁶ “ ‘An unpredictable and rampant virus’, “ News & Reports, *The Veterinary Record*, May 12, 2001, pp 582 – 583.

“Mr. Brown also drew attention to the way in which foot and mouth disease had been spread by the unintended actions of those working with livestock, and the need to maintain strict biosecurity. Listing practices identified by MAFF’S epidemiologists as having been linked to disease spread, he noted that these included cattle being turned out on fields which were adjacent to infected areas; use of relief milkers with no adequate cleaning and disinfection procedures who visited several premises and had their own stock at home; and stockmen tending animals for other people on several premises. Other problems included sharing equipment between premises and inadequate cleaning and disinfection; family visits from infected clean areas, again without adequate cleaning and disinfection; and a collection of hay, fodder or silage from at risk premises.”

“MAFF’S website reported on May 16 that a total of 1600 cases of foot and mouth disease had been confirmed in Great Britain since the first outbreak was confirmed on February 20. In the seven-day period ending May 13, an average of five new cases of the disease had been confirmed each day, compared with seven in the week before. A total of 2,804,000 animals have been slaughtered or identified for slaughter since the outbreaks began; 2,718,000 of these had been slaughtered, and 38,000 carcasses still had to be disposed of.”

“MAFF announced on May 11 that infected area restrictions had been lifted (in several areas of the nation) releasing 503 farms from restrictions. It later announced that another 614 farms had been released from restrictions.”

“Three changes in the operations of the livestock movement schemes were announced on May 11. First, the scope of the longer distance movement scheme has been extended to allow the movement of male animals for breeding.

“The prohibition on moving animals under longer distance movement licenses to premises within one km of common or shared grazing had been lifted. New arrangements were being developed to allow owners to apply for a license to move animals on the common are shared grazing and details would be announced shortly.”

“Rural development service would no longer be accepting new license applications, and all application should be made to LVIs (Local Veterinary Inspectors).”

“MAFF also announced last week that it proposes to introduce a licensing scheme for sheep shearing, which, it points out, presents a significant risk of transmitting FMD, but, for animal welfare reasons, needs to go ahead. Precise details had still to be announced but the proposed scheme would work on the basis that all shearers would be licensed and all farmers would be legally obliged to contract only licensed shearers.”

“Other measures announced during the past week include arrangements for cattle breeding in infected areas, and exceptional arrangements for moving sheep, cattle and goats to common grazings in England and Wales.”¹¹⁷

C. INITIAL LESSONS LEARNED AS PUBLISHED BY THE BVA

Although full recovery from FMD took Great Britain well over a year, the British Veterinary Association (BVA) published its initial lessons learned in “*The Veterinary Record*” just over three months into the epidemic. Those lessons learned included statements from industry, regional, and governmental representatives.

News and Reports Section, May 26, 2001

"The outbreak has shown very clearly that the veterinary profession must be part of the integrated agricultural industry. The need for "more vets on farms" and an effective veterinary surveillance was now widely agreed. This meant that the role of the Local Veterinary Inspector (LCI) must be reestablished and properly funded."

The picture that emerged in the review of lessons learned was one of “central bureaucracy hampering clinicians on the ground, early confusion being replaced by effective use of TVIs, and of different branches of the profession pulling together to defeat FMD.”

The British Cattle Veterinary Association representative said that “their aim was to restore cattle to health and productivity within a sustainable livestock industry. Using the Internet and other means to ensure effective communication and dissemination of information, it had worked closely with other groups.” As to the outbreak, the government’s resources were “overwhelmed by the unpredictably rapid and wide spread

¹¹⁷ “Foot-and-mouth disease: MAFF calls for continued cooperation,” News & Reports, *The Veterinary Record*, May 19, 2001, page 610.

of the disease. Mobilization of TVI's had been slow at first, and there had been no grading by experience. Utilization of LVI's, too, had initially been inefficient." "Confusion over paperwork lead to a lack of coordination between MAFF, practices and farms."

"From the clinician's point of view, detection of the disease was much easier in cattle than in sheep; farmers were much more likely to report a lame cow than a lame sheep, and the signs were more readily identified in cattle."

"The State Veterinary Service (SVS) should be stronger in the future and have better resources, and a formal arrangement of local disease management group's was necessary, with LVI's and the SVS working together."

"...veterinary involvement in such issues as biosecurity when farms restocked would be important." "...there was a need for veterinary involvement in animal health policy at high levels; for more effective communication with a better resourced MAFF; a national surveillance policy; development of herd health plans; and the setting up of effective biosecurity systems."

The Sheep Veterinary Society representative said that "a good strategy for control had been hampered by poor organization, with central bureaucracy overriding local control of events. ...FMD was difficult to diagnose in sheep as the cardinal signs mimicked other conditions." They continued by saying that "there was a lack of resources leading to delays in testing." Also, "issues surrounding decisions on whether to vaccinate had been widely misunderstood by many because of uninformed reporting by the media. And, "the welfare disposal scheme had been enormously overloaded at first; it had not worked." Looking to the future, it was noted that sheep were rarely a major part of a practice's work but were inextricably interlinked with cattle..." "Meanwhile, long term contingency planning for such outbreaks was essential."

A representative of the Pig Veterinary Society "said that the pig industry had been less directly affected than the sheep or cattle industries. Seventy per cent of pigs were kept in FMD-free areas and the remainder pinned down by movement restrictions. "Discussing the origin and spread of the outbreak, he commented that these were the lack

of biosecurity.” “Lack of veterinary presence on the farms meant that the disease had not been spotted until animals reached the abattoir.”

A council member of the BVA “called for the setting up of a “national veterinary forum” made up of practitioners in various specialist fields. The forum would meet once or twice a year to discuss and identify emerging problems, acting as (paid) consultants to MAFF. And, there should be compulsory veterinary supervision of all farms.”

“A member of the State Veterinary Service in the thick of the control operation told of hard-pressed understaffed centers working around the clock.” “The service’s lack of resources, he said, spread across the board: from policy managers, to experienced center managers to take local decisions and deal with anxious farmers, to personnel managers to deploy staff effectively. People had to be drafted in other departments. At one center, only two out of 28 staff were veterinarians. The lack of resources had hampered efforts to control the disease they had risen to the challenge, (it was) believed that the stress placed on colleagues was unacceptable. “If you are going to fight a war, you need an army that is equipped for the task, he said.” “Resources must be built up to be ready for the next time.”

A representative of the Public Health Association said, “the outbreak highlighted the need to train undergraduates and graduates in veterinary public health. The disease had been spotted by an abattoir OVS, yet there was a shortage of such personnel.”

A representative of the British Veterinary Zoological Society “said that the FMD outbreak showed how problems could overlap from one sector to another. Zoos had been badly affected by the outbreak. Most had to close temporarily, leading to financial problems which could in turn result in animal welfare problems. He pointed out that zoos played an important role in conserving species but there was no official policy on how to deal with zoo animals in such outbreaks.”

In its “Reports from the regions,” section of the lessons learned, a regional representative “spoke of the dreadful sight of the smoke from the funeral pyres rising across the countryside from Cumbria. Many practices had felt isolated in their efforts, although they appreciated the work of the BVA and other bodies.” The speaker “felt that there had been a “litany of errors” from MAFF, although he felt more sympathy for

ministry veterinarians when working alongside them and seeing the amount of red tape they had to deal with. He believed that control of FMD had been achieved in spite of Government control rather than because of it. Many of his colleagues felt contempt for the “suits” in London, who pontificated, but had never had to kill a newborn lamb.”

“In the Carlisle area, practice incomes had fallen by up to 75 per cent; local practitioners were very worried about the future.”

A regional representative from Shropshire “paid tribute to the work of the young graduates, students and small animal veterinarians who had enrolled as TVIs, and had been sent into the field with little training and were now apparently being criticized for “over-diagnosis.” Those staffing the veterinary helpline had also proved very helpful.”

A regional representative from Wyvern “expressed “some dissatisfaction” with the remuneration offered to TVIs compared with the rates for others involved in the outbreak.”

The head of epidemiology at MAFF’s headquarters in Page Street said, “An enormous campaign, run on a war footing, had been mounted to control the epidemic in the SVS was extremely grateful to practicing veterinarians for their contribution; the control campaign was dependent on their input. The number of outbreaks during the current epidemic was smaller than the 1967/68 epidemic, but the problems had been much greater. He emphasized that the control procedures were continually being monitored and improved.”

“Rather than a single epidemic, the outbreaks have been regarded as a series of mini epidemics. Different husbandry practices in different parts of the country had made the epidemiology difficult, and control policies had had to be tailored to local circumstances. Here, information from local petitioners had proved invaluable.”

“He drew attention to the difficulty of diagnosing the disease in sheep, and said the success in controlling the outbreak was partly due to the veterinary profession “doing a difficult job in extremely difficult circumstances”. Emphasizing the importance of clinical diagnosis in controlling the outbreaks, he suggested that the reason some cases have not been confirmed on serological testing was because samples have been

contaminated with disinfectant. Laboratory tests were just that: an aide to diagnosis. “It's the clinical picture that matters, he said.””

“Although the disease was under control, the outbreaks would continue to arise, he said, as he emphasized the need for farmers to maintain strict biosecurity. Many of the “unexpected” (and highly publicized) incidents of FMD had been caused by people handling infected stock and going on to another site, without taking proper precautions.”

A farmer and honorary associate of BVA discussed economic aspects of disease control and animal welfare in the broad context saying, “the public was concerned about animal welfare and other aspects of food production, but was reluctant to pay for food produced to higher standards. They had to be made aware of the fact that welfare had to be paid for. He said the UK must have a strategy for dealing with disease outbreaks. This must take account of the availability of veterinarians to deal with emergencies and encompass such issues as herd health assurance schemes, environmental considerations and vaccination. Some were veterinary professional issues and some were farming issues, and there was a degree of overlap.”

The Chairman of the BVA’s Veterinary Policy Group said, “Points to consider for the policy might include the formation of a central veterinary surveillance scheme, including both active and passive surveillance, with independent veterinary input. Funding should be provided by government stakeholders; but consideration should also be given as to whether private funding from, for example, the farming and pharmaceutical industry should be sought.” The representative said “that there should be a veterinary equivalent of the territorial Army, available on standby to deal with future disease outbreaks. And there should be a new management structure including remuneration for the TVI/LVI system, to make the most effective use of practitioners.”

A representative from Hertfordshire and Bedfordshire said that “small animal practitioners felt they should be brought into the picture more.”

One representative called for the formation of the national disease forum and for the inspection of licensing of farms; licensing would be conditional on participation in a veterinary herd health scheme. He pointed out that restocking after the outbreak would

have to be carefully managed: we don't want to restock Cumbria with TB infected cattle, he said.”¹¹⁸

D. MODELING ISSUES

Papers and Articles Section, August 4, 2001

“Specific roles of different modeling methods.” “Computer modeling can provide valuable assistance in making rapid and informed decisions about the relative merits of different control strategies in emergency disease control, provided that the model has been developed and tested, and is ready for immediate application. Although InterSpread had not been populated with British farm data before the FMD epidemic, prior experience of team members allowed the model to be populated within a week, and adjusted to handle special requirements such as the unusually prominent role of sheep movements in this epidemic.”

“An alternative approach is mathematical modeling, in which mathematical equations are formulated to represent the biological processes, and these are processed repeatedly through time to predict the behavior of the epidemic under different control scenarios. Typically, such models are deterministic -- the outcome of any single analysis will always be the same, because the modeling approach does not have built in consideration of variability. ...Such models and can be very useful as a source of broad insights into the biological behavior of diseases in populations. However, they are by their inherent nature, simplified mathematical abstractions of biological reality, and, as such, suffer a range of limitations as tools for making policy decisions in the face of a disease which has complex biological interactions among the various species involved, and for which spatial relationships among farms strongly influence the probability of disease transmission between them. It is also important to consider for policy purposes the inherent biological variability in disease epidemics, and to provide decision-makers with soundly derived ranges of expected outcomes, rather than single predictions, which

¹¹⁸ “Foot-and-mouth disease: lessons for the future,” News & Reports, *The Veterinary Record*, May 26, 2001, pp 645 – 648.

fail to recognize that an outcome which is favorable, on average may have a probability of (say) 20 per cent of producing a very adverse result, which would lead to its exclusion from the feasible options.”

“A method which is widely used to overcome these limitations and standard mathematical modeling is Monte Carlo simulation modeling. In this approach, a representation of the biological processes involved is constructed, in which the outcome of events and decisions is in each case determined by sampling on probability distributions derived from epidemiological knowledge of the disease. Multiple runs are carried out to measure the expected variation in outcome arising from chance influences - - just as in reality. Simulation models can also accurately represent the geography of the region being modeled and can incorporate data items from external data sources, such as true spatial coordinates of farms. Hence they can predict the spatial evolution of the epidemic, as well as its temporal development -- the former being much more challenging to achieve than the latter.”

“However, simulation models take considerably longer to develop than mathematical models, and cannot usually be developed in the face of an immediate need. It is possible to produce relatively generic models which are applicable to different the diseases and in different geographical regions and which can be rapidly applied to new situations in response to a disease emergency, as was done in the case with InterSpread. Simulation models are also more complex in design, and hence need more parameters than mathematical models. Obtaining adequate estimates of these parameters requires access to data (which, in this case, were obtained from the 1967/68 FMD epidemic in the UK plus a review of the literature). It may also be possible to produce very similar results with different sets of parameter values, because changes in one parameter may compensate for changes in another. Validation procedures and sensitivity analysis help to provide confidence in the robustness of a model, and comparison of model predictions with subsequent field experience will also be valuable.”

"Allowing some infected farms to wait up to 48 hours between diagnosis and slaughter raised the total number of farms in the outbreak by about 5% if preemptive slaughter was conducted on an adequate scale, but enlarged the scale of the epidemics

substantially in the absence of effective preemptive slaughter. This represents the situation which developed early in the epidemic when resources were very limited, and demonstrates that this would've been a much larger epidemic had extra resources provided by the British army in additional veterinarians not been applied to reduce the time from reporting to slaughter.”

"Considerable public discussion took place in March and April about the merits of switching to of a vaccination policy, as the epidemic grew rapidly. It proved impossible to find a vaccination strategy, which was achievable within an acceptable time period, and which would have favorably influenced the course of the epidemic to a worthwhile extent. Substituting vaccination for stamping out in realistically achievable buffer zones resulted in a massive epidemic, with little prospect of achieving eradication in less than several years. Using vaccination in conjunction with stamping out was predicted to reduce the size of the epidemic slightly, but the direct cost was high and the adverse trading consequences large. Thus, introduction of vaccination would have been a very high risk strategy which was unlikely to have yielded a favorable result either in economic terms or in usefully reducing the scale or the duration of the epidemic. Additionally, it would have made it more difficult for Britain to prove freedom from the disease in the aftermath of the epidemic.”

"The results reported here predict a smaller an earlier-peeking epidemic than that predicted by Ferguson and others (2001) and subsequent field evidence has been compatible with the InterSpread predictions. The differences appear to be principally due the lack of species specificity and full spatial representation in the model reported by Ferguson and others.”¹¹⁹

Letters Section, August 25, 2001

Keith Sumption, Royal School of Veterinary Studies, responded to the paper regarding “Predictive Spatial Modeling” by saying, “SIR, I find the claim ...that their analysis on the use of vaccination instead of, or in conjunction with, stamping out "were undertaken to help make decisions on the true merits of such policies” to be more than a

¹¹⁹ R.S. Morris, J.W. Wilesmith, et al, “Predictive spatial modeling of alternative control strategies for the foot-and-mouth disease epidemic in Great Britain, 2001,” Papers & Articles, *The Veterinary Record*, August 4, 2001, pp137 – 143.

little unconvincing, given that they failed to include the vaccination of sheep in their scenarios. Their results should be considered an incomplete assessment and not indicative of the role emergency vaccination could play when undertaken in other ways which are more consistent with past success and recent international practice, and consistent with recent thinking and the EU (that is, the strategy on emergency vaccination in advance by the EU's animal health and animal welfare scientific committee on foot and mouth disease adopted in 1999.)" ¹²⁰

E. LESSONS LEARNED AS EXPRESSED BY THE BRITISH GOVERNMENT

News and Reports Section, March 30, 2002

The Government published its account of developments during the 2001 foot and mouth disease outbreak in the form of a memorandum... “Running to 240 pages, the memorandum, which is been published on DEFRA’s web site at www.defra.gov.uk, gives an account of what happened during the outbreak, and explains the policies applied by the Government and those that have been developed since. In an executive summary, it also seeks to address some “key issues” about the Government's handling of the crisis, “raised at the time, or afterwards, with the benefit of hindsight”. Criticisms addressed include whether it was too slow to respond to the outbreak, whether it was underprepared, and whether there was no leadership or the organization was confused.”

“The initial response to the outbreak was, the Government says, “rapid, and went beyond that which many people felt was reasonable at the time.” Following confirmation of the first case at an abattoir in Essex on February 20, 2001, movement restrictions were imposed in Essex and Kent, as required under EU law. Countrywide movement restrictions were imposed on February 23, when the first case outside Essex was confirmed, and were enforced by local authorities.”

“At the time, the Government says, the movement restrictions were seen by some as draconian; however, it continues, as a result of what is now known, it has built into its new interim contingency plan “immediate imposition of national movement restrictions

¹²⁰ Keith Sumption, “Modelling control strategies for foot-and-mouth disease,” Letters, *The Veterinary Record*, August 25, 2001, page 249.

on confirmation of the first case". Regarding the question of whether it was adequately prepared, the Government states that crises cannot be predicted with precision. However, it says, "comprehensive contingency plans were in place and had been recently updated, drawing on the lessons from FMD epidemics across the world". MAFF, it says had a detailed contingency plan, which has been cleared with the EU and regularly updated, most recently in July 2000. At the start of the outbreak, the Government adopted the standard approach based on veterinary advice around the world, namely, one of strict containment aimed at rapid eradication of what was believed to be a local epidemic. The State Veterinary Service, it says, was "immediately reinforced" and, once the widespread nature of the epidemic became clear, the Government "supported it further by strengthening the administrative teams across the country and bringing in the armed forces". It was, the Government says, recognized throughout the crisis that eradication of the disease was the "only sensible policy", and this was required by EU law. Not to have eradicated the disease would, it says, have "condemned farming and tourism to serious and ongoing damage" and, if it had not acted decisively, a far greater proportion of the industry would have been affected."

“Government ministers, it points out, are not experts in disease control, so policy decision said to be based on the best veterinary and scientific advice. The document states that there was clear leadership in dealing with the crisis, "initially from MAFF, and then from an early stage directly from the Prime Minister." In the very early stages, MAFF took the lead in coordinating the Government's response but, the document says "the Prime Minister was kept informed from the beginning", being briefed on an almost daily basis by the then, Agriculture Minister and by the Chief Veterinary Officer (CVO), and being involved in all major decisions, such as the ban on animal movements on February 23. Once the national scale of the epidemic became clear, the document continues, "the Prime Minister oversaw the development of policy, working closely with the Agriculture Minister, guiding every stage by the developing scientific and policy advice." The Cabinet Office Briefing Room was opened, from March 22 to coordinate the logistics, usually under the chair of the Prime Minister or the defense minister and subsequently DEFRA ministers. This, the Government says, separated policy and logistics -- "an arrangement that worked very well".

Attempting to answer the question of whether the Army should have been brought in earlier, the Government states that the armed forces were crucial to the logistical operation and that the Ministry of Defense was told of the outbreak on day one. The armed forces were put on alert on March 1, initially to provide military resources such as snipers and Army vets; however, “by March 14, it became clear that, despite the engagement of far more civil resources and plant than was available to the armed forces, their logistical and organizational skills could help mobilize such resources more effectively”. Troops were deployed from March 19, initially in Cumbria and Devon and, from March 23 at DEFRA’s headquarters.

Discussing development of the contiguous culling policy, the Government states that, in the early stages of the epidemic, the policy, based on veterinary advice, was to slaughter all animals on infected premises, together with dangerous contacts, within 24 hours. As part of this policy, dangerous contacts were traced and culled; this, the Government says, did much to control the growth of the disease, and "took out." many contiguous premises. It continues (by saying that), "From mid-March, the Government's Chief Scientific Adviser convened daily meetings of an FMD science group, which included the UK's leading veterinary and scientific advisers on the disease, and epidemiologists from inside and outside government. By then there were sufficient data for epidemiological modelers to devise scenarios about the outbreak, which reflected the infectivity of the disease and the fact that any animals infected on neighboring premises could themselves infect other premises before their disease could be spotted. The modeler’s input, alongside veterinary evidence, was therefore vital in developing the slaughter policy to emphasize the necessity of rapid culling on infected and contiguous premises.

The models of how the epidemic would evolve under the target-based culling policy were, the Government says, very close to the actual development of the number of cases, which, it says "is testament to the role of the targets in delivering fast and effective culling on the ground". It adds that, without adoption of the culling policy, there could have been several times as many cases of the disease.

Moving towards the target of culling animals on infected premises within 24 hours and on contiguous premises within 48 hours was, the Government says, "at the heart of the logistical operation". "The scientists advised that the 24-hour target was the most important parameter for disease control, and it was the most fully achieved. The achievement of the targets was rendered more difficult by the degree of opposition to culls on individual farms, including the formal use of the appeals system. But the pressure to achieve the targets gave invaluable impetus to reduce slaughter times and did much to bring the disease under control. The 24-hour/48-hour policy remains as the basis for the new interim contingency plan."

Vaccination, the Government says, could only have played a limited role in controlling the outbreak and, although it was seriously considered for some areas, "the full conditions recommended by veterinary and scientific advisers were never fully met". Vaccination, it says "has never successfully been used to respond to an outbreak of this scale anywhere in the world" and, if used widely, "would have been a vast logistical exercise, and would have required greater stocks of vaccine than were, in fact, available". It would not have obviated the need to cull animals given that some parts of the industry were not prepared to put vaccination animals into the food chain and, the Government adds, farmers' unions were strongly oppose throughout.

Nevertheless, the Government says that, throughout the outbreak, it continued to review the situation with its veterinary and scientific advisers, to see whether vaccination could play a role in slowing or curtailing disease spread in particular parts of the country. Contingency plans were put in place to enable a limited vaccination policy to be implemented quickly if the government decided to do so. In late March, the Chief Veterinary Officer recommended vaccination of cattle in North Cumbria. However, this recommendation was contingent on support from a substantial portion of the farming community, local veterinarians, the food industry and consumers. The conditions, the Government says were not met, "and the vaccination option was, in fact, consistently opposed by core groups, including many within the farming industry and some parts of the food industry". As the epidemic waned, the arguments for vaccination became "less compelling", although the option was considered in August for pigs as a preventive measure if the outbreak spread in the direction of the large-scale pig production units..."

Discussing carcass disposal routes and, in particular, the use of on-farm pyres, the Government notes that it was keen throughout the epidemic to protect human health when disposing of carcasses and that "the public health analysis was clear that the worst option would have been to leave carcasses to rot in the fields". In some areas, the disposal options were limited -- with, for example, the exceptionally high water table precluding on-farm burial -- and, until the logistics caught up, there was a backlog of carcasses. Difficulties in using other options, and the wholly unexpected size of the epidemic, meant that pyres were necessary; however, the Government says, once rendering and mass burial were brought on stream to augment on farm burial and burning, and carcass backlogs were eliminated, pyres were the first option to be phased out.

The pictures of pyres were, the Government says, some of the most damaging images across the world for tourism in this country". However, it points out, "a much longer tail¹²¹ to the disease would have been much worse still". It further points out that the new interim contingency plan does not include the use of pyres as a disposal route, focusing instead on securing sufficient capacity in other options.

Discussing the wider effects of the outbreak on farming and tourism, the document states that rapid eradication of the disease is clearly in the best interests of these industries. It notes that the Government stressed that the countryside was open for business as soon as it could, but that, "while the government drew up guidance quite early on, decisions on when to re-open footpaths were made by local authorities".

With regard to the cost of the outbreak, the document states that total costs to the Exchequer were 2.7 billion pounds (3.81 billion of today's U.S. dollars), some of which will be rebated from Brussels. Of this, 1 billion pounds was compensated for slaughtered animals for disease control purposes, and .2 billion was compensation under the livestock welfare disposal scheme. In net terms, the total cost to farming, the rural industry and tourism amounted to 2% of the Gross Domestic Product.

¹²¹ The term "tail" most likely means – had the outbreak continued for a longer duration because other methods were used other than burning. This is an example of British versus American use of the English Language.

The Government describes the outbreak as "unprecedented, perhaps the most serious epidemic to affect hitherto FMD-free country anywhere in the world." ¹²²

F. THE BVA RESPONDS TO GOVERNMENT LESSONS LEARNED
News and Reports Section, March 30, 2002

“The BVA submitted its own evidence to the lessons learned inquiry last week, explaining its role both in ensuring that the interests of its members were protected, while at the same time ensuring that every effort was made to eliminate the disease.”

“The 2001 FMD outbreak, the association points out, impacted heavily on the veterinary profession, which played an important part in the UK regaining its FMD-free status. Maintaining this status must, it says, remain a priority, with the risk of future disease incursions being minimize through rigorous import controls. It also points out that, in the event of disease entering the country, a necessary early recognition and control measures must be in place to deal with it.”

“Discussing movement of livestock, the BVA states that a movement ban should have been immediate on discovery of the disease, and that traceability of livestock must be improved. There must also be controls on animal movements to reduce the risk of spread of disease and, in this respect, it describes the 21-day shutdown on animal movements as a "step in the right direction". Noting that movement of sheep through dealers and markets played a significant part in last year's outbreak, it suggests that changes to the subsidy system are needed to discourage the large number of movements, both official and unofficial. Legislation in place to guard against the spread of unrecognized infection was "ineffective", it says, partly because of poor standards of observance and enforcement, but mainly because standstill restrictions were not in place. It draws attention to the problems caused by devolution, with arrangements for livestock movements being in place in Scotland and England and Wales, which particularly affected farmers in the border areas. It also draws attention to problems resulting from a

¹²² “FMD: the Government publishes its evidence to the Lessons Learned inquiry...,” News & Reports, *The Veterinary Record*, March 30, 2002, pp 390 – 391.

lack of control of movement to slaughter licenses issued by local authorities, with, for example, multiple licenses being issued.”

“The movement of cattle and sheep between markets without a period of quarantine is, the BVA says, "unacceptable". However, it says, segregation between slaughter markets and others, combined with a requirement that cattle and sheep entering the slaughterhouse should not be removed alive, would reduce the risks that some markets pose. Biosecurity in a market is “virtually impossible”, it points out, and it suggests that alternative means of marketing livestock should be explored.”

“From the outset, the level of veterinary manpower to cope with last year's outbreak was inadequate, the BVA says, and it calls for a greater veterinary presence on farms to improve the detection of livestock diseases. Meanwhile, DEFRA’s veterinary resources, including Local Veterinary Inspectors (LVIs), must be recruited and trained to ensure effective handling of any future outbreaks from the start. “The State Veterinary Service will never be adequately resourced to cope with an outbreak of this scale unaided,” the BVA says, adding that DEFRA needs to ensure that it has developed a sound relationship with private practitioners if practitioners are to assist in the future.”

The association argues that there should be "a Territorial Army-style" reserve to provide veterinary surgeons, nurses and lay staff to help deal with the disease outbreaks, with a strategy in place for training large numbers of Temporary Veterinary Inspectors (TVIs). Private practitioners should be adequately recompensed for any future assistance they might provide to the Government and the contractual basis on which TVIs are employed needs to be clarified. Basic training in large animal disease management should be available for potential TVIs from small animal practice at all times, the BVA says, adding that, if TVIs are to continue to be used in the future, the recruitment procedure must be determined and rehearsed in advance. In addition, it says, it is important that the available expertise should be employed where it can be most effective, and that veterinarians with differential diagnostic skills are used to best effect.”

“Discussing contingency planning, the BVA comments that, with some 2030 confirmed cases, and more than 4 million animals culled during the epidemic, it is hard to see how anyone could argue that the contingency plans were effective. It understands

that the contingency plan may have been based on having to deal with only 10 cases: if that was the case, it says, the plan clearly underestimated the scale of the problem FMD could cause. In addition, it says, it would indicate that the government failed to understand the structure and nature of the livestock industry, and their influence on the spread of the disease.”

Contingency plans, the association points out, need to consider and plan for every eventuality, and must be reviewed on a regular basis. They need to take into account of changing legislation -- such as that which prevented on farm burial during last year's outbreak. They should also operate on two levels: nationally, to ensure that the national interest is protected; and locally, so that local knowledge and circumstances are taken fully into account.

Discussing vaccination, the BVA notes that there is a need to develop marker vaccines to differentiate between infected and vaccinated animals. It understands there is no FMD vaccine, which is known to be effective in sheep and says that, given that the disease was widely disseminated throughout the country before identification of the first case, a policy of ring vaccination, as applied in Holland, would not have control last year's epidemic.

Regarding slaughter and disposal, the BVA's evidence to the inquiry, notes that swift and humane slaughter of animals on infected premises is paramount to successful control but that the speed of slaughter is partially governed by the disposal process. The rationale for the contiguous cull "was not always clear", it says, resulting in more animals being slaughtered than was necessary in adding to the problems of disposal. Disposal of carcasses needs to be refined, it says, with increased rendering capacity being made available. Meanwhile, it says, "legal powers to enter premises and slaughter animals to prevent spread of infection need to be clarified as a matter of urgency... traditional culling remains a highly effective method of control in small outbreaks, or at an early stage of a larger outbreak. While it was effective initially in this outbreak, its effectiveness was injured by the scale of the number of animals involved, legal challenges and lack of flexibility and application.

“Discussing the use made of modeling techniques during last year's epidemic, the BVA remarks, whilst the input of epidemiologists and the creation of disease models are useful, they cannot be applied across the board to all situations, and account must be taken of local knowledge and circumstances. Similarly, any system of modeling must take full account of veterinary considerations. Better use of veterinary epidemiology and statistical models should, it says, be a feature of future outbreaks, to allow more targeted control methods to be applied.”

“The association notes that laboratory diagnostic capability and serology testing requirements are likely to be more important in controlling future epidemics, and suggests the diagnostic testing for FMD must be refined, improved and validated. There is, it says, a need to develop on-farm tests for the disease; "these must be tested in field conditions, where there is an ongoing epidemic in each relevant susceptible species".”

“The BVA calls for increased surveillance to detect livestock disease and prevent its spread, with improved veterinary supervision being linked with farm licensing. This, it says would ensure that all producers -- including "low input, high risk" producers who are outside the quality assurance network -- would be subject to regular veterinary inspection. The present system of holding registration is, the BVA says, unsatisfactory and needs to be reviewed, adding that licensing must make clear the ownership of all livestock and where it is kept.”

“The BVA’s submission also highlights the need for improvements to be made in communication from DEFRA in Whitehall to farmers, DEFRA divisional offices, the media and the public. Summing up, it emphasizes the need to be prepared for future outbreaks, "as it can be assumed that FMD, or something similar, will happen again". It concludes, innovative thinking is now essential to ensure that both the appropriate manpower is on hand to deal with the future crisis, and that farming systems through farm assurance schemes, and therefore regular veterinary visits to farms, can identify and manage risk in the event of a crisis.”¹²³

¹²³ “...as the BVA submits its own evidence,” News & Reports, *The Veterinary Record*, March 30, 2002, pp 390 – 394.

FMD recovery operations in the United Kingdom continued for several months. The Office International Epizooties (OIE) declared Great Britain “free of FMD without vaccination” on January 21, 2002, forty nine weeks after the initial outbreak. For the purposes of this project, the lessons learned as developed and reported by the British Veterinary Association from February 24th through March 30th provides sufficient data to evaluate U.S. policies.

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