FOOT-AND-MOUTH DISEASE RESPONSE PLAN
THE RED BOOK

FAD PReP
Foreign Animal Disease Preparedness & Response Plan

United States Department of Agriculture

United States Department of Agriculture • Animal and Plant Health Inspection Service • Veterinary Services

DRAFT October 2020
October 2020
USDA APHIS, Veterinary Services
National Preparedness and Incident Coordination Center

By the end 2015, the United States experienced its largest Foreign Animal Disease (FAD) outbreak—highly pathogenic avian influenza (HPAI)—in history. Subsequent to the 2015 HPAI outbreak, APHIS has tested its response capabilities with FAD outbreaks in 2016, 2017, 2018 and 2019, as well as the planning and execution of the 2018 ARMAR (Agriculture Response Management and Resources foot-and-mouth disease (FMD) functional exercise. This version of the USDA APHIS FMD Response Plan: The Red Book (Updated October 2020) reflects knowledge and lessons learned during these activities. Additionally, this version incorporates changes made in related Foreign Animal Disease Preparedness and Response Plan (FAD PReP) materials.

The following list highlights important revisions that were made to this version of the FMD Response Plan.

- Reflects policy that explicitly recognizes vaccine as a likely response tool in an FMD outbreak.
- Includes new surveillance sections, revised by the Center for Epidemiology and Animal Health.
- Provides revised templates for epidemiology questionnaires and State FMD vaccine planning.
- Streamlines content into four chapters specific to FMD: 1) general information; 2) national roles, responsibilities, and authorities; 3) response goals and strategy; and 4) critical response activities.
- Includes critical activity “Essentials” sidebars, highlighting available training resources and often overlooked planning considerations.
- Incorporates policy guidance prepared for ARMAR on managing a National movement standstill.
- Corrects comments made on, and any errors identified in, the prior version.

This version of the FMD Red Book is being distributed as an early draft to assist in the preparation for the next cycle of FMD response planning and exercises. Links to appendices in the body of the document are internal and do not require an internet connection; however, connectivity is needed to access other links in the body and in the Essentials sidebars. It is our hope that those involved in preparing for the Southern Animal Health Association FMD functional exercise (scheduled in November 2021) will find the updated material and format useful. Future updates of this plan will incorporate new National policy guidance and/or lessons learned from FAD response experiences and exercises.
We invite comments on the FMD Response Plan for incorporation into the next version. Please email all comments to FAD.PReP.Comments@usda.gov with the subject line of “Comments to Updated FMD Response Plan.”

Additional policy guidance documents for FMD, as well as general response topics, are available at www.aphis.usda.gov/fadprep. These documents, alongside the FMD Response Plan: The Red Book, should be consulted in an FMD outbreak.

The Foreign Animal Disease Preparedness and Response Plan (FAD PReP) mission is to raise awareness, define expectations, and improve capabilities for FAD preparedness and response.

For more information, please go to:
http://www.aphis.usda.gov/fadprep
or e-mail FAD.PReP.Comments@usda.gov

Note: Users who are printing this document may access the complete appendices by viewing the attachments within the PDF file.
Preface ................................................................................................................................. x

Chapter 1 Introduction and FMD Information ............................................................. 1-1
  1.1 INTRODUCTION TO RESPONSE PLAN .............................................................. 1-1
  1.2 AUDIENCE AND PURPOSE OF DOCUMENT ................................................... 1-2
  1.3 FMD INFORMATION ......................................................................................... 1-2
      1.3.1 Etiology ....................................................................................................... 1-3
      1.3.2 History and Global Distribution .................................................................. 1-3
      1.3.3 International Trade .................................................................................... 1-5
      1.3.4 Impact of an FMD Outbreak ................................................................. 1-5
      1.3.5 Ecology ..................................................................................................... 1-6
      1.3.6 Diagnosis .................................................................................................. 1-9
      1.3.7 Immunity .................................................................................................. 1-11

Chapter 2 National Coordination for FMD Preparedness and Response .................. 2-1
  2.1 FOUNDATIONS OF PREPAREDNESS AND RESPONSE ..................................... 2-1
      2.1.1 National Response Framework .................................................................. 2-1
      2.1.2 National Incident Management System ................................................. 2-1
      2.1.3 USDA Roles and Responsibilities Overview ......................................... 2-2
  2.2 USDA AUTHORITIES AND ACTIVITIES ............................................................ 2-3
      2.2.1 Authorities .................................................................................................. 2-4
      2.2.2 Foreign Animal Disease Preparedness and Response Plan ..................... 2-5
      2.2.3 Exercises .................................................................................................. 2-6
      2.2.4 Domestic Activities .................................................................................. 2-6
      2.2.5 International Activities ............................................................................. 2-8
      2.2.6 International Trade ................................................................................... 2-8
  2.3 USDA ORGANIZATIONAL STRATEGY ............................................................... 2-9
  2.4 APHIS INCIDENT MANAGEMENT STRUCTURE .............................................. 2-9
      2.4.1 Multi-Program Committee ....................................................................... 2-9
      2.4.2 APHIS Incident Coordination Group ...................................................... 2-11
      2.4.3 Organization at the Field Level ............................................................... 2-12
2.5 DIAGNOSTIC RESOURCES AND LABORATORY SUPPORT ......................... 2-13
   2.5.1 National Veterinary Services Laboratories ..................................... 2-13
   2.5.2 National Animal Health Laboratory Network .................................. 2-13
   2.5.3 Center for Veterinary Biologics ....................................................... 2-14

Chapter 3 FMD Outbreak Response Goals and Strategy ......................... 3-1
   3.1 RESPONSE GOALS ............................................................................ 3-1
   3.2 PRINCIPLES AND CRITICAL ACTIVITIES OF AN FMD RESPONSE .... 3-2
      3.2.1 Critical Activities ......................................................................... 3-2
      3.2.2 Epidemiological Principles ............................................................ 3-2
      3.2.3 Coordinated Public Awareness Campaign .................................... 3-3
      3.2.4 FMD Vaccination Strategy ............................................................. 3-4
      3.2.5 Incident Management ................................................................... 3-4
      3.2.6 Authorization for Initial Response Activities .............................. 3-4
      3.2.7 Timeline in any FMD Response for the First 72 Hours ............... 3-5
   3.3 RESPONSE STRATEGIES FOR CONTROL AND ERADICATION OF FMD IN DOMESTIC LIVESTOCK ................................................................. 3-6
      3.3.1 Stamping-Out as a Response Strategy ........................................... 3-8
      3.3.2 Stamping-Out Modified with Emergency Vaccination to-Kill or to-Slaughter ............................................................... 3-9
      3.3.3 Stamping-Out Modified with Emergency Vaccination to-Live ..... 3-11
      3.3.4 Emergency Vaccination to-Live without Stamping-Out .............. 3-12
   3.4 FACTORS INFLUENCING THE SELECTION OF RESPONSE STRATEGY OR STRATEGIES ................................................................. 3-13
      3.4.1 General Factors that Influence a Response Strategy .................. 3-14
      3.4.2 Emergency Vaccination Sourcing and Availability .................... 3-14
      3.4.3 Determining an Appropriate FMD Response Strategy ................ 3-16
      3.4.4 Phases and Types of FMD Outbreaks .......................................... 3-18
   3.5 RECOVERY AFTER AN FMD OUTBREAK ............................................ 3-19
      3.5.1 FMD-Free Designations ................................................................. 3-20
      3.5.2 OIE Minimum Time to FMD-Free Designations ...................... 3-20
      3.5.3 Surveillance for Recognition of Disease-Freedom ..................... 3-22
      3.5.4 Release of Control Area Restrictions ......................................... 3-22
      3.5.5 Disposition of Vaccinates ............................................................ 3-22
Chapter 4 Specific FMD Response Critical Activities and Tools ........ 4-1

4.1 Etiology and Ecology ............................................................. 4-1

4.2 Laboratory Definitions and Case Definitions ....................... 4-1
  4.2.1 Laboratory Criteria .......................................................... 4-1
  4.2.2 Case Definitions ............................................................... 4-3

4.3 Surveillance ............................................................................ 4-4
  4.3.1 Surveillance Planning for FMD Outbreak ......................... 4-4
  4.3.2 Surveillance Sampling ....................................................... 4-9

4.4 Diagnostics ............................................................................ 4-15
  4.4.1 Sample Collection and Diagnostic Testing ....................... 4-15
  4.4.2 Surge Capacity ................................................................. 4-20
  4.4.3 Reporting ........................................................................ 4-20

4.5 Epidemiological Investigation and Tracing ......................... 4-21
  4.5.1 Summary of Zones, Areas, and Premises Designations .... 4-21
  4.5.2 Epidemiological Investigation ........................................... 4-23
  4.5.3 Tracing ............................................................................. 4-24
  4.5.4 Considerations for Size of Control Area and Minimum Sizes of Other Zones ...................................................... 4-25

4.6 Information Management ....................................................... 4-28
  4.6.1 EMRS2 .............................................................................. 4-28

4.7 Communication ..................................................................... 4-29
  4.7.1 Objectives ....................................................................... 4-30
  4.7.2 Key Messages ................................................................. 4-30
  4.7.3 Social Media .................................................................... 4-31

4.8 Health and Safety and Personal Protective Equipment .......... 4-32
  4.8.1 Personal Protective Equipment ........................................... 4-33
  4.8.2 Mental Health Concerns .................................................. 4-33

4.9 Biosecurity ............................................................................. 4-34
  4.9.1 Biosecurity Hazards and Mitigating Measures ................ 4-34
  4.9.2 Closed Herds ................................................................. 4-35
  4.9.3 Waiting Period ............................................................... 4-35
4.10 QUARANTINE AND MOVEMENT CONTROL ........................................................ 4-36
  4.10.1 Movement Standstill.............................................................................. 4-37
  4.10.2 Moving Commodities, Animals, and Conveyances in FMD Outbreak... 4-38
  4.10.3 Repopulation......................................................................................... 4-47
4.11 CONTINUITY OF BUSINESS (COB) ............................................................ 4-48
4.12 REGIONALIZATION FOR INTERNATIONAL TRADE (FOR A U.S. FMD RESPONSE) .. 4-49
  4.12.1 Compartmentalization ........................................................................... 4-49
  4.12.2 Further Guidance.................................................................................. 4-50
4.13 MASS DEPOPULATION AND EUTHANASIA ................................................. 4-50
4.14 DISPOSAL .................................................................................................... 4-51
4.15 CLEANING AND DISINFECTION ............................................................... 4-53
4.16 VACCINATION ............................................................................................... 4-54
  4.16.1 Vaccination Plan ................................................................................... 4-54
  4.16.2 Zone, Area, and Premises Designations............................................... 4-55
  4.16.3 Movement Restrictions for Vaccinates.................................................. 4-58
  4.16.4 Cessation of Vaccination ..................................................................... 4-58
4.17 LOGISTICS .................................................................................................... 4-59
4.18 WILDLIFE MANAGEMENT AND VECTOR CONTROL ..................................... 4-59
  4.18.1 Wildlife Management ............................................................................ 4-60
  4.18.2 Vector Control....................................................................................... 4-60
4.19 ANIMAL WELFARE ....................................................................................... 4-60
4.20 MODELING AND ASSESSMENT TOOLS ....................................................... 4-61
4.21 APPRAISAL AND COMPENSATION ............................................................ 4-61
4.22 FINANCE ....................................................................................................... 4-62
  4.22.1 Federal Funding Sources...................................................................... 4-62
  4.22.2 Supplemental Cooperative Agreements ............................................... 4-63
4.23 INCIDENT MANAGEMENT ............................................................................ 4-64

Appendix A FAD PReP Materials to Support FMD Response ................. A
Appendix C Laboratory Network List for FMD .......................................... C
Appendix D Procedures for FMD Investigation and Specimen Submission ........................................ D
Contents

Appendix E Emergency Vaccine Plan and Vaccination Priorities .......... E
Appendix F FMD Outbreak Surveillance Guidance and Rationale .......... F
Appendix G Epidemiological questionnaires ........................................ G
Appendix H Movement Control Notice Examples .................................. H
Appendix I FMD Vaccines and Vaccination ........................................... I
Appendix J Selected References ............................................................. J
Appendix K FMD Acronyms ................................................................. K

Figures

Figure 1-1. Worldwide FMD Events in 2018 ........................................ 1-4
Figure 2-1. APHIS Multiagency Coordination Structures and APHIS Emergency Operations: Relationship to Incident Management Team .......................................................... 2-11
Figure 2-2. Details of USDA APHIS Multiagency Coordination, Incident Coordination Group, and a Unified Incident Management Team ............................ 2-12
Figure 3-1. Critical Activities in the First 72 Hours of a U.S. FMD Outbreak 3-5
Figure 3-2. Example of Zones and Areas in Relation to Stamping-Out (Infected Premises Would be Depopulated) ................................................................. 3-9
Figure 3-3. Examples of Zones and Areas Utilizing Stamping-Out: Modified with Emergency Vaccination to Kill or Slaughter (Infected Premises Would be Depopulated in Either Case) ............................................. 3-10
Figure 3-4. Example of Zones and Areas for Stamping-Out Modified with Emergency Vaccination to Live (Infected Premises would be Depopulated) ... 3-12
Figure 3-5. Example of Zones and Areas for Emergency Vaccination to Live without Stamping-Out ................................................................. 3-13
Figure 3-6. Phases of FMD Response ..................................................... 3-19
Figure 3-7. Minimum OIE waiting periods and pathways for recovery of FMD free status after an outbreak where vaccination is not practiced ................. 3-21
Figure 4-1. Diagnostic Flowchart for Initial Investigation of FMD .......... 4-17
Figure 4-2. Outbreak Diagnostics after Positive Confirmation of FMD in United States ................................................................. 4-19

Figure 4-3. Example of Zones, Areas, and Premises in FMD Outbreak Response .................................................................................. 4-23

Figure 4-4. Premises Designations in Relation to Permitting and Movement Control ............................................................................ 4-46

Figure 4-5. Examples of Containment Vaccination Zones (Figures are not to scale.) ........................................................................... 4-56

Figure 4-6. Examples of Protection Vaccination Zones (Figures are not to scale.) 4-57

Figure 4-7. Vaccinated Premises (Figures are not to scale.) .......................... 4-58

Tables

Table 3-1. Overview of Traditional FMD Response Strategies ....................... 3-7

Table 3-2. Factors Influencing a Response Strategy or Strategies for U.S. FMD Outbreak ........................................................................ 3-17

Table 4-1. Descriptive statistics of serotype O FMDV infection periods by species ...................................................................................... 4-5

Table 4-2. Examples of animals with a Higher Probability of Disease (HPD) during an FMD outbreak ...................................................................... 4-6

Table 4-3. Sampling Frequency Guidelines by Premises Designations ............. 4-13

Table 4-4. Summary of Premises .................................................................... 4-21

Table 4-5. Summary of Zones and Areas .......................................................... 4-22

Table 4-6. Minimum Sizes of Areas and Zones ............................................... 4-25

Table 4-7. Factors to Consider in Determining Control Area Size for FMD ........ 4-26

Table 4-8. Movement into Control Area from Outside Control Area to Specific Premisesa .............................................................. 4-40

Table 4-9. Movement within a Control Areana ................................................ 4-42

Table 4-10. Movement from Inside a Control Area to Outside a Control Area from Specific Premisesa .......................................................... 4-44
Table 4-11. Projected Vaccine Dose Need ........................................................... 4-55
Preface

The Foreign Animal Disease Preparedness and Response Plan (FAD PReP)—Foot-and-Mouth Disease (FMD) Response Plan: The Red Book provides strategic guidance for responding to an animal health emergency caused by FMD in the United States. This FMD Response Plan (October 2020) updates the FMD Response Plan (September 2014) and replaces previous versions of FMD summary response plans. Information in this plan may require further discussion and development with stakeholders.

This FMD Response Plan is under ongoing review. This document was last updated in October 2020. Please send questions or comments to:

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While best efforts have been used in developing and preparing the FMD Response Plan, the U.S. Government, U.S. Department of Agriculture (USDA) and the Animal and Plant Health Inspection Service and other parties, such as employees and contractors contributing to this document, neither warrant nor assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information or procedure disclosed. The primary purpose of this FMD Response Plan is to provide strategic guidance to those government officials responding to an FMD outbreak. It is only posted for public access as a reference.

The FMD Response Plan may refer to links to various other Federal and State agencies and private organizations. These links are maintained solely for the user’s information and convenience. If you link to such site, please be aware that you are then subject to the policies of that site. In addition, please note that USDA does not control and cannot guarantee the relevance, timeliness, or accuracy of these outside materials. Further, the inclusion of links or pointers to particular items in hypertext is not intended to reflect their importance, nor is it intended to constitute approval or endorsement of any views expressed, or products or services offered, on these outside websites, or the organizations sponsoring the websites.

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Chapter 1
Introduction and FMD Information

1.1 INTRODUCTION TO RESPONSE PLAN

This updated Foot-and-Mouth Disease (FMD) Response Plan Draft: The Red Book (October 2020) incorporates comments received on the FMD Response Plan: The Red Book (2014), lessons learned from animal disease response exercises, and reflects updates to Foreign Animal Disease Preparedness and Response Plan (FAD PReP) materials. The objectives of this plan are to identify the 1) capabilities needed to respond to an FMD outbreak and 2) critical activities that will be involved in responding to that outbreak, and the time-frames for these activities. In an outbreak situation, these critical activities are the responsibility of a unified Incident Command (IC) per the National Incident Management System (NIMS).

To achieve these objectives, this plan provides current information on FMD and its relevance to the United States, and presents the organizational strategy for an effective FMD response. In addition, it offers guidance on key outbreak response strategies. This plan also contains updated guidance on 23 critical response activities and tools, such as disposal, appraisal and compensation, and quarantine and movement control. As indicated by links throughout the document, this plan is integrated and coordinated with other FAD PReP documents such as FMD standard operating procedures (SOP), National Animal Health Emergency Management System (NAHEMS) Guidelines, and existing Animal and Plant Health Inspection Service (APHIS) and Veterinary Services (VS) Guidance. (Appendix A provides a list of documents related to FMD outbreak response and an overview of FAD PReP).

FMD is a highly contagious viral disease that may affect domestic cloven-hoofed animals (cattle, swine, sheep, and goats) and many wild animals (deer, bison, pronghorn antelope, and feral swine). The disease is characterized by fever, vesicular (blister-like) lesions, and subsequent erosions (ulcers) of the surfaces of the mouth, tongue, nostrils, muzzle, feet, and teats. FMD is not considered a public health risk. It is considered the most contagious disease of livestock and is a high priority concern for the U.S. Department of Agriculture (USDA) APHIS.

The United States has been FMD-free since 1929; however, the disease is still found in about two-thirds of the world. There are many susceptible animals in the United States, including approximately 93.6 million cattle, 72.4 million
swine, and 8.0 million sheep and goats.\textsuperscript{1} Although FMD does not typically kill adult livestock, it does have highly detrimental effects on productivity (meat and milk). In addition, high mortality rates may occur in young animals.

An outbreak of FMD in the United States would have a significant economic impact, considering the loss of international trade as well as costs directly associated with depopulation, disposal, and disinfection. There would be additional costs for any vaccination or control program implemented, and heavy production losses.

1.2 AU迪ENCE AND PURPOSE OF DOCUMENT

This document is intended for animal health emergency responders at all levels of government, as well as industry partners. It provides strategic guidance, current policy information, and response strategies for the control and eradication of FMD, should an outbreak occur in the United States. It also offers additional resources for responding individuals on tactical information needed to respond during an FMD outbreak in domestic livestock.

This plan does not replace existing regional, State, Tribal, local, or industry preparedness and response plans relating to FMD. Regional, State, Tribal, local, and industry plans should be aimed at more specific issues in FMD response. In particular, States should develop response plans focused on the specific characteristics of the State and its livestock industry.

1.3 FMD INFORMATION

These sections provide an overview of FMD and cover the following subjects:

- Etiology
- History and global distribution
- Impact of an FMD outbreak
- Ecology
- Diagnosis
- Immunity.

Further information on FMD can be found in the \textit{FAD PReP FMD Overview of Etiology and Ecology SOP} available at \url{http://www.aphis.usda.gov/fadprep}. See \textbf{Chapter 4} of this plan for the case and laboratory definitions for FMD.

\footnote{\textsuperscript{1} Data retrieved from National Agricultural Statistics Service, 2017 Census of Agriculture: \url{https://www.nass.usda.gov/Publications/AgCensus/2017/index.php}.}
1.3.1 Etiology

1.3.1.1 OVERVIEW

The FMD virus (FMDV) is an Aphthovirus in the family Picornaviridae. FMDV is the etiologic agent of an acute systemic vesicular disease affecting cloven-hoofed animals worldwide. There are seven immunologically distinct FMDV types: A, O, C, South African Territories types SAT-1, SAT-2, SAT-3, and Asia 1; each containing numerous strains. There is a substantial amount of genetic variability in FMD viruses, and new strains occasionally develop spontaneously. There is no cross protection between serotypes, and protection between strains varies depending on their antigenic similarity. FMD is also known as fiebre aftosa, fievre aphteuse, and maul-und-klauenseuche.

1.3.1.2 WORLD ORGANIZATION FOR ANIMAL HEALTH (OIE) DEFINITION OF FMDV INFECTION

The 2019 OIE Terrestrial Animal Health Code *(Terrestrial Code*, see Appendix B)*2 defines the occurrence of infection with FMDV as:

1. FMDV has been isolated from a sample from an animal; or

2. viral antigen or viral ribonucleic acid (RNA) specific to FMDV has been identified in a sample from an animal showing clinical signs consistent with FMD, or epidemiologically linked to a suspected or confirmed outbreak of FMD, or giving cause for suspicion of previous association or contact with FMDV; or

3. antibodies to structural or nonstructural proteins of FMDV that are not a consequence of vaccination, have been detected in a sample from an animal showing clinical signs consistent with FMD, or epidemiologically linked to a suspected or confirmed outbreak of FMD, or giving cause for suspicion of previous association or contact with FMDV.

1.3.2 History and Global Distribution

FMD is present in approximately two-thirds of the world and endemic in parts of Africa, Asia, Eastern Europe, the Middle East, and South America. North America (the United States, Canada, and Mexico) and Central America are free of FMD, as is Western Europe, Australia, and New Zealand.

The United States has not experienced an FMD outbreak since 1929, Canada since 1952, and Mexico since 1954.

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1.3.2.1 PREVALENCE OF SEROTYPES

The seven FMDV serotypes demonstrate some regionalism; the O serotype is most common, followed by Asia 1. All serotypes produce disease that is clinically indistinguishable but immunologically distinct. There is no cross protection between serotypes. Figure 1-1 maps the distribution of serotypes worldwide, as typically found.

![Figure 1-1. Worldwide FMD Events in 2018](https://www.foot-and-mouth.org/sites/foot/files/user-files/research-paper/pdf/11-19/OIE-FAO%20FMD%20Ref%20Lab%20Network%20Report%202018.pdf)

1.3.2.2 THREAT OF FMD IN THE UNITED STATES

Although the United States has been FMD-free (without vaccination) since 1929, international travel and trade pose a substantial risk that it could enter the country. The disease is a critical threat to the United States because of the country’s millions of susceptible cloven-hoofed livestock and wild animals, such as feral swine. FMD can be transmitted over long distances by animal products, fomites, people, and other mechanical vectors; the virus is also considered a potential agent for agricultural terrorism.

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1.3.3 International Trade

Currently, the United States does not import livestock from countries that are not considered FMD-free. USDA maintains a list of countries and regions considered FMD-free at itsAPHIS website, Animal Health Status of Regions.

In addition, the United States takes additional precautions for FMD-free countries that employ import standards less restrictive than those of the United States and countries sharing a border with countries or regions not free of FMD.

Certain meat products can be exported from countries that are not recognized as free of FMD, provided that specific conditions are met and documented. For example, Uruguay is not considered by the United States to be FMD-free, but is permitted to export fresh beef and ovine meat under specific conditions. Additional information on the products eligible for importation into the United States from other countries is posted on the Food Safety and Inspection Service (FSIS) website, Countries Eligible for U.S. Export.

1.3.4 Impact of an FMD Outbreak

1.3.4.1 Economic

The 2001 FMD outbreak in the United Kingdom had an estimated economic impact between $12 and $18 billion\(^4\). A U.S. outbreak contained to California could cost $6–14 billion; a nation-wide agroterrorism attack could reach $228 billion.\(^5\) Modeled costs for a hypothetical, accidental release of FMDV from the National Bio and Agro-Defense Facility (NBAF) (under construction in Kansas) exceed $180 billion, but were lowered by more than half with the implementation of a vaccination campaign.\(^6\) The estimated economic impact depends primarily on three things: the duration and geographic extent of the

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outbreak; the extent of trade embargoes on U.S. products; and the reaction of consumers to the disease and control measures.

The value of lost exports would be a substantial detriment to the economy. In addition, an FMD response effort would involve direct costs for depopulation, indemnity payments, animal disposal, disinfection, and movement control measures, as well as vaccine, if chosen as a disease control measure. Additional indirect costs would be incurred by consumers and related sectors of the economy, such as feed producers and suppliers. Any FMD outbreak in the United States would likely have a sizeable and lingering economic impact.

1.3.4.2 Zoonotic Potential and Public Health Implications

FMD is not considered a public health threat. FMDV infections in humans are very rare: about 40 cases have been diagnosed since 1921. These cases are typically characterized by vesicular lesions and influenza-like symptoms. The disease in humans is generally mild, short-lived, and self-limiting. FMD differs from hand, foot, and mouth disease of humans. FMD may be able to survive in the human respiratory tract for 24 hours, allowing people with very close contact with infected animals to potentially serve as a source of virus exposure for susceptible animals.

Mass depopulation and disposal of animals in an FMD outbreak may create public health implications for personnel and individuals associated with the response effort. The effects on mental health may include post-traumatic stress disorder and depression. Support should be made available to those involved, particularly to responders and owners of affected livestock.

1.3.5 Ecology

FMD affects cloven-hoofed animals. Susceptible species include the following:

- Cattle
- Pigs
- Sheep
- Goats
- Deer
- Elk
- Bison.

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The disease is generally most severe in cattle and pigs. New World camels in the family Camelidae (alpacas, llamas, guanacos, and vicuñas) have low susceptibility to FMDV but can develop clinical illness. Old World camels (dromedaries, Bactrian camels) are more susceptible. While rare, FMD has been documented in several other species, including elephants and hedgehogs.

1.3.5.1 CARRIERS

There is a “carrier state” in many FMD-susceptible species. FMDV carriers have historically been defined as “recovered or vaccinated and exposed animals in which FMDV persists in the oropharynx for more than 28 days.”\(^8\) Carriers of FMD can include cattle, sheep, and goats, though sheep and goats seem to become carriers less often and for shorter periods than cattle. A carrier state has not been documented in swine. The duration of the carrier state in cattle can range from several months to several years. Persistent infections have also been reported for a limited period in some experimentally infected wildlife, including white-tailed deer, kudu, and fallow deer. Animals can become carriers regardless of their vaccination status or whether they showed clinical signs of the virus. The only wildlife reservoir of FMD proven to actually transmit the disease occurs in the African buffalo (Syncerus caffer).\(^9\)

How an animal develops the carrier state and the role of FMD carriers in the infection of susceptible cattle are not well understood.\(^10\) However, a 2018 laboratory study in which susceptible animals were exposed to oropharyngeal fluid of carrier animals demonstrated transmission of FMDV, causing full clinical infection in naïve cattle.\(^11\) Allowing carrier animals to persist in an FMD outbreak will increase the risk for further infection and new outbreaks.

1.3.5.2 INTRODUCTION AND TRANSMISSION OF FMD

FMDV is thought to be introduced through infected animals, contaminated fomites, and possibly carrier animals. As indicated above, there is no clear evidence on the conditions in which specific species of carrier animals can transmit FMDV to naïve animals, and wildlife does not appear to be a common means of introduction. Historically, meat products have been an important mode of introduction.

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FMDV is highly contagious, and there are multiple modes of transmission. Direct contact between infected and susceptible live animals is the most common mode of transmission, particularly when animals are in close proximity. FMDV can be found in all secretions and excretions from acutely infected animals, including expired air, saliva, nasal secretions, milk, urine, feces, and semen. Animals may shed FMDV from 1 to 4 days prior to the onset of clinical signs. Fomites contaminated with secretions and excretions from infected animals commonly serve as transmission pathways.

FMDV can also spread via aerosol transmission under favorable environmental conditions. Pigs, particularly, excrete large amounts of virus through their respiratory tract, which can lead to infectious aerosols that can be inhaled by other animals (especially cattle, due to their large inspiratory capacity) in proximity. FMDV has also been known to spread through windborne transmission, where the virus infects naïve animals located some miles from known infected animals without any history of contact. The distance of windborne transmission over land surfaces depends on the atmospheric conditions and the amount of virus emitted into the air by the infected animals. Multiple sources suggest FMDV may spread to distances well over 10 kilometers over land in favorable conditions and much greater distances over water. The conditions for long distance spread are thought to be highly specific, including high relative humidity, steady wind, minimal convection currents, and lack of topographical obstructions. These conditions tend to be met more often over water than over land.

1.3.5.3 Persistence in Environment and Animal Products

FMD viruses are susceptible to both acid and alkaline pH, and are quickly inactivated by pH < 6.0 and pH > 9.0. FMDV is preserved by refrigeration and freezing, but progressively inactivated by temperatures above 50ºC. In cool laboratory conditions, FMDV has been found to survive in cattle and swine slurry as long as 10 and 14 weeks, respectively. FMDV is resistant to many disinfectants, such as iodophores and phenol, particularly when organic matter is present.

FMDV can survive in frozen bone marrow or lymph nodes for long periods. Meat must be subjected to heat treatment at 70ºC for 30 minutes to ensure FMDV deactivation. Typical industrial processes for salami inactivate the virus. FMDV can persist in dairy products, and typical pasteurization may not inactivate the virus. For milk or cream for human consumption, the OIE suggests three procedures for inactivation of FMDV: 1) a sterilization process applying a

minimum temperature of 132ºC for at least 1 second, 2) if the milk has a pH less than 7.0, a sterilization process applying a minimum temperature of 72ºC for at least 15 seconds, or 3) if the milk has a pH of 7.0 or over, applying the process in 2) twice.\textsuperscript{14}

FMDV can also persist in wool, hair, and other products for substantial periods. Please refer to the FMD Overview of Etiology and Ecology SOP, as well as the OIE Terrestrial Code for further information (www.aphis.usda.gov/fadprep and www.oie.int).

1.3.6 Diagnosis

Producers as well as veterinarians may be the initial detectors of an FMD outbreak, so they should be familiar with signs of vesicular disease. The incubation period is 2–14 days, and varies by species, on the dose of the virus, and on the route of infection. The OIE Terrestrial Code (2019) defines the incubation period as 14 days.

1.3.6.1 MORBIDITY & MORTALITY

The morbidity and mortality of FMD varies depending on the species affected, as well as the serotype and strain of the virus. Generally, morbidity is significant, and can approach 100 percent. Mortality is typically low in adult animals (1–5 percent), and higher in very young animals.

1.3.6.2 CLINICAL SIGNS

FMD is usually recognized by vesicular signs, although animals infected with FMD show a variety of clinical signs. Clinical signs are generally more prominent in cattle and pigs than in sheep and goats, and vesicles are indistinguishable from other vesicular diseases.

1.3.6.2.1 Cattle

Common signs in cattle include the following:

- Pyrexia (fever), anorexia, shivering, reduction in milk production for 2–3 days, followed by
  - smacking of the lips, grinding of the teeth, and drooling;
  - excess nasal mucous secretions;

lameness, stamping, or kicking caused by vesicles on buccal and nasal mucous membranes or between the claws and coronary band;

vesicles on mammary gland; and/or

ruptured vesicles

Vesicles on the tongue

Abortion

Sudden death in young animals.

The infection usually resolves in 8–15 days unless there is a serious secondary bacterial infection.

1.3.6.2.2 Pigs

Typical signs of FMD in pigs include the following:

Pyrexia (fever) and blanching of the coronary bands, followed by

severe foot lesions;

severe lameness;

reluctance to move;

lesions on snout, muzzle, gums, and interdigital spaces; and/or

less severe oral lesions than in cattle (so no drooling)

High mortality in piglets

Possible abortion.

1.3.6.2.3 Sheep and Goats

Clinical signs of FMD in sheep and goats are typically less pronounced and frequent than in pigs and cattle and may go unrecognized:

Possible mild lameness where there are small vesicles or erosions on coronary band

Death of young animals

Lesions in dental pad of sheep

Agalactia in milking animals
1.3.6.3 **GROSS PATHOLOGICAL LESIONS**

Lesions typically include vesicles or blisters on the tongue, dental pad, gums, cheek, hard and soft palate, lips, nostrils, muzzle, coronary bands, teats, udder, snout of pigs, corium of dewclaws, and interdigital spaces. Post-mortem lesions can be on rumen pillars, as well as in the myocardium. Necrosis may also occur.

Lesions will vary among cattle, swine, and sheep. For extensive pictures demonstrating the aging of FMD lesions, see the EuFMD (European Commission for the Control of FMD) resource available online (pp. 32–33) and the Iowa State University: Center for Food Safety and Public Health images, also available online.

1.3.6.4 **DIFFERENTIAL DIAGNOSES**

Vesicular stomatitis, swine vesicular disease, Senecavirus A (SVA), and vesicular exanthema of swine are all clinically indistinguishable from FMD. FMD also has common features with bovine viral diarrhea, mucosal disease, infectious bovine rhinotracheitis, and bluetongue.

1.3.7 **Immunity**

1.3.7.1 **NATURAL INFECTION**

Infection with FMDV causes animals to develop a humoral antibody that is transient and also specific for the subtype of the infecting FMDV. Approximately 7 to 14 days post-infection, protective antibodies are developed against FMDV structural proteins.

1.3.7.2 **VACCINATION**

Vaccination against FMDV has been practiced with relatively positive immunity results, mostly in cattle. Vaccine has not only prevented clinical disease, but helps control FMDV transmission in an outbreak. Vaccination campaigns are more likely to succeed if the interval between vaccination and exposure is sufficient to ensure animals develop adequate immunity to FMDV. However, certain limitations of vaccination, in terms of immunity, should be acknowledged.

- Vaccines provide only serotype-specific protection. Vaccination against one serotype may fail to protect fully or at all against other strains within the serotype. This protection depends on the
  - similarity between the field strain and the vaccine, and
potency of the vaccine (more potent vaccines are likely to be protective against even less well-matched strains).

- Onset of immunity is not immediate. Inactivated FMD vaccines may decrease viral shedding and clinical signs in cattle and sheep in challenge studies as early as 4–5 days after vaccination with protection improving for the next 2–3 weeks.

- Swine appear to be more difficult to protect shortly after challenge; limited studies have reported some protection as soon as 3–4 days after vaccination. However, with more severe challenges, pigs may not be protected against disease until 21–28 days after vaccination.

- No currently available vaccine provides “sterilizing immunity” which will prevent subsequent infection.

- It is possible that individual vaccinated cattle, sheep, and goats infected with FMDV could still become asymptomatic virus carriers.

- In very young animals, a high level of maternal antibodies inhibits the immune response to vaccines.

Differentiating infected animals from vaccinated animals, known as a “DIVA” strategy, would be critical to a successful emergency vaccination strategy in an FMD outbreak. DIVA diagnostic techniques typically use tests for antibodies against viral nonstructural proteins (NSP) to differentiate animals that are infected with FMDV in the field (natural infection) from those that have been vaccinated with an FMD vaccine. This diagnostic DIVA capability is important for an effective vaccination campaign, business continuity processes, and FMDV surveillance.

Emergency vaccination and DIVA are discussed in the NAHEMS Guidelines: Vaccination, Appendix A: FMD. This document is available at www.aphis.usda.gov/fadprep.
Chapter 2
National Coordination for FMD Preparedness and Response

2.1 FOUNDATIONS OF PREPAREDNESS AND RESPONSE

Successful emergency preparedness for, and response to, FMD is based on the principles found in the National Response Framework (NRF) and NIMS.

2.1.1 National Response Framework

The NRF is a guide to how the Nation conducts response activities, through a whole community approach.\(^\text{15}\) It describes core capabilities for response, defines specific authorities, and establishes a comprehensive approach for responding to domestic incidents that range from serious local events to large-scale terrorist attacks or catastrophic natural disasters. It emphasizes private response efforts that support community lifelines to maintain or restore critical government operations. The NRF builds on NIMS, which provides a template and consistency in roles and responsibilities for those managing incidents.

The most recent update to the NRF retains the Emergency Support Function (ESF) annexes for coordination of Federal government resources and capabilities, but adds support annexes inclusive of private sector, non-governmental organizations, in addition to governmental entities. The NRF is available at https://www.fema.gov.

2.1.2 National Incident Management System

NIMS, a companion document to the NRF, provides a systematic, nationwide, proactive approach guiding departments and agencies at all levels of community and government to prepare for, prevent, respond to, recover from, and mitigate the effects of incidents, regardless of its size or complexity. A key concept is unified command for joint management of incidents under a single action plan. NIMS provides a common framework and a shared vocabulary, and describes systems and processes, that allow a large variety of organizational elements to achieve

\(^{15}\) As defined in the Federal Emergency Management Agency (FEMA) National Preparedness Goal, the whole community is a focus on enabling the participation in a wider range of players from the private and nonprofit sectors, including nongovernmental organizations and the general public, in conjunction with the participation of all levels of government in order to foster better coordination and working relationships. For more information visit fema.gov.
common response and recovery goals. NIMS information is available at [https://www.fema.gov](https://www.fema.gov).

NIMS consists of three major components:

- **Resource Management**
  - This section describes standard mechanisms to systematically manage resources, including personnel, equipment, supplies, teams, and facilities, both before and during incidents in order to allow organizations to more effectively share resources when needed.

- **Command and Coordination**
  - This section describes leadership roles, processes, and recommended organizational structures for incident management at the operational and incident support levels and explains how these structures interact to manage incidents effectively and efficiently. It describes four NIMS Command and Coordination structures in common use at USDA:
    - Incident Command System (ICS)
    - Emergency Operations Centers (EOC)
    - Multiagency Coordination Group (MAC)
    - Joint Information System (JIS)

- **Communications and Information Management**
  - This section describes systems and methods that help to ensure that incident personnel and other decision makers have the means and information they need to make and communicate decisions.

### 2.1.3 USDA Roles and Responsibilities Overview

The Departments of Agriculture and Interior share the primary agency role in ESF #11—Agriculture and Natural Resources—under the NRF; USDA is the coordinating agency. As stated in ESF #11, USDA responds to agriculture disease and pest incidents under its own statutory authority. USDA is responsible for implementing an integrated Federal, State, tribal, and local response to an outbreak of a highly contagious or economically devastating animal/zoonotic disease. This includes detecting animal disease anomalies, assigning FAD Diagnosticians (FADD) to conduct investigations, and coordinating tasks with other ESFs, State veterinary emergency response teams, and voluntary animal care organizations. ESF #11 ensures, in coordination with ESF #8 – Public Health and Medical Services, that animal/veterinary issues in natural disasters are supported. The USDA also plays a supporting role in other ESFs.
During a foreign animal disease (FAD) event of livestock, like an FMD outbreak, USDA deploys National Incident Management Teams (NIMT), coordinates the incident response, manages public messages, and takes measures to control and eradicate FMD. Measures used to control and eradicate FMD include quarantine and movement control, epidemiologic investigation, appraisal and compensation, depopulation or euthanasia of affected livestock, carcass disposal, cleaning and disinfection, active surveillance for additional cases, diagnostics, and, potentially, emergency vaccination.

During the course of an FMD outbreak response, USDA may request Federal-to-Federal support as necessary from other Federal agencies. If the President declares an emergency or major disaster, or if the Secretary of Agriculture requests the Department of Homeland Security (DHS) lead coordination, the Secretary of Homeland Security and DHS assume the lead under a unity of effort concept for coordinating Federal resources. USDA would maintain the lead for overall incident management.

For more information on the roles of other Federal agencies, such as the Departments of Health and Human Services (HHS) and the Interior (DOI), in the event of an FMD outbreak, see the APHIS FAD Framework: Roles and Coordination (FAD PReP Manual 1-0) and APHIS FAD Framework: Response Strategies (FAD PReP Manual 2-0). These documents are available at www.aphis.usda.gov/fadprep.

2.2 USDA AUTHORITIES AND ACTIVITIES

USDA APHIS is the Federal agency with primary responsibility and authority for animal disease control and will interface with Federal, State, Tribal, and local partners to control, contain, and eradicate FMD. USDA is also the primary Federal liaison to the U.S. animal industry. In addition, it operates the National Veterinary Services Laboratories (NVSL), including the Foreign Animal Disease Diagnostic Laboratory (FADDL), which is an OIE reference laboratory for identifying and confirming FMD.

APHIS produces FAD PReP documentation and materials, including this FMD-specific plan, to provide detailed response guidance for an animal disease outbreak in the United States. FAD PReP documents are consistent with both NRF and NIMS.

APHIS implements necessary mitigations to reduce risk prior to entry of animals or animal products into the United States. While the priority is always prevention, the agency is also active with domestic and international partners in preparedness efforts. These exclusionary and preparedness and activities for foreign animal diseases, generally, and FMD, specifically, are described in this section.
2.2.1 Authorities

The Animal Health Protection Act (AHPA), 7 U.S. Code 8301 et seq., authorizes the Secretary of Agriculture to restrict the importation, entry, or further movement in the United States or order the destruction or removal of animals and related conveyances and facilities to prevent the introduction or dissemination of livestock pests or diseases. It authorizes related activities with respect to exportation, interstate movement, cooperative agreements, enforcement and penalties, seizure, quarantine, and disease and pest eradication. The Act also authorizes the Secretary to establish a veterinary accreditation program and enter into reimbursable fee agreements for pre-clearance abroad of animals or articles for movement into the United States.

The Secretary of Agriculture has the authority to cooperate with other Federal agencies, States, or political subdivisions of States, national or local governments of foreign governments, domestic or international organizations or associations, Tribal nations, and other persons to prevent, detect, control, or eradicate FMD. If measures taken by a State or Indian Tribe to control or eradicate a pest or disease of livestock are inadequate, the AHPA authorizes the Secretary—after notice to and review and consultation with the State’s governor or Tribe’s chief official—to declare that an extraordinary emergency exists because of the presence in the United States of a pest or disease of livestock that threatens the livestock of the United States (7 U.S. Code 8306). This extraordinary emergency declaration allows the Secretary to impose restrictions within a State or Territory.

7 U.S. Code 8306 further directs the Secretary to compensate the owner for animals (and articles, facilities, and conveyances) taken under these provisions. Payment is not to exceed fair market value less any compensatory payments received from a State or other payer. Regulations at 9 CFR §53.2 are applicable to FMD and authorize the APHIS Administrator to pay 50 percent of fair market value for takings in a disease control and eradication effort. The Secretary has authority to increase compensation to 100 percent. These are general provisions; exceptions are specified in the regulations, and additional sections may apply, e.g., 9 CFR §71.14.

Section 421 of the Homeland Security Act, 6 U.S. Code 231, transfers to the Secretary of Homeland Security certain agricultural import and entry inspection functions under the AHPA, including the authority to enforce the prohibitions or restrictions imposed by USDA.

2.2.2 Foreign Animal Disease Preparedness and Response Plan

APHIS VS and its stakeholders established FAD PReP to provide guidance for preparing and responding to a FAD emergency. The precursor to FAD PReP was the NAHEMS, which offered a functional veterinary framework for responding to FADs. Now incorporated into FAD PReP, the NAHEMS Guidelines join strategic concept of operations documents, disease response plans (such as this FMD-specific plan), SOPs, and other materials to create a comprehensive approach to FADs that is consistent with NRF and NIMS. These documents aim to ensure a successful response commensurate with the severity of the outbreak. Federal, State, and local agencies; Tribal nations; and other stakeholders involved in animal health emergency management activities should integrate the information found in these documents into their preparedness and response planning activities and processes.

FAD PReP offers

- competent veterinary guidance on cleaning and disinfection (virus elimination), disposal, mass depopulation, and other critical activities;
- information on disease control and eradication strategies and principles;
- guidance on health, safety, and personal protective equipment (PPE);
- biosecurity information and site-specific management strategies; and
- training and educational resources.

These documents provide the foundation for coordinated National, regional, State, Tribal, and local activities in an emergency situation. They also serve as a practical guide and complement non-Federal preparedness activities.

Building on existing planning and response knowledge and relationships, FAD PReP efforts raise awareness of critical issues in FAD response and foster further collaboration between Federal partners, States, Tribes, industry, academia, and other stakeholders.

Appendix A provides more information on FAD PReP and associated materials.

Typically, documents are cleared by APHIS Legislative and Public Affairs (LPA) and posted on the FAD PReP website at www.aphis.usda.gov/fadprep. The APHIS website also hosts critical policy updates relating to ongoing or recent FAD outbreaks.
2.2.3 Exercises

Preparedness and response exercises help ensure our Nation is able to respond quickly and effectively to an FMD outbreak. They are an ideal, no-fault learning environment to discuss, practice, and implement plans, procedures, and processes in advance of an actual event. APHIS exercises are conducted in accordance with Homeland Security Exercise and Evaluation Program guidance.

APHIS VS has conducted multiple preparedness exercises to simulate an FMD outbreak and associated response effort in the United States. These exercises allow responders to discuss and practice activities relating to this highly contagious animal disease, such as movement control, and to consider the social and economic implications of an FMD outbreak. They help prepare the United States and responders for the difficult decisions that will be made regarding animal depopulation and business continuity. Multistate exercises, like ARMAR (Agriculture and Response Management and Resources) held in 2018, have enhanced coordination and collaboration among States, and between State and Federal governments.

The National Veterinary Stockpile (NVS) has also conducted exercises to assess and test its ability to deliver supplies and services—and State and Tribal ability to receive and stage these items—in the event of an FMD outbreak. These exercises have incorporated States and Tribes, as well as industry and academia, to train together and simulate a response effort (even down to the conducting minor maintenance and troubleshooting of equipment).

2.2.4 Domestic Activities

USDA conducts a variety of ongoing preparedness and response activities with respect to FMD. Domestically, the USDA prevents the introduction of FMD into the country and also performs FAD investigations for suspected cases or reported vesicular conditions. The following list details a selection of ongoing USDA activities:

- **Import and export services.** APHIS facilitates international trade, monitoring the health of animals presented at the border as well as regulating the import and export of animals and animal products. As an example, all cattle and breeding swine eligible for entry into the United States must go through a 60-day quarantine before export to the United States. In addition, all cattle (except those from Canada and Mexico) must be quarantined for 30 days at a USDA Animal Import Center. Cattle from countries affected with FMD are not permitted to be imported into the United States.

- **Prohibited items screening.** APHIS works directly with Federal partners, including DHS’s Customs and Border Protection, to screen cargo and prevent travelers from bringing any products of concern into the United States. Travelers must declare all food items and materials of plant or
animal origin in their possession upon entry, as well as recent visits to farms and livestock facilities prior to their arrival back into the country.

- **Smuggling Interdiction and Trade Compliance (SITC).** SITC conducts risk management and anti-smuggling activities to prevent unlawful entry and distribution of prohibited agricultural commodities. It looks at domestic markets likely to have illegal imported animal products to establish baseline estimates on how much product is bypassing ports of entry.

- **Vesicular disease surveillance.** USDA rapidly responds to reported or suspected cases of vesicular conditions in the United States with FAD investigations. These investigations are intended to rapidly detect and diagnose any vesicular disease in the United States.

- **Modeling, Assessments & Geospatial Analyses.** The USDA Center for Epidemiology and Animal Health (CEAH) uses complex disease spread simulation models, such as Interspread Plus and the Animal Disease Spread Model, to develop computer-generated outbreak scenarios for FMD. The results of these models can be further analyzed using economic modeling tools. Other modeling tools are used to examine within-herd spread, wind dispersion, and geospatial risk factors. Risk assessments can also inform decision-making processes. Additionally, geographic information systems are used to support preparedness and response activities. Together, various models, assessments, and analyses are used to explore possible control strategies and evaluate the consequences of FMD incursions in the United States. They may also help to estimate the countermeasures, materials, and personnel needed for control and eradication.

- **Emergency assistance.** After the 2014–2015 highly pathogenic avian influenza outbreak (HPAI), APHIS created the Voluntary Emergency Ready Response Corps (VERRC) to further increase the agency’s capacity to respond to an emergency. Additionally, APHIS may use term and temporary hires, and volunteers from other USDA agencies or Federal entities.

- **Animal Care.** APHIS Animal Care works with the American Zoological Association (AZA) on FMD planning. USDA and the AZA support the Zoo and Aquarium All Hazards Preparedness, Response, and Recovery (ZAHP) Fusion Center. More about this organization may be found at its website: [https://zahp.aza.org/](https://zahp.aza.org/). Among the resources found at the ZAHP fusion center is the Secure Zoo Strategy ([https://securezoostrategy.org/](https://securezoostrategy.org/)).
2.2.5 International Activities

In addition to the domestic activities discussed above, USDA conducts ongoing international activities in support of FMD eradication and to bolster preparedness planning and response capabilities. The following list details a selection of USDA activities:

- **Hemispheric collaboration.** USDA works with South American countries in support of FMD eradication and coordinates planning with international organizations, reducing duplication of effort and increasing sociopolitical support for FMD eradication. APHIS offers support for vesicular disease outbreaks and provides resources for diagnostic testing. In addition, because some countries in South America are considered to be FMD-infected, USDA supports programs to maintain a buffer zone between Panama and Colombia in an effort to keep North and Central America FMD-free.

- **International coordination.** USDA APHIS collaborates with interdepartmental and international partners to mitigate, prevent, and control animal health threats outside the United States through the sharing of expertise and information, and development of infrastructure.

- **Global Foot-and-Mouth Disease Research Alliance (GFRA).** USDA’s Agricultural Research Service participates in GFRA, a worldwide association of animal research organizations involved in combating FMD. This global alliance creates collaborative partners and results in sharing of progressive FMD control and eradication measures.

- **Emergency veterinary assistance.**
  - USDA has sent veterinarians to participate in international FMD training activities and to assist in FMD response efforts, at the request of foreign governments. In providing this assistance, USDA gains a bank of valuable expertise in FMD response and control efforts.
  - The United States is also a signatory country—with Australia, Canada, Ireland, New Zealand, and the United Kingdom—in the International Animal Health Emergency Reserve (IAHER). While not specific to FMD, the IAHER arrangement supports ready mobilization of personnel in case of an emergency animal disease event.

2.2.6 International Trade

USDA, in collaboration with the Department of State and the United States Trade Representative, will promptly address foreign governments that impose unjustifiable U.S. livestock and livestock product trade restrictions because of an FMD detection. These efforts focus on cases where bans are inconsistent with OIE standards, or with any U.S. bilateral agreements.
OIE member countries, like the United States, are to “immediately” notify the OIE of any confirmed FMDV infection, as defined in the OIE Terrestrial Code. International standards for FMD do allow countries to impose bans on imports from FMD-infected countries and zones. Countries recognized as FMD-free by the United States are listed on the APHIS Animal Health Status of Regions web page.

USDA overseas embassy offices have guidance on how to rapidly report trade disruptions to Washington, D.C., headquarters and how to help foreign officials respond to such events. Multiple USDA agencies, led by the Foreign Agricultural Service, would coordinate a response to any such trade disruption and communicate with industry in the United States. USDA APHIS would also quickly fulfill any official requests for additional scientific information, including case surveillance, movement control measures, and laboratory diagnostics.

2.3 USDA ORGANIZATIONAL STRATEGY

In the event of an FMD outbreak, effective and efficient whole community situation management and clear communication pathways will be critical for a successful response effort. A synchronized management and organizational structure will help to support the necessary control and eradication actions. Accordingly, APHIS has adopted NIMS and the ICS organizational structures to manage FAD outbreak response. The ICS is designed to enable efficient and effective incident management by integrating facilities, equipment, personnel, procedures, and communications operating within a common organizational structure.

2.4 APHIS INCIDENT MANAGEMENT STRUCTURE

The APHIS Emergency Mobilization Guide recognizes that the initial response to an incident is handled at the local level, with the lead APHIS program establishing the scope and scale of the incident, assessing local resources that may be available, and identifying when the response requires support from additional APHIS units.

The APHIS Administrator is the Federal executive responsible for implementing APHIS policy during an FMD outbreak. The Administrator is supported by the APHIS Management Team (AMT) and Emergency Preparedness Committee (EPC) which will consider how to best address resource requests for the response through a Multi-program Committee (MPC) established at the APHIS level, based on the specific incident.

2.4.1 Multi-Program Committee

The APHIS MPC serves as the senior level leadership group to support incident coordination and program area senior leaders when responding to significant
agricultural emergencies. Its structure is adaptable and easily expands and contracts to provide flexibility. The MPC establishes supportive relationships among the various units preparing for and responding to an FMD outbreak.

The APHIS MPC offers guidance on the most efficient way to allocate resources during an FMD outbreak. General functions of the group include incident prioritization; resource allocation and acquisition; and identification and resolution of issues common to all parties. The MPC may also include subject matter experts who can reach across the agency to achieve an effective coordination structure.

If the emergency response becomes too complex for an APHIS MPC to handle efficiently—for example, a large multistate FMD incident with numerous response activities—cooperation with other agencies or committees will be implemented, and a USDA or other MAC would likely be stood up. These groups, comprised of representatives from across USDA agencies or other government agencies, would make decisions regarding the sharing and use of critical resources. MPC and MAC groups are not part of the on-scene IC; therefore, they do not command activities in the field.

In addition to policy and incident coordination, the APHIS Administrator, AMT, Veterinary Services Deputy Administrator (VSDA), and VS Executive Team (VSET) communicate, collaborate, and coordinate with relevant industry associations, the National Assembly of State Animal Health Officials (NASAHO) and National Association of State Departments of Agriculture (NASDA), public health agencies (Federal and State), and other partners in a whole community approach. Figure 2-1 provides a visual example of the relationship among these entities.
2.4.2 APHIS Incident Coordination Group

The VSDA, supported by the VSET, will coordinate many aspects of the response through an APHIS National Incident Coordination group (ICG) and NIMT. Led by a National Incident Coordinator (NIC) and a deputy NIC (or National Operations Coordinator), the ICG oversees the functions and response activities associated with the incident. Flexible and scalable to the size and scope of the incident, the ICG works closely with the unified (State/Federal) IC and the APHIS multiagency groups.

The ICG is responsible for requesting resources, formulating policy options, and assisting in implementing response and recovery strategies for an FMD outbreak. Another significant function of the ICG is to provide situational awareness, through daily or weekly reporting. (For additional information, see APHIS FAD Framework: Roles and Coordination (FAD PReP Manual 1-0) available at www.aphis.usda.gov/fadprep.)

Figure 2-2 provides a visual of the relationship of the ICG with response entities, including the NIMT, in the APHIS organizational structure.
2.4.3 Organization at the Field Level

At the beginning of an incident, the State Animal Health Official (SAHO) and the VS Area Veterinarian in Charge (AVIC), or their designees, may initially serve as Co-Incident Commanders in a unified IC structure. In an FMD response, one of five VS NIMTs would deploy and further develop the IC structure, jointly with the State.

The Unified IC establishes an Incident Command Post (ICP), which serves as the base of deployment for field personnel. In a large incident, multiple ICPs may exist, but each will still remain unified State-Federal IC organizational structures. (For additional information, see the *FAD PReP Incident Information Management and Reporting (FAD PReP Manual 3-0)* available at [www.aphis.usda.gov/fadprep](http://www.aphis.usda.gov/fadprep).

When more than one incident is occurring at the same time, more than one IC may be established. Under an Area Command (AC) may also be established. An AC is an organization that oversees the management of multiple incidents handled individually by separate IC organizations or to oversee the management of a very large or evolving incident engaging multiple IMTs. The ICG may assume the role of AC. An AC should not be confused with the functions performed by MPC, as an AC oversees management coordination of the incident(s), while a MPC element (such as a communications/dispatch center or EOC) coordinates support.
The actual organizational structure for a given incident will be specific to the needs of that incident. As required, APHIS will consider various strategies to supplement response personnel, applying either novel concepts or those utilized in recent animal disease outbreak responses. For details on the internal structure of IMTs and ACs, please see APHIS Foreign Animal Disease Framework: Roles and Coordination (FAD PReP Manual 1-0).

2.5 Diagnostic Resources and Laboratory Support

USDA also has critical diagnostic resources and a laboratory support network that will be leveraged in an FMD outbreak.

2.5.1 National Veterinary Services Laboratories

The NVSL is the official reference laboratory for FAD diagnostic testing and study in the United States. The NVSL performs animal disease testing in support of USDA-APHIS programs designed to protect the health of the Nation’s livestock. The NVSL provides all confirmatory testing for FMD on all specimens found presumptively positive at a National Animal Health Laboratory Network (NAHLN) laboratory or other USDA-approved laboratory. The NVSL has two locations for FAD diagnostic testing: Ames, IA (NVSL-Ames), and Plum Island, NY (NVSL-FADDL).

NVSL-FADDL is where FMD viruses would be isolated and the serotype and strain would be identified to determine the vaccine to stock or use for the outbreak. NVSL-FADDL also assists in testing currently available vaccines.

By 2023, NVSL-FADDL is scheduled to move from Plum Island to the NBAF, currently under construction, in Manhattan, Kansas.

2.5.2 National Animal Health Laboratory Network

As of November 2019, the NAHLN consists of 59 laboratories, and coordinates the veterinary diagnostic laboratory capacity of State animal health laboratories and their extensive infrastructure, including facilities, equipment, and professional expertise. The great majority of these laboratories—including NVSL-Ames and NVSL-FADDL—are currently approved to conduct FMD preparedness and surge testing. (See Appendix C for a list of approved laboratories).

The NAHLN provides a means for early detection of FMD, rapid response through surge capacity to test outbreak samples, and recovery by the capability to test large numbers of samples to show freedom from FMD. The confirmation of an FMD outbreak will be made at NVSL-FADDL. After positive confirmation of FMD, subsequent samples from premises inside the established Control Area
(CA) may be sent to laboratories that are part of the NAHLN. Please see Chapter 4 for more information.

2.5.3 Center for Veterinary Biologics

APHIS’ Center for Veterinary Biologics is responsible for licensing new products, including new diagnostic test kits and vaccines for FMD. This work—centered on enforcement of the Virus-Serum-Toxin Act—ensures that pure, safe, potent, and effective veterinary biologics are available for the diagnosis, prevention, and treatment of animal diseases.
Chapter 3
FMD Outbreak Response Goals and Strategy

This chapter covers a wide range of information about how USDA APHIS, States, Tribal Nations, localities, and stakeholders would respond to an FMD outbreak in the United States. In particular, this chapter

- identifies USDA APHIS goals for responding to an FMD outbreak;
- identifies critical activities and tools required to achieve the response goals;
- discusses the epidemiological principles for any FMD response strategy;
- defines and describes key response strategies, including vaccine strategies;
- reviews factors that may influence the response strategies and scope of regulatory intervention;
- identifies types of FMD outbreaks and phases of FMD response; and
- addresses recovery and reviews the international standards from the OIE for FMD-free status.

3.1 RESPONSE GOALS

The goals of an FMD response are to (1) detect, control, and contain FMD in animals as quickly as possible; (2) eradicate FMD using strategies that seek to protect public health and the environment, and stabilize animal agriculture, the food supply, and the economy; and (3) provide science- and risk-based approaches and systems to facilitate continuity of business for non-infected animals and non-contaminated animal products.

Achieving these three goals will allow individual livestock facilities, States, Tribes, regions, and industries to resume normal production as quickly as possible. The objective is to allow the United States to regain FMD-free status without the response effort causing more disruption and damage than the disease outbreak itself.
3.2 PRINCIPLES AND CRITICAL ACTIVITIES OF AN FMD RESPONSE

3.2.1 Critical Activities

In order to achieve the goals of an FMD response, critical activities and tools must be implemented to execute the response strategy. Box 3-1 lists these critical activities and tools. A science- and risk-based approach that protects public health, animal health, and the environment and stabilizes animal agriculture, the food supply, and the economy will be employed at all times. Please see Chapter 4 for more information on these critical activities and tools, (i.e., movement control, disposal, and epidemiological investigation and tracing).

Box 3-1. Critical Activities and Tools for and FMD Response

### Critical Activities and Tools for Containment, Control, and Eradication

- Public awareness campaign
- Swift imposition of effective quarantine and movement controls
- Rapid diagnosis and reporting
- Epidemiological investigation and tracing
- Increased surveillance
- Continuity of business measures for non-infected premises and non-contaminated animal products
- Biosecurity measures
- Cleaning and disinfection (virus elimination) measures
- Effective and appropriate disposal procedures
- Mass depopulation and euthanasia (as response strategy indicates)
- Emergency vaccination (as response strategy indicates)

3.2.2 Epidemiological Principles

Three basic epidemiological principles form the foundation of any response strategy to contain, control, and eradicate FMD in the U.S. domestic livestock population:

1. Prevent contact between FMDV and susceptible animals.

   a. This is accomplished through quarantine of infected animals, movement controls in the Infected Zone(s) (IZ) and Buffer Zone(s) (BZ) (the CAs), biosecurity procedures, and rigorous cleaning and disinfection protocols to protect non-infected animals.

   b. Certain circumstances may warrant accelerating the depopulation of animals at risk for exposure to FMD to decrease the population density of susceptible animals.
c. There is a serious but lesser transmission risk posed by people, materials, conveyances, and animals that may have been in contact with FMD and serve as mechanical vectors. Contact with susceptible animals should be prevented and transmission risk mitigated through biosecurity and cleaning and disinfection (virus elimination) measures.

2. *Stop the production of FMDV in infected or exposed animals.* This is accomplished by timely slaughter (and processing) or mass depopulation (and disposal) of infected and potentially infected animals.

3. *Increase the disease resistance of susceptible animals to FMDV or reduce the shedding of FMDV in infected or exposed animals.* This can be accomplished by emergency vaccination if a suitable vaccine is available and can be administered in a timely manner.

### 3.2.3 Coordinated Public Awareness Campaign

One of the most important critical activities is a public awareness campaign. Box 3-2 details the importance of a coordinated public awareness campaign in an effective response strategy.

*Box 3-2. Coordinated Public Awareness Campaign*

**Importance of Response Communication**

Regardless of the response strategy or strategies selected, a public awareness campaign must be effectively coordinated with audience-appropriate information. This will support the response strategy by

- engaging and leveraging Federal, State, Tribal, local, and stakeholder relationships to provide unified public messages for local, national, and international audiences;
- addressing the issues and concerns relating to food safety, public health, the environment, and animal welfare;
- addressing issues and concerns related to interstate commerce, continuity of business, and international trade; and
- widely disseminating key communication messages to consumers and producers.

APHIS LPA periodically updates a detailed set of FMD message maps and participates in the industry Cross-Species Communications Working Group. In addition, the livestock industry maintains a “dark” FMD website that can quickly be made visible to the public. These coordinated efforts will contribute to consistent messaging to producers and the public in case of an FMD outbreak.
3.2.4 FMD Vaccination Strategy

The use of emergency vaccination strategies may be considered in any FMD outbreak. An emergency vaccination strategy can help to achieve the goals of an FMD response effort and is founded upon the three epidemiological principles of response. In order to be effective, vaccines used in emergency vaccination must be matched to a specific serotype, and ideally matched with the field strain causing the outbreak. There are many challenges to using emergency vaccination in an FMD response, but also many benefits. An FMD response may use one strategy or a variety of strategies in order to detect, control, contain, and ultimately eradicate FMD in domestic animals. The use of emergency vaccination will be determined by the Unified IC, the SAHO(s), and the VSDA, who is also the U.S. Chief Veterinary Officer (VSDA/CVO).

3.2.5 Incident Management

The outbreak response effort should be implemented in a manner consistent with NIMS and ICS with an appropriate span of control and delegation of authority, as described in Chapter 2. Incident Management includes conducting critical activities in accordance to Federal and State response plans, policies, and procedures to prevent further spread of FMD. Cooperative Federal, State, Tribal, local and industry response measures will be carried out with extreme urgency using the most appropriate geographic and jurisdictional scopes required to manage the situation. Response information must utilize the coordinated public awareness campaign (see Section 3.2.3) to clearly, and frequently relay consistent information to the whole community throughout the duration of the outbreak.

3.2.6 Authorization for Initial Response Activities

When the criteria for a presumptive FMD case has been met, the APHIS Administrator or VSDA/CVO can authorize APHIS personnel—in conjunction with State, Tribal, and Federal personnel—to initiate activities on the index premises. These activities may include, but are not exclusive to, depopulation, cleaning and disinfection, and epidemiological investigations of associated Contact Premises (CP)16. Concurrently, SAHOs or Tribal officials will immediately issue a quarantine or hold order for the relevant zones, areas, or premises. A Federal quarantine may be issued when requested by SAHOs or as directed by the Secretary of Agriculture.

State, Federal, and Tribal officials will also immediately discuss the issuance and specifications of initial movement standstill(s) in the United States for relevant regions or zones. In the event a National Movement Standstill is needed, USDA APHIS will provide specific guidance via Federal Register Order.

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16 Contact Premises that are depopulated because of epidemiological risk factors are often termed as “dangerous Contact Premises (DCs)”.

3-4
Additionally, an ICG NIC and an IC should be identified as soon as possible to coordinate initial activities of an FMD detection.

3.2.7 Timeline in any FMD Response for the First 72 Hours

In the first 72 hours after the detection of FMD in the United States, specific actions will occur, regardless of outbreak characteristics. These critical tasks are fundamental to the rapid control and containment of FMD. Figure 3-1 highlights these tasks.

*Figure 3-1. Critical Activities in the First 72 Hours of a U.S. FMD Outbreak*
3.3 Response Strategies for Control and Eradication of FMD in Domestic Livestock

There are several generally accepted strategies for the control and eradication of FMD in domestic livestock following an outbreak, as described below and in Table 3-1.

- **Stamping-out.** Depopulation of clinically affected and in-contact susceptible animals.

- **Stamping-out modified with emergency vaccination-to-kill.** Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, with subsequent depopulation and disposal of vaccinated animals. Depopulation and disposal of vaccinated animals may be delayed until logistically feasible, as determined by IC and the VSDA/CVO.

- **to-slaughter.** Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, with subsequent slaughter and processing of vaccinated animals, if animals are eligible for slaughter under USDA FSIS authority and rules and/or State and Tribal authority and rules.

- **to-live.** Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, without subsequent depopulation of vaccinated animals. Vaccinated animals intended for breeding, slaughter, milking, or other purposes live out their useful lives.

- **Emergency vaccination to-live without stamping-out.** Vaccination used without depopulation of infected animals or subsequent slaughter or depopulation of vaccinated animals.

- **No action.** A course of action where FMD would run through an affected population paired with control and containment measures. This is an unlikely option for domestic animals; however, if FMD does encroach into wildlife this may be a likely strategy.

Depending upon the circumstances and scale of the outbreak, one or a combination of these strategies can be applied. In some cases, the intended disposition of vaccinated animals (kill, slaughter, live) may be affected by epidemiological, logistical, and other considerations during an outbreak.
## Table 3-1. Overview of Traditional FMD Response Strategies

<table>
<thead>
<tr>
<th>Strategy or Strategies</th>
<th>Definition of Strategy</th>
<th>Likelihood of Use</th>
<th>Example of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stamping-Out (No Emergency Vaccination)</td>
<td>Depopulation of clinically affected and in-contact susceptible animals.</td>
<td>Possible (if outbreak is contained in jurisdictional areas in which FMD can be readily contained and further dissemination of the virus is unlikely).</td>
<td>Stamping-out Infected Premises.</td>
</tr>
<tr>
<td>Stamping-Out Modified with Emergency Vaccination to Kill</td>
<td>Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, with subsequent depopulation and disposal of vaccinated animals. Depopulation and disposal of vaccinated animals may be delayed until logistically feasible.</td>
<td>Possible (if outbreak is contained in jurisdictional areas in which FMD can be readily contained and further dissemination of the virus is unlikely).</td>
<td>Stamping-out Infected Premises, emergency vaccination to kill within the selected areas of the Buffer Zone in Containment Vaccination Zones.</td>
</tr>
<tr>
<td>Stamping-Out Modified with Emergency Vaccination to Slaughter</td>
<td>Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, with subsequent slaughter of vaccinated animals if animals are eligible for slaughter under USDA FSIS and/or State and Tribal authority and rules.</td>
<td>Highly likely (depending on the type of the FMD outbreak).</td>
<td>Stamping-out Infected Premises; emergency vaccination to slaughter within the Control Area in Containment Vaccination Zones.</td>
</tr>
<tr>
<td>Stamping-Out Modified with Emergency Vaccination to Live</td>
<td>Depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, without subsequent depopulation of vaccinated animals. Vaccinated animals intended for breeding, slaughter, or other purposes live out their useful lives.</td>
<td>Highly likely (depending on the type of the FMD outbreak).</td>
<td>Stamping-out Infected Premises; emergency vaccination to live outside of the Control Area in Protection Vaccination Zones.</td>
</tr>
<tr>
<td>Combination of Stamping-Out Modified with Emergency Vaccination to Kill, Slaughter, and Live</td>
<td>Combination of emergency vaccination to kill, slaughter, and live.</td>
<td>Highly likely (depending on the type of the FMD outbreak).</td>
<td>Stamping-out Infected Premises; emergency vaccination to slaughter within the Control Area in Containment Vaccination Zones and emergency vaccination to live outside.</td>
</tr>
<tr>
<td>Vaccination to Live (without Stamping-Out)</td>
<td>Vaccination used without depopulation of infected animals or subsequent depopulation or slaughter of vaccinated animals.</td>
<td>Less likely (unlikely to be implemented at start of outbreak).</td>
<td>No stamping-out Infected Premises; Vaccination to live outside of the Control Area in Protection Vaccination Zones.</td>
</tr>
</tbody>
</table>

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### 3.3.1 Stamping-Out as a Response Strategy

Stamping-out has been a common approach in past FMD outbreaks in countries that were previously FMD-free. This strategy is most appropriate if the outbreak is contained to a jurisdictional area or a region in which FMD can be readily contained and further dissemination of the virus is unlikely. (See Box 3-3.) Stamping-out, is currently defined in the *OIE Terrestrial Code* (2019), as a policy designed to eliminate an outbreak by carrying out under the authority of the Veterinary Authority the following: a.) the killing of the animals which are affected and those suspected of being affected in the herd or flock and, where appropriate, those in other herds or flocks which have been exposed to infection by direct animal to animal contact, or by indirect contact with the causal pathogenic agent; . . .

**Box 3-3. Critical Elements of Stamping Out**

**Stamping-Out: Critical Elements**

- As soon as possible after classification of premises as an Infected Premises (IP), the infected and susceptible livestock will be euthanized or depopulated. In many cases, susceptible livestock on Contact Premises (CP) may also be depopulated as soon as possible.
- Where resources are limited, premises will be prioritized so that those with the highest potential for active FMD spread are ‘stamped-out’ first.
- Based on an epidemiological assessment, animals with clinical signs may be prioritized for depopulation to reduce virus excretion.
- Public concerns about stamping-out will require a well-planned, proactive public relations and liaison campaign. Stakeholders, the public, and the international community must be involved.
- Care should be taken to consider mental health implications for owners and responders in the event a stamping-out strategy is implemented.

### 3.3.1.1 Zones and Areas in Relation to Stamping-Out

Figure 3-2 shows an example of a stamping-out strategy, where IP are depopulated. See Section 4.5 for more information on zones, areas, and premises for FMD outbreak response.
3.3.2 Stamping-Out Modified with Emergency Vaccination to-Kill or to-Slaughter

These strategies are similar in implementation but differ in the final disposition of vaccinated animals. Vaccination to-kill involves the depopulation of clinically affected, in-contact susceptible animals, and vaccination of at-risk animals, with subsequent depopulation and disposal or slaughter of vaccinated animals. Vaccination to-slaughter requires that animals are eligible for slaughter under USDA FSIS authority and rules, and/or State and Tribal authority and rules.

These suppressive vaccination strategies involve the following:

- The goal is to suppress virus replication in high-risk susceptible animals by using emergency vaccination and then depopulate or slaughter vaccinates at a later date as determined by IC and the VSDA/CVO.

- The targeted vaccination of high-risk susceptible animals in an IZ, BZ, or Vaccination Zone (VZ). Ring or regional vaccination around an IP or IZ is a frequently cited example of this strategy.

- Vaccinated animal identification, movement controls, traceability, and an effective, scalable permitting system may be necessary.
Additionally, for movement to slaughter, DIVA testing may be necessary for movement between zones, interstate commerce, and international trade.\textsuperscript{18}

3.3.2.1 ZONES AND AREAS IN RELATION TO STAMPING-OUT MODIFIED WITH EMERGENCY VACCINATION TO-KILL OR TO-SLAUGHTER

Figure 3-3 shows four examples of how a stamping-out modified with emergency vaccination to-kill or to-slaughter strategy might be implemented. Animals on IP would be depopulated, while other animals in a Containment Vaccination Zone (CVZ) may be vaccinated.

\textit{Figure 3-3. Examples of Zones and Areas Utilizing Stamping-Out: Modified with Emergency Vaccination to-Kill or Slaughter (Infected Premises Would be Depopulated in Either Case)}

\begin{center}
\includegraphics[width=\textwidth]{example Zones.png}
\end{center}

\textsuperscript{18} Detailed information on vaccine selection and vaccination strategies can be found in \textit{National Animal Health Emergency Management System (NAHEMS) Guidelines: Vaccination for Contagious Diseases, Appendix A: FMD}. 

3-10
3.3.3 Stamping-Out Modified with Emergency Vaccination to-Live

This strategy involves the depopulation of clinically affected and in-contact susceptible animals and vaccination of at-risk animals, *without* subsequent slaughter or depopulation of vaccinated animals because of their vaccination status. Stamping-out modified with emergency vaccination to-live is used when vaccinated animals intended for breeding, slaughter, milking, or other purposes live out their useful lives.

This protective vaccination strategy involves the following:

- The goal is to protect susceptible animals from infection using emergency vaccination with the deliberate intent to maintain vaccinates for the duration of their usefulness.

- The targeted vaccination of non-infected animals. This may include valuable genetic stock, long-lived production animals, or areas with a high-density population of susceptible animals at high risk of becoming infected.

- Requires the establishment of one or more VZs free of FMD, the establishment of one or more CAs for infected animals, and movement controls to keep infected animals out of VZs free of FMD.

- DIVA testing may be necessary for movement between zones, interstate commerce, and international trade.

- Vaccinated animal identification, movement controls, traceability, and an effective, scalable permitting system may be necessary.
3.3.3.1 Zones and Areas in Relation to Stamping-Out Modified with Emergency Vaccination to-Live

Figure 3-4 shows an example of how a stamping-out modified with emergency vaccination to-live response strategy might be implemented. Animals on IP would be depopulated, while other animals in a Protection Vaccination Zone (PVZ) would be vaccinated. Any animals vaccinated would not be subsequently depopulated or slaughtered solely on the basis of vaccination status.

Figure 3-4. Example of Zones and Areas for Stamping-Out Modified with Emergency Vaccination to-Live (Infected Premises Would be Depopulated)

Note: Figure is not to scale.

3.3.4 Emergency Vaccination to-Live without Stamping-Out

This strategy involves no depopulation of infected animals and the emergency vaccination of susceptible animals, with the intention of not slaughtering or depopulating these animals at a later date because of their vaccination status. This strategy might be used in an FMD outbreak in which FMD is widely disseminated across the United States, affecting many animal industries, where resources are not available for stamping-out, and a policy decision has been made not to stamp-out. Although this strategy is highly unlikely to be employed initially in an FMD outbreak response, it is possible that, in the course of an outbreak, the decision might be made to switch to this strategy if the disease becomes widespread.

This protective vaccination strategy involves the following:

- The goal is to protect susceptible animals from infection with emergency vaccination, with the intention of not depopulating or slaughtering vaccinates at a later date because of vaccination status.
FMD Outbreak Response Goals and Strategy

- Requires the establishment of one or more VZs free of FMD, the establishment of one or more CAs for infected animals, and movement controls to keep infected animals out of VZs free of FMD.

- DIVA testing may be necessary for movement between zones, interstate commerce, and international trade.

- Vaccinated animal identification, movement controls, traceability, and an effective, scalable permitting system may be necessary.

3.3.4.1 Zones and Areas in Relation to Emergency Vaccination to-Live without Stamping-Out

Figure 3-5 provides an example of emergency vaccination to-live without stamping-out. There would be no stamping-out under this response, only emergency vaccination to-live.

Figure 3-5. Example of Zones and Areas for Emergency Vaccination to-Live without Stamping-Out

Note: Figure is not to scale. Yellow signifies a Vaccination Zone. Containment Vaccination Zones are typically inside a Control Area; Protection Vaccination Zones are typically outside a Control Area. Protection Vaccination Zones are intended to be zone(s) without infected animals.

3.4 Factors Influencing the Selection of Response Strategy or Strategies

Depending upon the circumstances and scale of the outbreak, a combination of one or more of the response strategies can be applied. Choosing an initial response strategy or modifying strategies as an outbreak unfolds is an important, but complex decision process. Thus, it is not possible to delineate a priori the specific factors that might signal the need to modify the response to an FMD.
outbreak, but multiple factors must be considered and their favorable or undesirable impacts weighed.

3.4.1 General Factors that Influence a Response Strategy

Detection of FMD will result in emergency intervention by State, Tribal, Federal, and local authorities; the scope of regulatory intervention and the selection of a response strategy or strategies in an FMD outbreak depend on the following:

- **Consequences of the outbreak.** The consequences of the FMD outbreak, and the impact of the response, in terms of disruptions to interstate commerce and international trade, national security, food security, animal health, the environment, the economy, interstate commerce, international trade, and regulatory issues.

- **Acceptance.** Acceptance of response policy (social and political) by different communities, from local to international.

- **Scale of the outbreak.** The number of animals infected, species infected, number of premises affected, and susceptible animal population density for infected areas or areas at high-risk of becoming infected with FMDV.

- **Rate of outbreak spread.** The rate of spread of infection in terms of number of premises, types of premises, number of susceptible animals, types of susceptible animals; this is the rate at which each IP “reproduces” or results in other, additional IPs.

- **Veterinary countermeasures available.** The availability and efficacy of veterinary countermeasures such as FMD vaccines.

- **Resources available to implement response strategies.** The capabilities and resources available to eradicate FMD in domestic animals and to control and eradicate FMD in potential wildlife reservoirs.

3.4.2 Emergency Vaccination Sourcing and Availability

The acquisition and use of FMD vaccine is a complicated issue including the amount of vaccine available, production limitations, and the availability of the appropriate type/subtype(s) of the FMDV. The most commonly used FMD vaccine is inactivated or killed vaccine. Manufacture of this product requires starting with live virus and processing until completion to finished vaccine. Vaccine may be stored as vaccine antigen concentrate (VAC) for up to 5 to 12 years depending on the manufacture. Per 21 U.S. Code 133a, no live FMDV may be introduced for any purpose into any part of the mainland of the United States by commercial manufacturers or Federal entities. Therefore, conventional inactivated vaccine must be manufactured abroad then shipped to the United States for use.
There are currently two mechanisms by which the United States is supplied with FMD vaccine, the North American Foot-and-Mouth Disease Vaccine Bank (NAFMDVB) and the National Animal Vaccine and Veterinary Countermeasures Bank (NAVVCB). These Banks contain quantities of vaccine stored as VAC encompassing a range of representative FMD types/subtypes that will be converted into finished vaccine at the time of the outbreak. Current quantities of VAC in the Banks are only sufficient to address small to moderate outbreaks. Vaccines produced from the VAC are high-potency inactivated vaccines (meaning they do not contain live virus), are DIVA capable, and are shown to be effective in cattle, swine, sheep and goats. This section reviews current vaccine capabilities for an FMD outbreak in the United States.

3.4.2.1 THE NORTH AMERICAN FOOT-AND-MOUTH VACCINE BANK

The NAFMDVB is a trilateral entity that it is jointly administered by the CVOs of Mexico, Canada, and the United States. If one or more of the three countries has an outbreak and needs to use FMD vaccine, the Bank will be activated and vaccine will be shipped to the affected country(s) assuming an appropriate match is available. Allocation of the vaccine will be in accordance to the contribution ratio to the Bank—70 percent for the United States, 20 percent for Mexico and 10 percent for Canada. Any or all countries may opt to take a portion of their finished vaccine, irrespective of whether they have animals infected with FMD. However, vaccine availability is not strictly limited by this ratio since countries may decide to reallocate all or a portion of their vaccine to the affected country(s). Each country is responsible for replenishing the VAC which they choose to reformulate into vaccine.

3.4.2.2 THE NATIONAL ANIMAL VACCINE AND VETERINARY COUNTERMEASURES BANK

The Agricultural Improvement Act of 2018 (The “Farm Bill”) included the establishment of the National Animal Vaccine and Veterinary Countermeasures Bank (NAVVCB), otherwise known as the National Bank. The National Bank has sufficient resources to acquire greater quantities more quickly, and more strains of FMD vaccine, as compared to the NAFMDVB, for exclusive use in the United States. Vaccine acquisition is currently underway to complete this new National Bank. The goal is to have between 10 and 25 million doses of each of the 10-12 highest risk strains included in the NAVVCB.

3.4.2.3 BANK ACTIVATION AND SURGE CAPACITY

In the event FMD is introduced to the United States, vaccine would likely be requested by USDA APHIS after confirmatory testing, approximately 24-48 hours after sample submission.

- Activation of the NAFMDVB provides the U.S. access to an allocation of 70%, between 1.75 and 2.5 million doses (depending on the manufacturer), that would be received within 10-14 days post-order.
Based on the unique epidemiology of the outbreak, Canada and Mexico could also elect to donate their vaccine allotment to the U.S., if appropriate, to support rapid containment. The reverse also applies if Mexico or Canada experience an outbreak.

- With NAVVCB activation, it is anticipated that a minimum of 2.5 million doses would come to the U.S. within 10-14 days post-order, all of it available for domestic use, with subsequent shipments arriving every 10-14 days as available.

In a moderate to large scale outbreak, the banks are likely to be activated to exhaust all available VAC for rapid receipt of finished vaccine, prior to soliciting continuous production. The production cycle for inactivated vaccine, starting with master seed and finishing with completed vaccine, is 14 weeks. This means there may be a gap in vaccine receipt even if surge capacity production is requested and orders are immediately placed for future vaccine. Vaccine manufacturers also have other customers which must be served as well as meeting the surge capacity needs of the United States, so quantities may be somewhat restricted. For example, one of the primary FMD vaccine suppliers to the United States can only commit a portion of their production to North America, totaling one million doses per week up to 80 weeks.

3.4.2.4 FUTURE TECHNOLOGIES

Novel vaccine technologies on a variety of different platforms are currently being investigated by commercial, academic and governmental research institutions. To date, only one novel vaccine (an adenovirus-vectored A24 topotype) has been licensed by the APHIS Center for Veterinary Biologics for use in the United States.

Additionally, restrictions on research of FMD vaccines on the U.S. mainland have been relaxed. In 2018, the Secretary of Agriculture authorized the movement of a genetically modified, non-infectious version of the FMDV into the U.S. mainland for continued vaccine development and study. Having access to efficacious vaccines would enable USDA to more quickly source and acquire FMD vaccine in the event of an outbreak of this devastating disease.

3.4.3 Determining an Appropriate FMD Response Strategy

Table 3-2 highlights key factors to be considered when determining whether a particular response strategy would be appropriate and advantageous for responding to an FMD outbreak. This table simply lists important factors that will be considered in determining the initial response strategy or modifying this strategy. No single factor listed below will independently dictate a response strategy.
<table>
<thead>
<tr>
<th>Factor or criterion supporting the response strategy</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stamping-out</td>
</tr>
<tr>
<td>Suitable vaccine for FMD outbreak strain</td>
<td>Not available/feasible</td>
</tr>
<tr>
<td>Resources for stamping-out (such as disposal)</td>
<td>Adequate</td>
</tr>
<tr>
<td>Resources for vaccination (such as diagnostic testing, tracing efforts, and permitting activities)</td>
<td>Limited</td>
</tr>
<tr>
<td>Population density of susceptible animals at high risk of becoming infected</td>
<td>Low</td>
</tr>
<tr>
<td>Population density of virus amplifying animals</td>
<td>Low</td>
</tr>
<tr>
<td>Movement of infected animals, products, or fomites out of Control Area</td>
<td>No evidence of extensive movement</td>
</tr>
<tr>
<td>Origin of outbreak</td>
<td>Known</td>
</tr>
<tr>
<td>Location of initial outbreak</td>
<td>Isolated premises</td>
</tr>
<tr>
<td>Spread of outbreak</td>
<td>Slow</td>
</tr>
<tr>
<td>Distribution of outbreak</td>
<td>Limited or restricted</td>
</tr>
<tr>
<td>Risk of infection in valuable, rare, endangered, or high-value genetic livestock</td>
<td>High</td>
</tr>
<tr>
<td>Likelihood that FMD could become prevalent in feral swine, deer, or other wildlife</td>
<td>High</td>
</tr>
<tr>
<td>Public acceptance of stamping-out strategy</td>
<td>Neutral reaction or weak opposition</td>
</tr>
<tr>
<td>Surveillance, diagnostic, and laboratory resources for serosurveillance after vaccination</td>
<td>Limited</td>
</tr>
</tbody>
</table>
### Table 3-2. Factors Influencing a Response Strategy or Strategies for U.S. FMD Outbreak

<table>
<thead>
<tr>
<th>Factor or criterion supporting the response strategy</th>
<th>Stamping-out</th>
<th>Stamping-out modified with emergency vaccination to kill</th>
<th>Stamping-out modified with emergency vaccination to slaughter</th>
<th>Stamping-out modified with emergency vaccination to live</th>
<th>Emergency vaccination to live without stamping-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic stakeholders’ acceptance of regionalization with stamping-out or vaccination to kill</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Domestic stakeholders’ acceptance of regionalization with vaccination to live or vaccination to slaughter</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Trading partner acceptance of regionalization with stamping-out or vaccination to kill</td>
<td>Accepted</td>
<td>Accepted</td>
<td>Not accepted</td>
<td>Not accepted</td>
<td>Not accepted</td>
</tr>
<tr>
<td>Trading partner acceptance of regionalization with vaccination to slaughter or vaccination to live</td>
<td>Not accepted</td>
<td>Not accepted</td>
<td>Accepted</td>
<td>Accepted</td>
<td>Accepted</td>
</tr>
<tr>
<td>Assessments and economic analysis of competing control strategies</td>
<td>It is likely that a control strategy with emergency vaccination will lead to significantly higher economic losses, or longer duration of the outbreak</td>
<td>It is likely that a control strategy without emergency vaccination to kill will lead to significantly higher economic losses or longer duration of the outbreak</td>
<td>It is likely that a control strategy without emergency vaccination to slaughter will lead to significantly higher economic losses or longer duration of the outbreak</td>
<td>It is likely that a control strategy without emergency vaccination to live will lead to significantly higher economic losses or longer duration of the outbreak</td>
<td>It is likely that a control strategy with stamping-out will lead to significantly higher economic losses or longer duration of the outbreak</td>
</tr>
</tbody>
</table>

#### 3.4.4 Phases and Types of FMD Outbreaks

An FMD outbreak in the United States will be a complex event. Having pre-defined phases and types\(^\text{19}\) may be useful to facilitate the development of adaptable emergency response plans and processes. The phase (temporal) and

type (extent) of the FMD outbreak is expected to change over time and could be designated by the authorities responsible for managing the response. Types are loosely defined as follows:

- **Type 1–2** Focal to Moderate Regional
- **Type 3** Large Regional
- **Type 4–6** Widespread/ National outbreak to catastrophic North American outbreak.

Figure 3-6 describes the phases of FMD response, which progress from confirmation through recovery to declaration of freedom.

**Figure 3-6. Phases of FMD Response**

For detail on the Types and Phases of a response with respect to associated zones, see the [FAD PReP Ready Reference Guide—Understanding Response Strategies](#).

### 3.5 Recovery After an FMD Outbreak

USDA APHIS will attempt to implement response strategies that are expedient in allowing the United States to return to FMD-free status, preferably FMD-free without (continued) vaccination. The OIE recognizes FMD-free status with and without vaccination in countries and in zones.
3.5.1 FMD-Free Designations

- **FMD-free country where vaccination is not practiced.** The OIE recognizes about 70 countries FMD-free without vaccination. Stamping-out is the most efficient strategy for achieving this status, though vaccination to-kill could also achieve this status. Vaccination to-slaughter and vaccination to-live strategies could be employed to achieve this status over a longer period.

- **FMD-free country where vaccination is practiced.** The OIE recognizes one country as having this status. The United States does not recognize this country as FMD-free, but it is permitted to export fresh beef to the United States.\(^{20}\) Vaccination to slaughter and vaccination to-live strategies could be used to achieve this status over time.

- **FMD-free zone where vaccination is not practiced.** The OIE recognizes several member countries with FMD-free zone without vaccination. The United States recognizes two of these zones as FMD-free for import purposes.\(^{21}\) This is a possible interim goal for the United States if FMD-free country status is not obtainable. Stamping-out, vaccination to-kill, vaccination to-slaughter, or vaccination to-live strategies could all be used to achieve this status.

- **FMD-free zone where vaccination is practiced.** The OIE recognizes several member countries with zones having this status. On the basis of risk assessments, the United States does not recognize any FMD-free zones where vaccination is practiced for import purposes. Vaccination to slaughter and vaccination to-live strategies could be used to achieve this status.

The remaining OIE member countries are generally considered to be FMD-infected countries. A country will not be recognized as FMD-free until the requirements are met for one of the classifications listed, per OIE standards. The *OIE Terrestrial Code* for FMD lists the detailed criteria for recognition.

3.5.2 OIE Minimum Time to FMD-Free Designations

For the United States to recover its free status after an outbreak, the summarized minimum time requirements herein will apply, in coordination with surveillance efforts and other documentation. These time requirements apply to both free countries and free zones where vaccination is not practiced:

- Three months after disposal of the last animal killed, if a stamping-out strategy without emergency vaccination is employed.


- Three months after disposal of the last animal killed or the slaughter of all vaccinated animals, whichever occurred last, if a stamping-out modified with emergency vaccination to-kill or -slaughter strategy is employed.

- Six months after the disposal of the last animal killed or the last vaccination, whichever occurred last, if a stamping-out modified with emergency vaccination to-live strategy is employed.

- Twelve months after the last vaccination, if stamping-out is not applied or is discontinued, and a continued vaccination to-live strategy has been adopted.

- FMD freedom with vaccination can be applied for 24 months after the last positive detection, if stamping-out is not employed and vaccination is continuing.

These time requirements are minimum OIE standards. Regardless of OIE recommendations, it is quite possible that international trade will not resume for many months after an FMD outbreak given the circumstances of the outbreak. Figure 3-7 visualizes and references OIE articles with respect to the minimum time requirements.

*Figure 3-7. Minimum OIE waiting periods and pathways for recovery of FMD free status after an outbreak where vaccination is not practiced*  

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### 3.5.3 Surveillance for Recognition of Disease-Freedom

Surveillance is fundamental in proving disease freedom after an FMD outbreak in hopes to regain disease-free status. The *OIE Terrestrial Code* specifies surveillance procedures for members re-applying for recognition of freedom from FMD for the whole country or zone where vaccination is either practiced or not practiced, following an outbreak. These general surveillance conditions and methods for FMD are found in Articles 8.8.40 through 8.8.42 (2019).

The use and interpretation of serological tests is addressed in the *OIE Terrestrial Code* and in the *OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (Terrestrial Manual23). These sections discuss serological tests for both structural proteins and NSP. Tests for structural proteins are serotype specific and include structural protein antigen enzyme-linked immunosorbent assays (ELISA) and the Virus Neutralization Test (VNT). Tests for NSP antibodies include the 3ABC ELISA, which is conducted by NVSL-FADDL.

Specific information on surveillance and diagnostic testing is provided in Chapter 4.

### 3.5.4 Release of Control Area Restrictions

Quarantine and movement controls will be maintained until at least 28 days (two OIE incubation periods) have elapsed since the decontamination of all confirmed IP and negative results of surveillance activities. IC and animal health officials need to plan for a release of quarantine prior to or during the issuance of quarantine and movement controls. Such a plan would specify procedures by which quarantined premises will be evaluated for FMD freedom and how the quarantine will be released (by sections, by risk, or in its entirety).

### 3.5.5 Disposition of Vaccinates

If vaccination was used in the outbreak, FMD vaccinates may still be subject to movement controls and monitoring measures after the release of the CA.

### 3.5.6 Country Freedom Declaration

The United States will apply to the OIE after meeting OIE requirements. FMD-free status will require a formal submission detailing FMD policy, eradication procedures, surveillance, monitoring and tracing of vaccinates, and veterinary infrastructure. Acceptance of the claim for country freedom may also involve an inspection by an international panel to review the eradication program and all available information.

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While the OIE lists minimum time requirements for recovering FMD-freedom after an outbreak in a previously free country, it should again be acknowledged that re-establishing international trade with trading partners may take longer than these minimum time periods.
Chapter 4
Specific FMD Response Critical Activities and Tools

FAD PReP documents identify critical activities and tools to be employed in the event of an FMD outbreak. These critical activities and response tools will assist in controlling, containing, and eradicating FMD while facilitating continuity of business (COB) in an outbreak. This chapter describes key components of these critical activities and tools.

The FAD PReP SOPs and NAHEMS Guidelines referenced in this chapter can be found at www.aphis.usda.gov/fadprep.

4.1 ETIOLOGY AND ECOLOGY

Information on the etiology and ecology of FMD promotes a common understanding of the disease agent among responders and other stakeholders (see Chapter 1 for FMD information). The FAD PReP FMD Overview of Etiology and Ecology SOP contains additional information.

4.2 LABORATORY DEFINITIONS AND CASE DEFINITIONS

Laboratory and case definitions provide a common point of reference for all responders. Case definitions and laboratory criteria are developed according to the FAD PReP Case Definition Development Process SOP available at www.aphis.usda.gov/fadprep.

The following sections are the APHIS-VS Center for Epidemiology and Animal Health (CEAH) definitions for FMD. For further information on the diagnostic tests conducted by NVSL-FADDL in the event of an FMD outbreak, please see Section 4.4.

4.2.1 Laboratory Criteria

*Agent identification:* Virus isolation (VI), ELISAs and rRT-PCR assays are used to detect FMDV-infected animals. Samples to collect for testing include vesicular epithelium, vesicular fluid, epithelial tissues, esophageal-pharyngeal fluid, and oral and nasal swabs.
a. VI in cell cultures: One of the “gold standard” tests for FMDV detection. VI is highly sensitive and specific when used with antigen ELISA or rRT-PCR to confirm the presence of FMDV after cytopathic effect is observed.

b. Antigen ELISA: The other “gold standard” test for FMDV detection. Detects viral proteins for serotyping (using polyclonal or monoclonal antibodies to FMDV) and is useful for FMD diagnosis in suspect cases. It is also capable of detecting South African Territories (SATs) serotypes.

c. rRT-PCR: Detects FMDV nucleic acids (RNA). It only takes 2-3 hours to obtain test results. It is used for surveillance and diagnosis, not as a stand-alone laboratory assay. Most rRT-PCRs detect all known FMDV serotypes, often with equal or greater sensitivity than VI; rRT-PCR does not identify virus serotype or subtype.

d. Strain characterization by nucleotide sequencing: RT-PCR amplification of the P1 region of the FMDV genome or a portion of the P1 region that contains VP1 of the genome, followed by nucleotide sequencing is the preferred method for generating sequence data strain characterization. If necessary, the whole genome of FMDV can be sequenced. Antigen ELISA is used to determine the serotype of the FMD present in the outbreak samples.

Serological tests: The sample to collect for testing is serum. The following serological assays detect FMDV-exposed animals and some help to discriminate vaccinated from infected animals.

a. Structural protein-based assays: VNT, solid phase competitive ELISA (SPCE), and liquid phase blocking ELISA (LPBE) are OIE-prescribed tests for trade purposes. These are highly sensitive, serotype-specific tests that detect FMDV antibodies. These assays may be utilized for confirmation of infection (previous or on-going) and to monitor immunity following vaccination. Low titer ELISA-positive sera must be confirmed by VNT to exclude false positive results. The VNT confirms the FMDV serotype and a version of this test is used to determine the serotype subtype during vaccine matching.

b. NSP-based antibody assays: ELISA and enzyme-linked immunoelectrotransfer blot (EITB) assays measure antibodies to NSP (3B, 2C, 3D, and 3ABC). Commercial ELISAs measure antibodies to 3ABC or 3B. The virus infection association antigen, VIAA, is an agarose immunodiffusion (AGID) test that detects antibodies to NSP 3D. These assays are not serotype-specific and they are used as screening tests. The PrioCHECK® FMDV NS (formally Ceditest® FMDV-NS) is an ELISA that detects antibodies to NSP 3ABC of FMDV with specificity greater than 97 percent for vaccinated and non-vaccinated cattle, and greater than 99 percent in non-vaccinated sheep and pigs. The sensitivity of
PrioCHECK® is 100 percent in non-vaccinated cattle, but varies greatly in vaccinated cattle, sheep and pigs depending upon time between infection and testing, clinical signs, and carrier status. PrioCHECK® FMDV NS can discriminate vaccinated from infected animals, and is best used as a herd test rather than an individual animal test.

### 4.2.2 Case Definitions

The *FAD PReP Case Definition Development Process SOP* describes the general process for developing and approving animal disease case definitions for use in animal health surveillance and reporting. Case definitions are developed by CEAH, in cooperation with VS Strategy & Policy. CEAH coordinates review with SAHOs, subject matter experts, stakeholders, and VS units. Case definitions are approved by the VSDA/CVO and VS Executive Team. Case definitions enhance the usefulness of animal disease data by providing uniform criteria for reporting purposes.

At the start of an FMD outbreak, the case definition will undergo review and will continue to be evaluated as the outbreak progresses. Any modifications will supersede what is mentioned in this Redbook on the basis of additional information or changing requirements of the eradication effort. For example, the positive predictive value of clinical signs will increase if the FMD prevalence increases.

The below presumptive positive and confirmed positive case definitions are for the index case and may change as an outbreak progresses. **Suspect case:** An FMD-susceptible animal that has either:

1. Clinical signs consistent with FMD; OR
2. Inconclusive or positive laboratory test results performed on a sample taken during routine surveillance, with or without the presence of clinical criteria; OR
3. Epidemiological information indicative of FMD.

**Presumptive positive case:** A suspect case that has positive laboratory test results (see laboratory criteria above):

1. Identification of antibodies to NSP 3D by AGID or 3ABC by ELISA, or to structural proteins by virus neutralization for serotype identification; OR
2. Identification of FMDV nucleic acid by rRT-PCR; OR
3. Identification of FMDV serotype by antigen ELISA.
Confirmed positive case: An animal from which FMDV has been isolated and identified at NVSL-FADDL or other laboratory designated by the Secretary of USDA.

4.3 SURVEILLANCE

Surveillance is a critical activity during an FMD outbreak. The following are surveillance goals during an FMD outbreak:

- Implement a surveillance plan within 48 hours of the outbreak’s confirmation.
- Implement a surveillance plan that will 1) define the size and extent of an FMD outbreak and 2) detect unknown IPs quickly.
- Provide evidence to demonstrate FMD absence on a premises, or demonstrate FMD absence in an area during the outbreak (e.g., in the Surveillance Zone [SZ]) or after eradication (e.g., in the CA).
- Provide evidence that premises are free of FMD at a nominal level, thereby setting the stage to conduct additional testing or apply predefined conditions to permit animal and animal product movements within and/or out of the CA.

Surveillance activities should be developed to achieve desired outcomes by leveraging available resources, satisfying jurisdictional requirements, and supporting implementation of COB measures. The surveillance plan should consider the susceptible wildlife population in the area, and planners should coordinate with representatives from APHIS Wildlife Services, DOI, State wildlife agencies, and State agriculture departments to perform appropriate FMD surveillance in these populations.

The surveillance plan should also provide guidance on who is responsible for surveillance data summaries and analysis. Generally, the ICG will coordinate with CEAH and the NIMT for surveillance data summary and analysis needs, at intervals specified by the IC. The surveillance plan should also supply information to assess and modify outbreak response activities in conjunction with the Epidemiology Group.

4.3.1 Surveillance Planning for FMD Outbreak

4.3.1.1 GENERAL CONSIDERATIONS

A surveillance plan will have to be customized to the size and scope of an outbreak, which may take many forms. The epidemiologic picture will guide the response and surveillance activities, including species affected, location of outbreak, number of infected premises, number and size of animal operations, incubation period, number of potential contacts from the index premises, and
many other factors. The IC will guide response efforts to account for these differences.

Parameter settings were developed based on transmission characteristics of serotype O FMDV described in literature by species, see Table 4-1. When developing an initial surveillance plan, planners should give additional consideration to the number and types of species on a premises and in a zone. Cattle tend to show clinical signs more readily than other species, while sheep and goats tend less to show clinical signs. Swine are replicators of FMDV and can shed large quantities of virus through respiration. If swine and cattle are raised near each other or on the same premises, there is opportunity for spread between species even if neither is showing clinical signs.

<table>
<thead>
<tr>
<th>Species</th>
<th>Latent Period</th>
<th>Subclinical</th>
<th>Incubation</th>
<th>Infectious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>3.6, 3 (2,5)</td>
<td>2.0, 2 (1, 3)</td>
<td>5.9, 5 (5, 6)</td>
<td>4.4, 4 (3,6)</td>
</tr>
<tr>
<td>Pig</td>
<td>3.1, 2 (2,4)</td>
<td>2.3, 2 (1,3)</td>
<td>5.6, 4 (3,9)</td>
<td>5.7, 5 (5,6)</td>
</tr>
<tr>
<td>Small ruminant</td>
<td>4.8 5 (3, 6)</td>
<td>2.2, 2 (1, 3)</td>
<td>6.6, 6 (4, 8)</td>
<td>3.3, 2 (2,4)</td>
</tr>
</tbody>
</table>

1Mean, Median, 25th-75th%

Appendix F of this document outlines more details on how to customize the surveillance plan after initial response efforts have begun. CEAH is available to provide additional consultation.

4.3.1.2 DEFINITIONS

*Active observational surveillance (AOS)* is a purposeful effort to detect evidence of disease through observation of clinical signs following these criteria:

- Observations are ongoing, frequent (e.g., once or twice a day in confinement facilities or once every 2 to 3 days in large grazing operations), and follow a pre-planned schedule.

- Observer is specifically tasked with monitoring for evidence of disease, toxicity, or other causes of morbidity, mortality and decreased production.

- The group of animals undergoing AOS is clearly defined.

- A set of guidelines exist describing expected production parameters and corresponding investigation triggers.

- A communication plan is created for a response to the investigation triggers, including when to contact regulatory animal health officials or their designees.
Observer is aware of and understands the production parameters, investigation triggers, and communication plan.

Observation of clinical signs or other changed consistent with the disease of interest during AOS serves as the screening “test.” Confirmatory testing is laboratory-based.

Utility of AOS is highest for diseases that show overt clinical signs such as HPAI or FMD. Vesicular diseases such as FMD in a naïve population are particularly amenable for AOS in many U.S. animal populations. Most confinement livestock operations have standard management practices with the above criteria and, in fact, already conduct AOS.

High Probability of Disease (HPD) – see Table 4-2 for examples. HPD animals are animals which fit into one of the categories listed but do not have clinical signs consistent with FMD infection. In the case of endemic SVA infection in swine, other clinical signs (fever, lameness, etc.) may still be used to differentiate the two diseases.

Table 4-2. Examples of animals with a Higher Probability of Disease (HPD) during an FMD outbreak

<table>
<thead>
<tr>
<th>Health Indicators</th>
<th>Immunosuppressed</th>
<th>Exposure Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ Poor-doers</td>
<td>✦ Young animals</td>
<td>✦ Recent introduction to premises</td>
</tr>
<tr>
<td>✦ Lethargic</td>
<td>✦ Old animals</td>
<td>✦ Housed in pastures adjacent to farms with FMD susceptible species (airborne spread)</td>
</tr>
<tr>
<td>✦ Decrease feed intake</td>
<td>✦ Pregnant animals</td>
<td>✦ Housed near entry/exit points</td>
</tr>
<tr>
<td>✦ Decrease in production (e.g. milk or rate of gain)</td>
<td>✦ Animals undergoing treatment for another disease</td>
<td>✦ Housed near another infected premises</td>
</tr>
<tr>
<td></td>
<td>✦ Animals under high stress (high production or recent movement)</td>
<td></td>
</tr>
</tbody>
</table>

1 This list is not meant to be exhaustive. It provides guidance on prioritizing animals for diagnostic testing.

Intensively managed – operations with a high stocking density. Examples may include: feedlots, dairies, indoor housed swine, and some seed stock or show stock production.

Observational surveillance – observation of all, or a subset, of the animals on an operation. Includes disease reporting of suspected clinical signs by livestock producers or animal health professionals to regulatory officials.

4.3.1.3 ASSUMPTIONS

Several assumptions are embedded in the design of surveillance plans and analyses of surveillance data. The accuracy of these assumptions impacts the strength of conclusions drawn from surveillance activities. For the example of
FMD surveillance schemes discussed in Appendix F, the following assumptions apply:

1. FMD virus causes severe clinical signs in most livestock species; however, in some species like sheep, goats, and cervids, clinical signs are less severe.

2. The proportion of FMD infected animals is highest among animals with clinical signs, followed by HPD animals, relative to apparently healthy animals in the same pen or premises.

3. Observational surveillance activities are routine and ongoing in all FMD susceptible animals, both inside and outside of the CA, including at slaughter plants, markets and shows.

4. Production parameters (milk production, feed consumption, etc.) will be monitored to detect FMD incursions quickly on intensively managed operations.

5. The producer separates poor-doing animals into a group and these are the animals to be sampled for surveillance.

6. Outbreak response field personnel visiting premises will suspect FMD if compatible signs are present, and will initiate testing and implement a quarantine if necessary.

7. The rRT-PCR test sensitivity for detection is 95 percent.

4.3.1.4 SURVEILLANCE ACTIVITIES BY TIME PERIOD

There are three key segments of surveillance activity in an outbreak. These segments have distinct goals to aid in the control, containment, and eradication of FMD from domestic livestock and for re-establishing disease freedom status after the outbreak. For more information on the zone, area, and premises designations referred to in this section, please refer to Section 4.5 in this chapter.

1. The initial 72 hours post FMD outbreak declaration. The initial surveillance objectives in the CA and SZ are to detect infected animals and premises as quickly as possible, and to determine the size and extent of the FMD outbreak. During this period, the goals of the IC include the following:

   a. Create the initial IZ and BZ designation and the boundary of the CA.

   b. Create a list of known premises with FMD susceptible animals in the CA and SZ. If possible, gather additional information for each premises including production type, estimated population size, and
whether the premises must move animals and/or product or whether it can function under quarantine for an extended time period.

c. Determine CP (this includes direct and indirect exposure, per the definition of a CP) to known IP.

d. Evaluate surveillance guidance below (Section 4.3.2) and FMD response and policy information on surveillance (available from www.aphis.usda.gov/fadprep). Modify existing surveillance guidance with outbreak-specific information to create a surveillance plan for the CA.

e. Initiate surveillance within the CA as soon as possible. Carry out active observation and diagnostic testing on all premises, starting with those premises that will need to move FMD susceptible animals or their products. Ensure active outreach to all premises and investigate those deemed high-risk.

f. Determine the boundary of the SZ and start developing a surveillance plan to be used in the SZ based on existing FMD response and policy information and surveillance guidance below (Section 4.3.2 and Appendix F). The objective of surveillance in the SZ is to determine the size and extent of the FMD outbreak and provide evidence of DF in this zone.

2. The control and eradication period (from the initial 72-hour period until the last case is detected and eradicated). Multiple key surveillance activities need to be performed simultaneously during this period.

a. Continue CA surveillance. The objectives are to detect new IPs so that control measures can be immediately implemented and the CA boundaries can be adjusted as needed.

b. Conduct surveillance in the SZ sufficient to demonstrate that the FMD virus does not extend beyond the CA.

c. As part of investigation and surveillance activities, gather information related to the epidemiology of the outbreak virus (virulence, incubation period, etc.) through observation and communication with other agencies, researchers, and partners (see Section 4.5 for additional information).

d. Revise or prioritize ongoing control and surveillance activities based on surveillance results and available epidemiologic information. Information may support modification of sampling frequency, movement restrictions, risk factor mitigations, vaccination decisions, or targeted sampling, as examples.
e. Provide evidence that premises are free of FMD virus at a nominal level, thereby setting the stage for movement of permitted FMD susceptible animals and their products into, within or out of the CA.

f. Provide evidence that the Free Area (FA) is free of disease, thereby facilitating unrestricted animal and animal product movement from the FA.

3. Post-eradication. The objective of this segment is to provide evidence that the CA and FA are free of disease (using OIE recommendations and requirements on surveillance).

a. Establish a containment zone as defined by OIE, which includes all outbreaks, to minimize the impact on the entire country.

b. Prove DF on depopulated premises.

c. Prove DF on at-risk premises (ARP) in the CA by random or targeted sampling (choosing populations based on risk) of selected premises and herds.

d. Prove DF in the FA, following OIE guidelines to restore international trade.

4.3.2 Surveillance Sampling

A surveillance plan will indicate the number and frequency of premises to be investigated, the number of animals to be sampled for each investigation, and the duration of the surveillance needed to meet the surveillance objectives. Initial surveillance plans and guidelines are provided for 1) detecting new infected premises in the CA, and 2) determining the size and extent of the FMD outbreak with SZ surveillance. For 3) demonstrating FMD absence in the CA after eradication, surveillance plans in the zones should be developed according to OIE guidelines and will depend on the control strategies used during the outbreak.

Throughout this section, an investigation is defined as a veterinarian traveling to a premises, examining/observing FMD-susceptible animals on the premises, collecting diagnostic specimens on clinical animals, and completing an epidemiology investigation (e.g., forward and backward tracing, identifying on-farm visitors/deliveries, etc.). Observational surveillance is one part of an investigation, but could be the main form of diagnosing FMD during very large outbreaks.

These initial plans and guidelines apply to all species when possible. Recommended adjustments by species are provided after the description of the initial plan. These initial plans presume a Type 1 or Type 2 outbreak (See Figure...
3-6). It is critical to note that during an outbreak, parameter estimates and surveillance plans may change as new information about viral characteristics, epidemiology, or outbreak size become available. Further information on surveillance parameters, factors and modifications are provided in Appendix F.

4.3.2.1 RECOMMENDED INITIAL DESIGNS

1. CA surveillance - Surveillance objectives in the CA during the outbreak include detecting FMD quickly and providing evidence that premises are free of FMD at a nominal level to set the stage to conduct additional testing or apply predefined conditions for the movement of permitted FMD susceptible animals and their products into, within or out of the CA.
   a. In the CA, all CP, SP, and ARP are subject to surveillance. Exemptions may be allowed for small, non-commercial, low-risk animal operations where the premises can maintain an appropriately secure quarantine and emergency response officials have adequately informed producers about their obligations for reporting as soon as possible after establishing a CA.
   b. All other premises should be investigated as soon as possible, but preferably within 3-5 days (approximately one latent period) after establishment of the CA. Surveillance of CPs and SPs should occur first followed by a prioritized list of ARPs.
   c. Diagnostic testing should preferentially occur in animals with clinical signs consistent with FMD, followed by those with a higher probability of disease (HPD). See Table 4-2 for examples of animals that might be classified as HPD.
   d. Specimens for testing (See Section 4.2.1, Laboratory Criteria) should be collected from sick and HPD animals. For medium to large premises, specimens from at least 100 sick and HPD animals should be submitted for diagnostic testing. For operations with less than 100 sick and HPD animals, all of the animals identified as sick and HPD should be tested. See Section 4.3.2.2, Animal Sample Size, for an explanation of initial sample size choice and guidance for adjusting this value.
   e. Investigations on CPs should occur twice within 5 days for cattle and swine and twice within 7 days for sheep and goats and then every 5-10 days thereafter, depending on species and type of contact, until 56 days, then test as an ARP.
   f. Investigations on all non-exempt ARP premises should occur every 10 days after the initial investigation until 56 days after the last detected case.

2. SZ surveillance – The primary surveillance objective in the SZ during the outbreak is to demonstrate that the virus has not extended beyond the boundary of the CA.
Specific FMD Response Critical Activities and Tools

a. All premises may be tested or a subset of premises (initially 300 to 500 premises is recommended) for investigation. Preferentially target premises with the highest probability of exposure to FMD. Small, non-commercial, low-risk animal operations that can maintain a secure quarantine should be excluded from the list frame. See Section 4.3.2.2 for explanation of premises samples sizes and for guidance on adjusting the number premises selected for investigation.

b. Similar to the CA, specimens for testing (See Section 4.2.1, Laboratory Criteria) should be collected from HPD animals. See Table 4-2 for examples of animals that might be classified as HPD.

c. For medium to large premises, specimens from at least 100 HPD animals should be submitted for diagnostic testing. For operations with less than 100 HPD animals, all animals identified as HPD should be tested. (See Section 4.3.2.2 Animal Sample Size for explanation.)

d. Investigations should begin around 72 hours after index case confirmation and the first round of investigations should be completed as soon as possible, keeping in mind the latent period of the disease.

e. A new subset of premises should be investigated at least every 21 days until 56 days after the last detected case.

3. DF surveillance after the last detected case

DF surveillance plans will vary widely depending on the size of the outbreak and the control strategies implemented. The OIE Terrestrial Code specifies waiting periods before a country can re-declare freedom from a disease outbreak based on the control strategy, including implementation of stamping out and/or different vaccination strategies (vaccinate to-kill or to-slaughter vs. vaccinate to-live). Regardless of the control strategy used, the animal sample size and premises sample size can be determined in the same way they were calculated for the outbreak CA and SZ.

4.3.2.2 EXPLANATION OF DETAILS ON RECOMMENDED INITIAL DESIGNS

Targeting animals with a higher probability of being diseased

Table 4-2 provides other factors that may indicate FMD susceptible HPD animals. If the premises is infected with FMD, these high-risk-for-exposure or sick animals should have a higher prevalence than the general population of animals on the premises in the early stages of an FMD infection. Therefore, prioritizing these animals for testing increases the probability of detecting disease.
Animal sample sizes

When infection in a small population, subpopulation, or target group is of interest, it is helpful to consider the actual number of infected animals rather than a prevalence level. When only one animal in the group is infected, testing all animals in the group results in a probability of detection equal to the sensitivity of the test. If the group contains two infected animals, the probability of detection increases to more than 0.95 as long as the test has sensitivity of 80 percent or more. (See Table F-1 in Appendix F.)

As the number of animals in the group increases, testing all of the animals becomes cost-prohibitive. With a sample size of 100, a prevalence of at least 3 percent can be detected (with 0.95 probability) using a 95 percent sensitivity test regardless of the size of the group. As outbreak size increases, reducing the sample size to 60 will enable detecting a prevalence of at least 5 percent. See Table F-2 in Appendix F. For a Type 2 or larger outbreak, observation of clinical signs may become the primary surveillance tool in place of diagnostic testing.

Premises sample sizes

Surveillance zones may contain several hundred to tens of thousands of premises, depending on the size and location of the outbreak. For small localized outbreaks, testing animals from all of the premises in the SZ would define the extent of the outbreak rapidly and allow faster implementation of control actions.

In most cases, a sample of premises will need to be selected for testing because of limited resources. Testing 500 premises will result in 0.95 probability of detecting at least one infected premises if at least 0.6 percent of the premises are infected, while testing 300 premises has a detection threshold of 1 percent premises prevalence. Alternatively, 60 to 100 premises could be sampled, which will result in 0.95 probability of detecting at least one infected premises if at least 3 to 5 percent are infected. Selection of any of these sample sizes will depend on the acceptable level of prevalence to be detected. Note that a surveillance design that allows for sampling of a subset of premises, rather than testing all premises, will not detect all infected premises. See Table F-3 in Appendix F for more information.

Frequency and duration of sampling

The frequency and duration of sampling is related to disease transmission characteristics. Testing of potentially exposed premises should occur as soon after the latent period as possible to prevent spread of infection. During an outbreak, the actual date of exposure is often unknown, so the length of the latent period is used as a guide for an ideal response time for the first visit. Of course, resource limitations may not allow an ideal response time, so these are provided as guidance. Sampling frequency thereafter is related to the approximate length of the incubation period, as listed in Table 4-3. The duration of sampling is related to
the length of the incubation period and length of viral persistence in infected animals.

Table 4-3. Sampling Frequency Guidelines by Premises Designations

<table>
<thead>
<tr>
<th>Premises Type</th>
<th>Sampling Frequency</th>
<th>Sampling Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Premises (CP)</td>
<td>Every 5 days</td>
<td>14 days, then as ARP/MP</td>
</tr>
<tr>
<td>Suspect Premises (SP)</td>
<td>Once</td>
<td>Temporary designation</td>
</tr>
<tr>
<td>At Risk Premises (ARP)</td>
<td>Every 10 days</td>
<td>Until 56 days after the last detected case</td>
</tr>
<tr>
<td>Monitored Premises (MP)</td>
<td>Every 10 days or more often for movement</td>
<td>Until 56 days after the last detected case 5 rounds minimum or more often for movement for duration of quarantine</td>
</tr>
<tr>
<td>Premises in the SZ</td>
<td>Every 21 days</td>
<td>Until 56 days after the last detected case 2-3 rounds minimum for duration of quarantine</td>
</tr>
</tbody>
</table>

Addressing resource limitations

Diagnostic testing is recommended unless laboratory or personnel resources are severely strained. If the outbreak grows in size, observational surveillance may be used to diagnose FMD and determine the premises status, especially for ARP.

Species-specific details

- Additional considerations for outbreaks involving primarily cattle:
  - Cattle tend to show clinical signs of disease more readily than other types of ruminants; for this reason, observation of clinical signs would be more effective as a potential surveillance tool during an extensive outbreak.
  - Cattle operations may vary considerably in housing styles and therefore risk of exposure to FMD may differ (i.e., cattle raised in intensive management systems, such as feedlots and dairies, are more likely to be exposed while extensively operated cattle, such as cow-calf or range cattle operations, are not).

- Additional considerations for outbreaks involving primarily swine:
  - Swine amplify FMD virus and shed large quantities of virus with their respirations. An outbreak in swine may have a greater chance for airborne spread, especially if other FMD-susceptible species are located near the infected operation.
  - Since most commercial swine are raised in confinement barns, their risk of exposure to FMD in the environment may be less,
assuming good biosecurity practices are followed, and therefore may be sampled less frequently.

- Swine operations tend to be located near other operations that may be contractors of the same company. This is important to note when identifying indirect contacts in disease spread.

- Additional considerations for outbreaks involving primarily small ruminants (e.g., sheep, goats, cervids):

  - Small ruminants tend to show less severe clinical signs, making reliance on observation of clinical signs a less effective strategy for these species. Due to this, increased sampling may be appropriate in these operations if they are suspected in the epidemiology of the outbreak.

  - Small ruminant operations vary in their density, from more intensively managed feedlot operations to extensive farmed cervid operations or range sheep/goat operations.

**Aggregate sampling**

Validated aggregate sampling techniques, such as bulk-tank milk sampling, water trough sampling, or oral fluid sampling from ropes for swine or beef cattle, are economical and efficient for testing large numbers of animals. Without aggregate sampling, early detection requires testing individual animal samples using rRT-PCR. Consideration should be given to validating such sampling techniques and/or deployed to laboratories, particularly for swine, dairy, and beef, so that additional diagnostics can supplement and amplify visual observation and individual animal sampling in the case of an outbreak. To date, some validation work performed on the bulk tests has yielded favorable results when applied to certain uses.

4.3.2.3 **ADDITIONAL INFORMATION**

At the APHIS level, CEAH is responsible for and assists the unified IC and NIMT in surveillance planning for the CA and SZ. CEAH is also available to advise, construct, or review outbreak surveillance plans for other stakeholders on request to VS. Field Operations is responsible for surveillance implementation.

**Appendix F** of this FMD Response Plan contains active surveillance strategies and introduces assumptions and methods that influence surveillance decisions. Online calculators are available to assist with certain aspects (e.g., FreeCalc). However, development of a detailed plan should either follow the templates and guidance in existing surveillance documents or involve the help of field or program teams with surveillance planning expertise.
The FAD PReP FMD Surveillance SOP provides additional information on the protocol for a surveillance team responding to FMD IP, the distinction between commercial and noncommercial premises surveillance, equipment checklists, and surveillance for proof of DF. The Outbreak Surveillance Toolbox (2019) is available at www.aphis.usda.gov/aphis/ourfocus/animalhealth/ceah-toolbox/home.

4.4 DIAGNOSTICS

Effective and appropriate sample collection, diagnostic testing, surge capacity, and reporting are critical in an effective FMD response. These activities may require additional resources in the event of an FMD outbreak. In particular, sample collection will require additional personnel. Surge capacity may also be required for diagnostic laboratory testing. Surveillance plan requirements must be fully integrated with current diagnostic sample collection, sample testing, surge capacity, and reporting capabilities.

During a suspected or actual FMD outbreak, the key goals of response are to 1) provide clear direction to responders on sample collection and processing procedures, if modification from routine standards is required, 2) meet the surge requirements for diagnostic testing at specific intervals, starting at time zero and at 24-hour intervals as the response escalates, and 3) report all diagnostic test results to appropriate personnel and information management systems as soon as possible and within 4 hours of diagnostic test completion. The Emergency Management Response System 2.0 (EMRS2) is the official system of record for an FMD response.

The FAD Investigation Manual (FAD PReP Manual 4-0) offers detailed information on sample collection, diagnostic testing, surge capacity, and reporting. In particular, this manual provides additional guidance on who is responsible for diagnostic testing, sample collection, processing, packaging and shipping, and roles in FAD investigations. The APHIS website at https://www.aphis.usda.gov/nvsl has information on packaging and labeling laboratory submissions.

See Appendix D for VS Guidance Document 12001 (previously VS Memorandum 580.4), which contains more information on submitting diagnostic samples. The procedures outlined in this memo should be followed regarding the submission of diagnostic samples in an FAD investigation.

4.4.1 Sample Collection and Diagnostic Testing

Trained personnel and field collection kits are required to effectively collect samples, particularly from large animals. Specific diagnostic tests are used for antigen detection, virus identification, and antibody detection. For antigen
detection, rRT-PCRs are used simultaneously with other tests selected on the basis of the sample type and priority. Virus isolation is used to confirm an FMD diagnosis, but this can take up to 7 days.

### 4.4.1.1 Diagnostics for Initial FMD Investigation

Figure 4-1 displays the diagnostics for a suspected case of FMD. In the figure, Priority 1 or A and Priority 2 refer to categorizations explained in VS Guidance Document 12001 (in Appendix D). While simultaneous, preliminary testing may be ongoing at a NAHLN laboratory, the confirmation of an FMD outbreak will only be made by NVSL-FADDL. If FMDV is detected, sequencing will be completed to reveal the strain and topotype to conduct vaccine matching.
Figure 4-1. Diagnostic Flowchart for Initial Investigation of FMD

Estimated Time to Test
Completion
VIAAA- Overnight
3ABC- Overnight
VI- 3 days x 2 cycles ~ 1 week
VNT- 3 days
AgELISA- 6 hours
rRT-PCR- 4 hours

Initial Investigation of Suspected FMDV in the United States

Epithelial Tissue (1gm) or Vesicular Fluid

Sample Type (samples of all types should be sent)

Oral Swab or Probang

Serum

Priority 1 or A

Priority Level

Priority 2

Simultaneous testing with (1) virus isolation on LK (lamb kidney-secondary) cells and IBRS-2 cells (swine kidney-permanent cell line), (2) rRT-PCR, and (3) AgELISA for 7 serotypes of FMDV

Neg

Pos

STOP

FMD Field Infection

Sequencing of VP1 and P1 regions and full genome

Strain ID, Topotyping, Vaccine Selection

Simultaneous testing with (1) VIAA group specific 3D AGID, and (2) 3ABC Prionics ELISA

Neg

Pos (either test)

VNT

Simultaneous testing with (1) virus isolation on LK (lamb kidney-secondary) cells and IBRS-2 cells (swine kidney-permanent cell line), (2) rRT-PCR

Neg

Pos

AgELISA for 7 serotypes of FMDV

FMD Field Infection

Sequencing of VP1 and P1 regions and full genome

Strain ID, Topotyping, Vaccine Selection

STOP means not infected, unless there is a circumstantial reason to request additional samples and conduct additional diagnostic testing.
4.4.1.2 Diagnostics After FMD Detection

NVSL-FADDL will confirm detections of FMD on any premises not currently in an FMD CA. After NVSL confirmation of FMD on a premises (index case), subsequent swab samples for rRT-PCR may be sent to USDA-approved laboratories that are part of the NAHLN network. (Appendix C lists NAHLN laboratories approved for FMD testing.) Figure 4-2 illustrates the diagnostic flow after FMD has been detected.

IC will provide specific instructions regarding the direction and collection of samples, which is likely to change as the outbreak evolves. In all cases, 1) NVSL will confirm the index case, 2) presumptive positive samples (on a rRT-PCR) from outside an established CA will be tested and confirmed by NVSL, and 3) NVSL will receive samples routinely from inside the CA to monitor for changes in the FMDV. All presumptive positive samples from NAHLN laboratories will be forwarded to NVSL for confirmation and subtyping.
Figure 4-2. Outbreak Diagnostics after Positive Confirmation of FMD in United States

Estimated Time to Test Completion
V/AA- Overnight
3ABC- Overnight
VI- 3 days x 2 cycles ~ 1 week
VNT- 3 days
AgELISA- 6 hours
rRT-PCR- 4 hours

STOP means not infected, unless there is a circumstantial reason to request additional samples and conduct additional diagnostic testing.

A second bleed on an animal showing nonspecific or inconclusive results on the 3ABC test should be requested. If this is likewise positive or inconclusive, serial probangs can be done on individual animals for VI and PCR if the original antigensamples tested negative and there was still concern over the possibility of the existence of a carrier state in a bovine.
4.4.2 Surge Capacity

Surge capacity may be needed in an FMD outbreak. Additional resources, such as personnel and materials, will be needed for sample collection. Additional capacity may also be required for laboratory sample testing. Surge capacity can help facilitate a rapid response and COB for non-infected premises. In the event that the affected State(s) NAHLN lab(s) and NVSL-FADDL are overwhelmed by the diagnostic testing requirements, NAHLN laboratories from across the country may provide surge capacity for diagnostic testing. For more information on surge capacity, please see the NAHLN Activation Guide. Individual laboratories have independent protocols on how to manage receiving samples and handle personnel requirements if a surge is required. Appendix C contains a list of the NAHLN labs approved to conduct FMD diagnostics.

NAHLN labs currently have the capability to conduct rRT-PCR tests, as shown above. Ideally, NAHLN labs will also have the capability to conduct 3ABC ELISA tests to detect FMDV in herds. It is a priority to ensure that NAHLN labs have this diagnostic capacity to test samples in the event of an FMD outbreak, particularly for recovering and proving DF.

4.4.3 Reporting

Box 4-1 clarifies reporting and notification of presumptive FMD cases. See APHIS VS Guidance Document 12001 and the FAD Investigation Manual (FAD PReP Manual 4-0) for further information on FMD investigation and reporting. This Guidance Document and a link to the manual are available at www.aphis.usda.gov/fadprep.

Box 4-1. Reporting and Notification

**Reporting and Notification**

- Cases of clinical illness that are confirmed positive by National Veterinary Services Laboratories—Foreign Animal Disease Diagnostic Laboratory (NVSL-FADDL), based on the current case definition, are reported to the affected States, other States, Tribal Nations, industry, other Federal agencies, trading partners, and the World Organization for Animal Health (OIE).
- Appropriate Federal-State-Tribal-industry response and containment measures will be initiated during FMD investigations.
4.5 EPIDEMIOLOGICAL INVESTIGATION AND TRACING

4.5.1 Summary of Zones, Areas, and Premises Designations

A critical component of an FMD response is the designation of zones, areas, and premises. The Incident Commander will work with the Operations Section and Situation Unit (in the Planning Section) to 1) determine appropriate zones, areas, and premises designations in the event of an FMD outbreak, and 2) re-evaluate these designations as needed throughout the outbreak based on the epidemiological situation. These zones, areas, and premises designations are used in quarantine and movement control efforts. For details on the zones, areas, and premises, please see the APHIS Foreign Animal Disease Framework: Response Strategies (FAD PReP Manual 2-0).

Table 4-4 summarizes the premises designations that would be employed in an FMD outbreak response. Table 4-5 summarizes the zone and area designations that would be used in an FMD outbreak response. Figure 4-3 illustrates these premises, zone, and area designations.

<table>
<thead>
<tr>
<th>Premises</th>
<th>Definition</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infected Premises (IP)</td>
<td>Premises where presumptive positive case or confirmed positive case exists based on laboratory results, compatible clinical signs, FMD case definition, and international standards.</td>
<td>Infected Zone</td>
</tr>
<tr>
<td>Contact Premises (CP)</td>
<td>Premises with susceptible animals that may have been exposed to FMD, either directly or indirectly, including but not limited to exposure to animals, animal products, fomites, or people from Infected Premises.</td>
<td>Infected Zone, Buffer Zone</td>
</tr>
<tr>
<td>Suspect Premises (SP)</td>
<td>Premises under investigation due to the presence of susceptible animals reported to have clinical signs compatible with FMD. This is intended to be a short-term premises designation.</td>
<td>Infected Zone, Buffer Zone, Surveillance Zone, Vaccination Zone</td>
</tr>
</tbody>
</table>
### Table 4-4. Summary of Premises

<table>
<thead>
<tr>
<th>Premises</th>
<th>Definition</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>At-Risk Premises (ARP)</td>
<td>Premises that have susceptible animals, but none of those susceptible animals have clinical signs compatible with FMD. Premises objectively demonstrates that it is not an Infected Premises, Contact Premises, or Suspect Premises. At-Risk Premises seek to move susceptible animals or products within the Control Area by permit. Only At-Risk Premises are eligible to become Monitored Premises.</td>
<td>Infected Zone, Buffer Zone</td>
</tr>
<tr>
<td>Monitored Premises (MP)</td>
<td>Premises objectively demonstrates that it is not an Infected Premises, Contact Premises, or Suspect Premises. Only At-Risk Premises are eligible to become Monitored Premises. Monitored Premises meet a set of defined criteria in seeking to move susceptible animals or products out of the Control Area by permit.</td>
<td>Infected Zone, Buffer Zone</td>
</tr>
<tr>
<td>Free Premises (FP)</td>
<td>Premises outside of a Control Area and not a Contact or Suspect Premises.</td>
<td>Surveillance Zone, Free Area</td>
</tr>
<tr>
<td>Vaccinated Premises (VP)</td>
<td>Premises where emergency vaccination has been performed. This may be a secondary premises designation.</td>
<td>Containment Vaccination Zone, Protection Vaccination Zone</td>
</tr>
</tbody>
</table>

### Table 4-5. Summary of Zones and Areas

<table>
<thead>
<tr>
<th>Zone/Area</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infected Zone (IZ)</td>
<td>Zone that immediately surrounds an Infected Premises.</td>
</tr>
<tr>
<td>Buffer Zone (BZ)</td>
<td>Zone that immediately surrounds an Infected Zone or a Contact Premises.</td>
</tr>
<tr>
<td>Control Area (CA)</td>
<td>Consists of an Infected Zone and a Buffer Zone.</td>
</tr>
<tr>
<td>Surveillance Zone (SZ)</td>
<td>Zone outside and along the border of a Control Area.</td>
</tr>
<tr>
<td>Free Area (FA)</td>
<td>Area not included in any Control Area.</td>
</tr>
<tr>
<td>Vaccination Zone (VZ)</td>
<td>Emergency Vaccination Zone classified as either a Containment Vaccination Zone (typically inside a Control Area) or a Protection Vaccination Zone (typically outside a Control Area). This may be a secondary zone designation.</td>
</tr>
</tbody>
</table>
4.5.2 Epidemiological Investigation

Epidemiological investigation and movement tracing during an outbreak are critical in controlling and eradicating FMD. In an FMD outbreak, the goals are as follows:

- Assign a premises classification and a priority of investigation within 6 hours of identifying potential IP or CP through tracing activities.
- Identify all CP within 24 hours of identifying the IP or initial CP.
- Determine, within 96 hours of identifying the index case, the nature of the FMD outbreak, identify the risk factors for transmission, and develop mitigation strategies.
- Collect trace-back and trace-forward information for at least 28 days before the appearance of clinical signs in FMD infected animals.
Analyze epidemiological data at routine intervals so that information gathered can apply to response activities to rapidly and effectively control, contain, and eradicate FMD.

These measures will aid in the control of FMD and lessen the impact of the response effort. Appendix G contains a sample template of an epidemiological questionnaire. The scope of any such questionnaire should be based on the circumstances of the outbreak, and is at the discretion of IC and epidemiological subject matter experts. It is likely that any epidemiological questionnaire will need to be modified and tailored to the specific outbreak.

The FAD PReP Epidemiological Investigation and Tracing SOP and the NAHEMS Guidelines: Surveillance, Epidemiology, and Tracing both provide more information.

4.5.3 Tracing

Box 4-2 explains the fundamental importance of movement tracing in an FMD response effort.

**Box 4-2. Importance of Movement Tracing in an FMD Outbreak**

Trace-back and trace-forward information should Ideally be collected for at least 28 days before the appearance of clinical signs in animals infected with FMD. Additional tracing information will be collected for movements up to the time that quarantine was imposed.

When resources or personnel are limited in a widespread outbreak, movements considered high-risk by the unified IC should be traced first, so that any necessary action can be rapidly taken to control and contain the spread of FMD. Recent trace-forwards involving semen or live animals are typically the first priority.

Tracing information will be obtained from many sources (such as reports from field veterinarians, producers, industry, farm service providers, or the public). EMRS2 will be used to collect and report epidemiological data, including...
movement tracing information, locally and nationally. Again, EMRS2 is the official system of record for an FMD response.

### 4.5.4 Considerations for Size of Control Area and Minimum Sizes of Other Zones

The perimeter of the CA should be at least 10 km (~6.21 miles) beyond the perimeter of the closest IP. The size of the CA depends on the circumstances of the outbreak, including the IP transmission pathways and estimates of transmission risk, livestock movement patterns and concentrations, distribution of susceptible wildlife in proximity, natural terrain, jurisdictional boundaries, and other factors. The boundaries of the CA can be modified or redefined when tracing and other epidemiological information becomes available.

Table 4-6 provides a description of the minimum sizes of areas and zones. Table 4-7 reviews the factors used to determine the size of the CA.

<table>
<thead>
<tr>
<th>Zone or Area</th>
<th>Minimum Size and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infected Zone (IZ)</td>
<td>Perimeter should be at least 3 km (~1.86 miles) beyond perimeters of presumptive or confirmed Infected Premises. Will depend on disease agent and epidemiological circumstances. This zone may be redefined as the outbreak continues.</td>
</tr>
<tr>
<td>Buffer Zone (BZ)</td>
<td>Perimeter should be at least 7 km (~4.35 miles) beyond the perimeter of the Infected Zone. Width is generally not less than the minimum radius of the associated Infected Zone, but may be much larger. This zone may be redefined as the outbreak continues.</td>
</tr>
<tr>
<td>Control Area (CA)</td>
<td>Perimeter should be at least 10 km (~6.21 miles) beyond the perimeter of the closest Infected Premises. Please see Table 4-7 for factors that influence the size of the Control Area. This area may be redefined as the outbreak continues.</td>
</tr>
<tr>
<td>Surveillance Zone (SZ)</td>
<td>Width should be at least 10 km (~6.21 miles), but may be much larger.</td>
</tr>
</tbody>
</table>
Table 4-7. Factors to Consider in Determining Control Area Size for FMD

<table>
<thead>
<tr>
<th>Factors</th>
<th>Additional Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jurisdictional areas</td>
<td>- Effectiveness and efficiency of administration</td>
</tr>
<tr>
<td></td>
<td>- Multi-jurisdictional considerations: local, State, Tribal, and multistate</td>
</tr>
<tr>
<td>Physical boundaries</td>
<td>- Areas defined by geography</td>
</tr>
<tr>
<td></td>
<td>- Areas defined by distance between premises</td>
</tr>
<tr>
<td>FMD epidemiology</td>
<td>- Reproductive rate</td>
</tr>
<tr>
<td></td>
<td>- Incubation period</td>
</tr>
<tr>
<td></td>
<td>- Ease of transmission</td>
</tr>
<tr>
<td></td>
<td>- Infectious dose</td>
</tr>
<tr>
<td></td>
<td>- Species susceptibility</td>
</tr>
<tr>
<td></td>
<td>- Modes of transmission (fecal-oral, droplet, aerosol, vectors)</td>
</tr>
<tr>
<td></td>
<td>- Survivability in the environment</td>
</tr>
<tr>
<td></td>
<td>- Ease of diagnosis (for example, no pathognomonic signs; requires diagnostic laboratory testing)</td>
</tr>
<tr>
<td></td>
<td>- Age of lesions</td>
</tr>
<tr>
<td>Infected Premises characteristics</td>
<td>- Number of contacts</td>
</tr>
<tr>
<td></td>
<td>- Transmission pathways and transmission risk</td>
</tr>
<tr>
<td></td>
<td>- Extent of animal movement</td>
</tr>
<tr>
<td></td>
<td>- Number of animals</td>
</tr>
<tr>
<td></td>
<td>- Species of animals</td>
</tr>
<tr>
<td></td>
<td>- Age of animals</td>
</tr>
<tr>
<td></td>
<td>- Movement of traffic and personnel to and from premises (fomite spread)</td>
</tr>
<tr>
<td></td>
<td>- Biosecurity measures in place at time of outbreak</td>
</tr>
<tr>
<td>Contact Premises characteristics</td>
<td>- Number and types of premises</td>
</tr>
<tr>
<td></td>
<td>- Susceptible animal populations and population density</td>
</tr>
<tr>
<td></td>
<td>- Animal movements</td>
</tr>
<tr>
<td></td>
<td>- Movement of traffic (fomites) and personnel to and from premises (fomite spread)</td>
</tr>
<tr>
<td></td>
<td>- Biosecurity measures in place prior to outbreak</td>
</tr>
<tr>
<td>Environment</td>
<td>- Types of premises in area or region</td>
</tr>
<tr>
<td></td>
<td>- Land use in area or region</td>
</tr>
<tr>
<td></td>
<td>- Susceptible wildlife and population density</td>
</tr>
<tr>
<td></td>
<td>- Wildlife as biological or mechanical vectors</td>
</tr>
<tr>
<td>Climate (for aerosol spread diseases)</td>
<td>- Prevailing winds</td>
</tr>
<tr>
<td></td>
<td>- Humidity</td>
</tr>
</tbody>
</table>
### Table 4-7. Factors to Consider in Determining Control Area Size for FMD

<table>
<thead>
<tr>
<th>Factors</th>
<th>Additional Details</th>
</tr>
</thead>
</table>
| General area, region, or agricultural sector | - Biosecurity practices in place prior to outbreak  
                                          | Biosecurity practices implemented once outbreak detected                                                   |
| biosecurity                                  |                                                                                                             |
| Number of non-commercial or transitional     | - Types of premises, animal movements, and network of animal and fomite movements                           |
| premises                                     |                                                                                                             |
| Continuity of business (COB)                 | - COB plans and processes in place or activated at beginning of outbreak (such as surveillance, negative  |
|                                             | diagnostic tests, premises biosecurity, and risk-assessments                                               |
|                                             | - Permit processes, memorandums of understanding, and information management systems in place or activated |
|                                             | at beginning of outbreak                                                                                    |
4.6 INFORMATION MANAGEMENT

Rapidly functional, robust, and scalable information technology infrastructure is needed in an FMD outbreak. Field personnel should be provided with access to the mobile technology devices necessary for collecting, monitoring, and sharing information. The Incident Information Management and Reporting manual (FAD PReP Manual 3-0) provides details on the information systems and functionality for disease and response management, as well as training resources.

Information management and reporting during an FMD incident or outbreak ensures that responders, stakeholders, and decision-makers have access to accurate and timely critical emergency response information. Ideally, Federal, State, Tribal, and local information management systems are compatible for information and data sharing.

4.6.1 EMRS2

EMRS2 is the official system of record for animal health incidents in the United States.\(^{24}\) Having accurate premises data in EMRS2 significantly facilitates response efforts, reporting, and resource tracking.

In an FMD outbreak, the goal is to have EMRS2 data entry processes performed in 12-hour or shorter intervals. Data should be entered as quickly as possible. Data must be entered in both an accurate and consistent manner across widespread field operations: this is particularly important when there is more than one ICP. If possible, it may be necessary and/or beneficial to centralize certain data-entry

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Updated October 2020—DRAFT 4-28
Specific FMD Response Critical Activities and Tools

capabilities, particularly when field resources are stretched.

Because it is built on a Microsoft platform, EMRS2 easily interfaces with other Microsoft programs that are used frequently, such as Word and Excel; however, the user interface is quite different from those familiar products. Training prior to an incident is highly recommended for both Federal and State responders. Details may be found in the sidebar.

Having accurate premises data in EMRS2, prior to an incident, reduces errors and saves valuable time during an animal disease response. In preparation for an animal health incident, States may request that premises data is imported into EMRS2 so that information is available to APHIS in an outbreak.25

EMRS2 also offers the Customer Permit Gateway, an interactive, secure web-application, where registered producers can create a permit request for movement. For further information, see FAD PReP Manual 6-0, Permitted Movement. In addition, EMRS2GO is an app that allows authorized users to collect new premises data off-line, then upload it into EMRS2 when re-connected online.

4.7 COMMUNICATION

The APHIS EPC Emergency Communications Plan provides guidance on communications activities during an FMD outbreak, covering the responsibilities of personnel and internal and external communication procedures. APHIS LPA will serve as the primary liaison with the news media in the event of an FMD outbreak. Under the ICS, a JIC is established. During an FMD outbreak, APHIS LPA and the USDA Office of Communications will operate from the JIC. The JIC will also ensure that all State and Community Essentials

- The APHIS EPC Emergency Communications Plan is available to APHIS employees.
- APHIS public resources:
  - FMD Site
  - FAD PReP FMD Communications RRG
  - FAD PReP Manual 5-0, Partial List of FAD Stakeholders
    www.aphis.usda.gov/fadprep


Updated October 2020—DRAFT 4-29
IMT Public Information Officers (PIO) share information on their activities with each other and the JIC.

Effective communication during an FMD outbreak should be carried out and maintained by

- establishing a network of stakeholders and systems for communication prior to an incident or outbreak; briefing the media, public, industry, Congress, trading partners, and others on the FMD outbreak status and the actions being taken to control and eradicate the disease;
- coordinating with Federal, State, and local agencies, Tribal entities, producer groups, and Land Grant University based Cooperative Extension Services to ensure consistent messaging regarding animal health, public health, and food safety; and
- assuring consumers that USDA is working on animal health issues, in an informed and timely manner.

In addition, all communications should highlight the importance of sound biosecurity measures and steps that producers and owners can take to protect against FMD infection in their own livestock herds.

4.7.1 Objectives

All FMD communications must

- furnish accurate, timely, and consistent information;
- maintain credibility and instill public confidence in the government’s ability to respond to an outbreak;
- minimize public panic and fear; and
- address rumors, inaccuracies, and misperceptions as quickly as possible.

4.7.2 Key Messages

Eight key messages will be conveyed in an FMD outbreak (Box 4-3).
4.7.3 Social Media

All personnel involved in an incident—from executive leadership to field responders—must be cognizant of the impact of social media. While it can be a useful tool in disseminating information or even gathering intelligence, it can also put a spotlight on a single aspect or episode of an event that misrepresents the whole of the effort. This threatens the intended public message, as well as the safety of responders and the progress, if not the success, of the response operation.

Any Agency-initiated social media for the incident must be done thoughtfully and coordinated through the on-site PIO and LPA. Responders should not use personal social media accounts to discuss the incident.

<table>
<thead>
<tr>
<th>Key Communication Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For consumers:</strong></td>
</tr>
<tr>
<td>1.  FMD does not cause disease in humans.</td>
</tr>
<tr>
<td>2.  Meat and meat products are safe to eat.</td>
</tr>
<tr>
<td>3.  Milk and dairy products are safe to eat.</td>
</tr>
<tr>
<td>4.  We are responding quickly and decisively to eradicate the virus.</td>
</tr>
<tr>
<td>5.  Meat and meat products from vaccinated animals are safe to eat.</td>
</tr>
<tr>
<td>6.  Milk and dairy products from vaccinated animals are safe to eat.</td>
</tr>
<tr>
<td><strong>For producers:</strong></td>
</tr>
<tr>
<td>1.  Protect your herds with good biosecurity practices.</td>
</tr>
<tr>
<td>2.  Be vigilant about reporting signs of illness.</td>
</tr>
</tbody>
</table>
4.8 **Health and Safety and Personal Protective Equipment**

During an FMD outbreak, responders are exposed to many hazards, particularly in working with heavy equipment and large animals. Taking precautions to prevent adverse human health events related to emergency response efforts is important.

To ensure responders are safe and physically prepared for the rigors of their deployment assignment, it is necessary that they receive medical clearance and, depending on the causative disease agent or disinfectant used, respirator fit testing prior to deployment.

♦ Medical clearance is the overall baseline clearance of an employee’s fitness based on a medical exam. The exam, for example, may include assessing your general health, eyesight, hearing, medical history, pulmonary health, etc. It may take 90 days to obtain a medical clearance. APHIS responders should receive an Emergency Qualifications System (EQS) notice as a reminder to initiate the medical clearance process via APHIS Form 29.

♦ Fit testing is the process of confirming that employees are medically able to wear a respirator and that they have been properly fitted with the different kinds of respirators that they may need to wear. This may be done in conjunction with a medical exam, or it may be available at the incident site.

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**Safety Essentials**

- APHIS emergency response employees may need a current medical clearance, and will need to have current status of defensive driver training.
- PPE will be provided at the incident. Any extreme weather conditions should be among the considerations in the hazard assessment.
- Learn the appropriate donning and doffing procedures.
- APHIS employees must report accidents and injuries through the Online First Report Tool at the my.APHIS Portal.
- States may have specific training requirements for their response employees.
- The unified incident command may need to contract with a mental health provider which can offer services, to both State and Federal employees.
- Water can be purchased via purchase card for responders; it requires a waiver approved by MRP/AAMD.
4.8.1 Personal Protective Equipment

PPE is crucial in protecting health and safety during an FMD outbreak response effort. PPE also helps ensure response personnel are taking care to avoid transmitting FMDV to naïve premises.

PPE is fundamental in ensuring personnel are protected in the FMD response effort. All workers involved in the handling, culling, transport, or disposal of items or animals infected with FMDV must be provided with appropriate PPE. All visitors and employees, regardless of their exposure, should be provided with disposable coveralls, boots, hats, and gloves before entering a premises. Disposal of this PPE is required when leaving.

For further information, see the FAD PReP Health and Safety and Personal Protective Equipment SOP. It provides information on best practices to ensure the well-being and safety of all individuals involved in the response effort. Specific topics covered include the following:

♦ procedures to create a site-specific health and safety plan;
♦ details of hazard analysis, necessary training, and medical surveillance requirements;
♦ PPE, including Occupational Safety and Health Administration respirator fit testing;
♦ pre-deployment information and guidance; and
♦ a protocol for staff field safety in an FMD response.

4.8.2 Mental Health Concerns

The health and safety of all personnel is affected by the mental state of those involved in the FMD response effort. Therefore, preserving health and safety of those involved in a disease response effort includes addressing their mental states. APHIS employees may call the Employee Assistance Program (1-800-222-0364) at any time for help with emotional issues. Additionally, APHIS EMSSD can contract with Federal Occupational Health for onsite federal responder counseling.

FMD depopulation efforts can significantly affect the health of responders, livestock owners, and others impacted by the outbreak and response efforts. HHS has developed resources specifically for emergency and disaster responders, States and local planners, health professionals, and the general public (https://emergency.cdc.gov/coping/index.asp); additional general mental health information may be found at www.cdc.gov/mentalhealth.
4.9 BIOSECURITY

To prevent or slow the spread of FMD strict biosecurity measures need to be implemented. Some level of biosecurity procedures should already be in place at large operations; enhanced biosecurity should be implemented within 24 hours of the identification of an index FMD case. Veterinarians, owners, and anyone else in contact with enterprises that have susceptible animals need to observe biosecurity measures.

Proper biosecurity measures have two functions:
1) containing the virus on IP (biocontainment), and 2) preventing the introduction of the virus via movement of personnel and material to naïve livestock and premises (bioexclusion). During an FMD outbreak, a careful balance must be maintained between facilitating response activities and ensuring personnel do not expose naïve animals and premises to FMDV.

Further information on biosecurity is provided in the FAD PReP Biosecurity SOP, which offers guidance on how to draft a site-specific biosecurity plan and
- identifies the roles and responsibilities of key personnel,
- explains biosecurity training and briefing requirements,
- addresses site security and safety,
- discusses biosecurity practices for shipping and transportation, and
- provides a biosecurity checklist.

In addition, more information on appropriate biosecurity measures can be found in the NAHEMS Guidelines: Biosecurity.

4.9.1 Biosecurity Hazards and Mitigating Measures

Box 4-4 shows biosecurity hazards and biosecurity measures to mitigate these risks during an FMD outbreak.
Box 4-4. FMD Biosecurity Hazards and Appropriate Biosecurity Measures

<table>
<thead>
<tr>
<th>Biosecurity Hazards</th>
<th>Biosecurity Measures to Mitigate Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Movement of livestock, vehicles, equipment, and people.</td>
<td>• Clean and disinfect premises, vehicles, and equipment and dispose of materials that cannot be disinfected in an appropriate manner.</td>
</tr>
<tr>
<td>• Contaminated feed and water.</td>
<td>• Account for the movement of all livestock, other animals, and equipment for accurate records.</td>
</tr>
<tr>
<td>• Contact with infected domesticated livestock and other non-susceptible animals that can act as mechanical vectors (cats, poultry, or foxes).</td>
<td>• Provide a location for all individuals to carry out appropriate cleaning and disinfection procedures and insist that these procedures are followed.</td>
</tr>
<tr>
<td>• Contact with contaminated people, clothes, footwear, or hands.</td>
<td>• Prevent close or direct contact between herds (over a single fence line).</td>
</tr>
</tbody>
</table>

4.9.2 Closed Herds

In the event of an FMD outbreak, an important biosecurity measure is closing herds to new livestock. Box 4-5 provides guidance on employing closed herds as a critical biosecurity measure.

Box 4-5. Biosecurity for Closed Herds

**Biosecurity: Closed Herds**

- To the fullest extent possible, close the herd to the introduction of new livestock (with population increases occurring only from offspring).
- If closing a herd is not possible, isolate newly purchased livestock (from the healthiest possible sources) and those returning from existing herds for 30 days or more.
- Do not introduce vaccinated animals to naïve herds.

4.9.3 Waiting Period

Another important biosecurity measure is to ensure personnel are not traveling between IP and unknown or non-infected premises. During an FMD outbreak, it is important that personnel wait the allotted time between premises visits in addition to following appropriate biosecurity and cleaning and disinfection protocols (see **Section 4.15**). Actual waiting periods will be recommended by IC on the basis of
the outbreak circumstances, and need for personnel. Typical waiting times vary between 24 and 72 hours (for example, 72-hours was used in the United Kingdom following the 2001 FMD outbreak). Team members should not travel from IP or SP to unknown or non-infected premises. However, they may travel between IPs, if proper mitigating procedures are followed.

Extended avoidance periods for personnel may be unnecessary with stringent biosecurity practices and effective cleaning and disinfection protocols. However, until further information is available, veterinarians and other responders should adhere to the guidance provided by the local IC.

4.10 QUARANTINE AND MOVEMENT CONTROL

By restricting the movement of infected animals, animal products, and contaminated fomites, quarantine and movement control (QMC) can be a powerful tool in controlling and containing an FMD outbreak. Movement control is accomplished through a permit system that allows entities to make necessary movements without creating an unacceptable risk of disease spread. Operational staff members need to strictly adhere to movement control procedures, which are based on the best scientific information available at the time. Refer to FAD PReP Manual 6-0, Permitted Movement, for a complete treatment of that topic.

Upon report of a highly suspicious or presumptive positive case of FMD, the State or Tribal Animal Health Official will immediately issue a quarantine or hold order on the premises. (Appendix H contains an example of a State quarantine order.) The Incident Commander, Disease Surveillance Branch (Operations Section),

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and Situation Unit (Planning Section), or other appropriate personnel, will coordinate to establish an IZ and a BZ within 6 hours of the identification of an index case. These initial zone designations may be modified at any time based on new information. Refer to Section 4.5.1 for premises and zone/area terminology and definitions.

4.10.1 Movement Standstill

Controlled movement orders and 24- to 72-hour standstill notices are likely to be implemented upon detection of FMD in the United States in relevant regions or zones. A State may require a movement standstill under its own authority or at the request of USDA, or in some cases, USDA may impose a Federal quarantine or other movement control by Federal Order when requested by SAHOs or as directed by the Secretary of Agriculture. (Appendix H contains an example of a Federal Order for a movement standstill.)

A national (or regional) standstill includes stopping the sending and receiving of all live susceptible animals as well as semen and embryos from susceptible animals. The applicable geographic region may be adjusted based on the location and any known information about introduction and transmission. In general, the following concepts apply:

♦ All movements of susceptible animals that are in progress when a national/regional movement standstill is announced should continue to move to their intended destinations. Destination premises should accept all movements of susceptible animals that are in progress at the time of the national standstill notice; this should be supported by States and industry. Reverting animals or returning them to the origin poses serious animal welfare and logistical issues.

♦ Exceptions may be made for critical movements. APHIS and State officials will determine the characteristics and requirements for these movements (an example would be animals scheduled to move to slaughter within 4 hours of the movement standstill being announced). APHIS and State officials may also approve critical movements of personnel or vehicle movements in a CA or onto and off of an infected premises for delivery of feed or veterinary care, for example.

♦ A national/regional movement standstill notice does not affect movement of milk. Premises may continue moving milk to processing. All premises moving milk must implement, monitor, and enforce their premises biosecurity plans to reduce the risk of FMD introduction. States may choose to implement additional or alternative guidance for premises needing to move milk.
In the event of a movement standstill, the USDA will provide clear concise policy guidance on the implementation and provisions of, made easily accessible to all stakeholders. Specifications of issuance will at least be defined for

1. a specific geographical area or boundary (e.g., Nationwide or other);
2. a specific requirement that all live swine in transit at issuance must reach a destination;
3. a specific time indicating the duration of a standstill (e.g., 72 hours);
4. a specific list of what items are restricted from movement (e.g., live swine and germplasm); and
5. a specific list of what items are exempt from movement restrictions (e.g., negligible risk Food Safety and Inspection Service [FSIS]-inspected products).

If a Federal quarantine or standstill notice is implemented under existing USDA authorities, States may be asked to provide resources to maintain and enforce these requirements; reimbursement formulas for these activities would be established between the States and USDA via cooperative agreement.

The release of this standstill, and costs associated with it, will be weighed carefully by APHIS officials against the risk of further disease transmission from premises that are infected but not yet detected. Additional national-level guidance will be provided when the national/regional movement standstill is lifted. All premises with susceptible animals should continue to implement elevated biosecurity.

4.10.2 Moving Commodities, Animals, and Conveyances in FMD Outbreak

Any movement of commodities, animals, and conveyances brings some level of risk of FMDV transmission from a known IP or an unknown IP to non-infected premises. The risk of moving commodities, animals, and conveyances depends on the nature of the item being moved and its ability to transmit or be contaminated with FMDV. FMDV can be transmitted via items that contain biological material (such as manure), through infected animals, or via a contaminated fomite or person.

The NAHEMS Guidelines: Quarantine and Movement Control provides information on measures considered necessary to prevent the spread of FMD through movement, including 1) keeping FMD out of livestock populations in areas free of FMD and 2) preventing the spread of FMD to non-infected livestock in areas where FMD exists.
4.10.2.1 PERMIT GUIDANCE TO MOVE INTO A CONTROL AREA, WITHIN A CONTROL AREA, AND OUT OF A CONTROL AREA

Each State’s animal health emergency response plan should describe the implementation of quarantine and movement controls, including a permit system.

Because of the variation in the risk of the commodities, animals, and conveyances, it is possible that premises—particularly MP and ARP—may be permitted to move one commodity, animal, or conveyance but not another. In making the decision whether movement will be allowed, substantial consideration will be given to critical movements (for example, the movement of animal feed onto premises).

During an FMD outbreak, the following guidance in Table 4-8 (movement into a CA), Table 4-9 (movement within a CA), and Table 4-10 (movement out of a CA) will be used to issue permits in movement control efforts. The Secure Food Supply plans at www.cfsph.iastate.edu/secure-food-supply/ promote COB and provide permit guidance. For milk and milk products, see the Secure Milk Supply (SMS) Plan, http://securemilksupply.org. The Secure Pork Supply (SPS) Plan offers guidance for pork and pork products, www.securepork.org. The Secure Beef Supply (SBS) Plan is also developing COB guidance, http://securebeef.org, as is the Secure Sheep and Wool Supply (https://securesheepwool.org/).

See Section 4.16 for additional guidance for movement control of vaccinates.
Table 4-8. Movement into Control Area from Outside Control Area to Specific Premises

<table>
<thead>
<tr>
<th>Item Moving into a Control Area to a/an...</th>
<th>Infected Premises</th>
<th>Suspect Premises^</th>
<th>Contact Premises^</th>
<th>At-Risk Premises</th>
<th>Monitored Premises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptible animals</td>
<td>Prohibited, except under certain circumstances as determined by the IC, such as slaughter.</td>
<td>Prohibited, except under certain circumstances as determined by the IC, such as slaughter.</td>
<td>Prohibited, except under certain circumstances as determined by the IC, such as slaughter.</td>
<td>Permit for movement must be approved by the IC with appropriate biosecurity measures.</td>
<td>Permit for movement must be approved by the IC with appropriate biosecurity measures.</td>
</tr>
<tr>
<td>Susceptible animal products</td>
<td>See continuity of business (COB) plans for information on susceptible animal products, or guidance and processes as determined by the IC. Please see the OIE Terrestrial Code for specific guidance for inactivating FMDV.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other animals (non-susceptible livestock) from premises with susceptible species</td>
<td>Prohibited unless permit approved by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless permit approved by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless permit approved by IC and appropriate biosecurity measures.</td>
<td>Allowed with appropriate biosecurity measures. IC may require a permit for movement depending upon FMD epidemiology and characteristics of destination premises.</td>
<td>Allowed with appropriate biosecurity measures. IC may require a permit for movement depending upon FMD epidemiology and characteristics of destination premises.</td>
</tr>
</tbody>
</table>
Other animals (non-susceptible livestock) from premises without susceptible species

<table>
<thead>
<tr>
<th>Equipment, vehicles, and other fomites from premises with susceptible species</th>
<th>Allowed with appropriate biosecurity measures.</th>
<th>Allowed with appropriate biosecurity measures.</th>
<th>Allowed with appropriate biosecurity measures.</th>
<th>Allowed with appropriate biosecurity measures.</th>
<th>Allowed with appropriate biosecurity measures.</th>
</tr>
</thead>
</table>

a Movement control and permit processes will change over time depending on situational awareness and operational capabilities.

^ Contact Premises and Suspect Premises are intended to be short-term premises designations. Ideally these Premises should be re-designated before movements occur.
<table>
<thead>
<tr>
<th>Item Moving within a Control Area from a/an...</th>
<th>Infected Premises</th>
<th>Suspect Premises(^a)</th>
<th>Contact Premises(^a)</th>
<th>At-Risk Premises</th>
<th>Monitored Premises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptible animals</td>
<td>Prohibited, except under certain circumstances as determined by the IC, such as slaughter.</td>
<td>Prohibited, except under certain circumstances as determined by the IC, such as slaughter.</td>
<td>Prohibited, except under certain circumstances as determined by the IC, such as slaughter.</td>
<td>Allowed to move by permit approved by the IC; surveillance, negative diagnostic tests, premises biosecurity, and risk-assessment may be required for permit.</td>
<td>Allowed to move by permit approved by the IC; surveillance, negative diagnostic tests, premises biosecurity, and risk-assessment may be required for permit.</td>
</tr>
<tr>
<td>Susceptible animal products</td>
<td>See COB plans for information on susceptible animal products, or guidance and processes as determined by the IC. Please see the OIE Terrestrial Code for specific guidance for inactivating FMDV.</td>
<td>See COB plans for information on susceptible animal products, or guidance and processes as determined by the IC. Please see the OIE Terrestrial Code for specific guidance for inactivating FMDV.</td>
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<td>See COB plans for information on susceptible animal products, or guidance and processes as determined by the IC. Please see the OIE Terrestrial Code for specific guidance for inactivating FMDV.</td>
</tr>
<tr>
<td>Other animals (non-susceptible livestock) from premises with susceptible species</td>
<td>Prohibited unless specific permit granted by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless specific permit granted by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless specific permit granted by IC and appropriate biosecurity measures.</td>
<td>Allowed to move by permit approved by the IC; surveillance, negative diagnostic tests, premises biosecurity, and risk-assessment may be required for permit.</td>
<td>Allowed to move by permit approved by the IC; surveillance, negative diagnostic tests, premises biosecurity, and risk-assessment may be required for permit.</td>
</tr>
<tr>
<td>Other animals (non-susceptible livestock) from premises without susceptible species</td>
<td>n/a (Infected Premises have susceptible species)</td>
<td>n/a (Suspect Premises have susceptible species)</td>
<td>n/a (Contact Premises have susceptible species)</td>
<td>n/a (At-Risk Premises have susceptible species)</td>
<td>n/a (Monitored Premises have susceptible species)</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Equipment, vehicles, and other fomites from premises with susceptible species</td>
<td>Prohibited unless specific permit granted by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless specific permit granted by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless specific permit granted by IC and appropriate biosecurity measures.</td>
<td>Allowed by permit approved by IC and appropriate biosecurity measures.</td>
<td>Allowed by permit approved by IC and appropriate biosecurity measures.</td>
</tr>
<tr>
<td>Semen, embryos from susceptible animals</td>
<td>Prohibited.</td>
<td>Prohibited.</td>
<td>Prohibited.</td>
<td>Allowed by permit approved by IC and appropriate biosecurity measures.</td>
<td>Allowed by permit approved by IC and appropriate biosecurity measures.</td>
</tr>
</tbody>
</table>

a Movement control and permit processes will change over time depending on situational awareness and operational capabilities.

^ Contact Premises and Suspect Premises are intended to be short-term premises designations. Ideally these Premises should be re-designated before movements occur.
Table 4-10. Movement from Inside a Control Area to Outside a Control Area from Specific Premises

<table>
<thead>
<tr>
<th>Item Moving out of a Control Area from a/an...</th>
<th>Infected Premises</th>
<th>Suspect Premises(^a)</th>
<th>Contact Premises(^a)</th>
<th>At-Risk Premises</th>
<th>Monitored Premises*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptible animals</td>
<td>Prohibited, except under certain circumstances as determined by the IC.</td>
<td>Prohibited, except under certain circumstances as determined by the IC.</td>
<td>Prohibited, except under certain circumstances as determined by the IC.</td>
<td>At-Risk Premises must become Monitored Premises to move susceptible livestock out of a Control Area.</td>
<td>Allowed to move by permit approved by IC; surveillance, negative diagnostic tests, premises biosecurity, and risk-assessment may be required for permit.</td>
</tr>
<tr>
<td>Susceptible animal products</td>
<td>See COB plans for information on susceptible animal products, or guidance and processes as determined by the IC. Please see the OIE Terrestrial Code for specific guidance for inactivating FMDV.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other animals (non-susceptible livestock) from premises with susceptible species</td>
<td>Prohibited unless specific permit approved by IC and appropriate biosecurity measures and risk-assessment.</td>
<td>Prohibited unless specific permit approved by IC and appropriate biosecurity measures and risk-assessment.</td>
<td>Prohibited unless specific permit approved by IC and appropriate biosecurity measures and risk-assessment.</td>
<td>Allowed to move by permit approved by IC; surveillance and negative diagnostic tests for susceptible animals on premises, premises biosecurity, and risk-assessment may be required for permit.</td>
<td>Allowed to move by permit approved by IC; surveillance and negative diagnostic tests for susceptible animals on premises, premises biosecurity, and risk-assessment may be required for permit.</td>
</tr>
<tr>
<td>Other animals (non-susceptible livestock) from premises without susceptible species</td>
<td>n/a (Infected Premises have susceptible species)</td>
<td>n/a (Suspect Premises have susceptible species)</td>
<td>n/a (Contact Premises have susceptible species)</td>
<td>n/a (At-Risk Premises have susceptible species)</td>
<td>n/a (Monitored Premises have susceptible species)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Equipment, vehicles, and other fomites from premises with susceptible species</td>
<td>Prohibited unless permit approved by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless permit approved by IC and appropriate biosecurity measures.</td>
<td>Prohibited unless permit approved by IC and appropriate biosecurity measures.</td>
<td>Allowed by permit approved by IC and appropriate biosecurity measures.</td>
<td>Allowed by permit approved by IC and appropriate biosecurity measures.</td>
</tr>
<tr>
<td>Semen, embryos from susceptible animals</td>
<td>Prohibited.</td>
<td>Prohibited.</td>
<td>Prohibited.</td>
<td>At-Risk Premises must become Monitored Premises to move semen, embryos from susceptible livestock out of a Control Area.</td>
<td>Monitored Premises only allowed by permit approved by IC and appropriate biosecurity measures.</td>
</tr>
</tbody>
</table>

- Movement control and permit processes will change over time depending on situational awareness and operational capabilities.
- Contact Premises and Suspect Premises are intended to be short-term premises designations. Ideally these Premises should be re-designated before movements occur.
- Continuity of business plans may apply.
For movement of susceptible animals and susceptible animal products out of the CA to a FA, the permit process must consider national standards, any OIE standards, and conditions for such movement such as biosecurity procedures and risk assessment recommendations. In addition, commodity-specific proactive risk assessments, COB plans, movement and marketability plans, and compartmentalization plans will also be considered. Figure 4-4 illustrates movement control and permitting in relation to premises designation.

*Figure 4-4. Premises Designations in Relation to Permitting and Movement Control*
4.10.2.2 OIE TREATMENT GUIDELINES FOR FMD

The OIE Terrestrial Code provides guidance for the importation of animals, products, and commodities from FMD-infected countries or zones, as well as processes for inactivating FMDV. Specifically, Section 8.8 of the Terrestrial Code (2019) for guidance on the inactivation of FMDV in meat, wool and hair, bristles, raw hides/skins, and milk/cream, as well as other items, such as skins, trophies, and casings.

4.10.2.3 SURVEILLANCE REQUIRED FOR LIVESTOCK AND PRODUCT MOVEMENT

Surveillance measures are required for movement of livestock and animal products for premises located in the CA (IZ and BZ). These steps may include visual surveillance and/or diagnostic testing prior to movement. (Appendix F contains more information on surveillance for the movement of livestock and animal products.) See the SMS Plan for disease monitoring for dairy cattle, http://securemilksupply.org; the SPS Plan for swine, www.securepork.org; the SBS Plan for cattle, http://securebeef.org; and the Secure Sheep and Wool Supply Plan (https://securesheepwool.org).

4.10.3 Repopulation

4.10.3.1 RESTOCKING GUIDANCE

Following appropriate cleaning and disinfection procedures, IPs will remain vacant for a period of time before restocking susceptible animals onto premises. The minimum recommendation is 21 days (used by the United Kingdom in the Foot-and-Mouth Disease Order, 2006) to 28 days (two OIE incubation periods). If it is not possible to carry out full cleaning and disinfection procedures, the premises must remain vacant for a longer period of time to be determined by the IC. It is critically important that in restocking, the IC consider the likelihood of FMDV survival based on environmental conditions, the execution of cleaning and disinfection procedures, and specific circumstances of the outbreak. In some cases, previously IPs may need to remain vacant for significantly longer than 28 days.

The producer should provide a restocking plan, including details of the susceptible species, number of animals, and locations of sentinel animals. Once introduced to the previously IP, no animals may leave until all locations on that premises have been restocked and serological diagnostics are negative. Replacing the slaughtered or depopulated animals with the same species is unnecessary—any FMD susceptible species is appropriate, though the use of sheep as sentinel animals should be discouraged.
Non-susceptible species also must be restocked a minimum of 21–28 days after full cleaning and disinfection procedures, as non-susceptible species can act as mechanical vectors for FMDV. The IC has the discretion to consider the risk of non-susceptible animals and make appropriate considerations for these species.

4.10.3.2 TESTING REQUIREMENTS FOR RESTOCKING

During restocking, animals will be subject to clinical inspection every 3 days for the first 14 days (one OIE incubation period), and once per week thereafter up to 28 days (two OIE incubation periods). At 28 days after the last animals are introduced, each animal must be clinically examined by a veterinary inspector and samples tested for the presence of FMDV antibodies.

4.10.3.3 APPROVED SOURCES OF LIVESTOCK

Introduced livestock must be derived from areas not subject to quarantine and movement control measures. All livestock must test negative before introduction. A 24-hour pre-movement clinical inspection is also required. Animals must originate on and come from premises on which there has not been a confirmed case of FMD within 6.2 miles (10 kilometers) for at least 30 days.

4.11 CONTINUITY OF BUSINESS (COB)

COB is the management of non-infected premises and non-contaminated animal products in the event of an FMD outbreak. COB provides science- and risk-based approaches and systems as a critical activity in an FMD response. This helps agriculture and food industries facilitate routine business, or a return to business, during a disease response while the risk of disease spread is effectively managed. COB planning can help to minimize unintended consequences on producers and consumers impacted by FMD. During an FMD outbreak, permitting, movement control, and prioritized disruptions—all based on science and risk-based approaches—are critical measures to ensure COB. The NAHEMS Guidelines: Continuity of Business covers topics such as

- key roles and responsibilities in COB planning,
- details of developing COB plans,
- potential components required for COB planning, and
- preparedness and response goals.

The SMS Plan (http://securemilksupply.org) offers additional COB information for milk and milk products; the SPS Plan (www.securepork.org) offers additional COB information for pork and pork products, particularly applicable to interstate trade. See also the Secure Beef Supply (SBS) Plan, http://securebeef.org/.

4.12 REGIONALIZATION FOR INTERNATIONAL TRADE (FOR A U.S. FMD RESPONSE)

In the event of an FMD outbreak in the United States, international trade of animals and animal products may be adversely affected for a significant period of time. This would have serious economic implications for the affected industries and the United States. Therefore, it is important to identify, prior to an outbreak, potential procedures and plans that may mitigate the consequences and reestablish international trade as rapidly as possible.

As defined by the OIE, regionalization, also known as zoning, is the concept of separating subpopulations of animals in order to maintain a specific health status in one or more disease-free regions or zones. Disease-free regions can be created to facilitate COB and reestablish international trade from the regions demonstrated to be disease-free.

Regionalization recognizes that risk may be tied to factors that are not reflected by political boundaries of the nation or individual States, especially when the outbreak has been confined to specific areas within an individual State or group of States. Providing information to the OIE, its member countries and our trading partners, which clearly identifies the boundaries of the disease-free areas, can be used to inform our trading partners’ decisions whether to receive or reject our exports. This risk-based process, based on sound science, can mitigate the adverse economic effects of an FMD outbreak.

4.12.1 Compartmentalization

Another tool that may potentially mitigate the economic consequences of a disease outbreak is compartmentalization. Compartmentalization, which defines an animal subpopulation by management and husbandry practices related to biosecurity, could be used by veterinary authorities to demonstrate and maintain DF in certain commercial establishments whose practices have prevented the introduction of the disease. The disease-free status of these compartments could enable trade movement of animal products.

Compartmentalization has not been fully implemented by the United States for any disease agent to-date, and will depend on the recognition of the status of these compartments by international trading partners. Implementation of compartmentalization will rely on producers, industry, and State and Federal animal health authorities. By working closely together to develop and strengthen
relationships and implementing the agreed upon procedures preceding an FAD outbreak, compartmentalization may be a useful tool.

4.12.2 Further Guidance

The OIE *Terrestrial Code* offers specific guidelines for an FMD-free compartment in Chapter 8.8 (2019).

4.13 MASS DEPOPULATION AND EUTHANASIA

Depending on the FMD strategy or strategies selected, animals on an IP will be depopulated as soon as possible after declaration of an FMD outbreak. Susceptible animals on CP may also be depopulated as soon as possible after the premises are classified as CP. Mass depopulation methods that may be considered include

- gunshot,
- penetrating captive bolt,
- electrocution,
- injectable euthanasia, and
- carbon dioxide and other gas.

In an FMD outbreak, euthanasia or mass depopulation should be conducted on affected animals as safely, quickly, efficiently, and humanely as possible. In addition, the emotional and psychological impact on animal owners, caretakers, their families, and other personnel should be minimized.

Mass depopulation and euthanasia are not synonymous, and APHIS recognizes a clear distinction. Euthanasia involves transitioning an animal to death as painlessly and stress-free as possible. Mass depopulation is a method by which large numbers of animals must be destroyed quickly and efficiently with as much consideration given to the welfare of animals as practicable, given extenuating circumstances. Mass depopulation is employed in an FMD response to prevent or
mitigate the spread of FMD through the elimination of infected or potentially infected animals. The mass depopulation guidance document\textsuperscript{27} issued in 2019 from the American Veterinary Medical Association (AVMA) recognizes the need for emergency destruction of animals in disease situations, and stresses adherence to strong ethical standards throughout depopulation to ensure animals experience minimal pain and distress. In short, qualified personnel should perform mass depopulation in the event of an FMD outbreak using the safest, quickest, and most humane procedures in accordance with AVMA guidance.

Sufficiency of available personnel or materials should be assessed before an outbreak occurs. Reliance on NVS contractors is not necessarily an option, as—despite contract solicitations—it does not have the capability to deliver resources for depopulation of large animals. VS holds several captive bolt units and has a roster of trained State and Federal responders on their use. Expertise in euthanasia and mass depopulation may also be available within particular industries.

NAHEMS Guidelines: Mass Depopulation and Euthanasia contains additional information on euthanasia and mass depopulation.

4.14 DISPOSAL

Appropriate disposal of animal carcasses and materials is a critical component of a successful FMD response. FMDV can survive for long periods on both organic and inorganic materials. The FAD PReP Disposal SOP discusses how to dispose of carcasses, animal products, contaminated and potentially contaminated materials, and items that cannot be properly cleaned and disinfected (such as manure, litter, and bedding), products of the response effort (such as PPE), and products of vaccination response. Disposal will occur as soon as possible after the depopulation of animals.

Planning in advance for carcass management is strongly advised, as coordination among State and local agriculture emergency response and environmental agencies and waste authorities will be necessary for timely disposal of contaminated materials. The APHIS Carcass Management Dashboard is available (see sidebar on next page) to guide States and producers through carcass management options for planning or response purposes.

Disposal must be conducted in a manner that does not allow FMDV to spread, minimizes negative environmental effects, and conserves meat or animal protein if logistically supportable from a biosecurity standpoint. In some cases, moving

clinically normal animals to a slaughter facility within the CA may be possible, though they may have been exposed to FMDV on IP or CP. IC must permit any movement required for disposal. Local and State regulations must be observed and memorandums of understanding may need to be obtained to ensure disposal capabilities. Cost effectiveness and stakeholder acceptance must also be considered.

Disposal methods should always be assessed and applied appropriately, given the facility location, type of housing, premises characteristics, and other situational factors. IC will coordinate closely with local authorities in deciding how to dispose of carcasses and other items.

On-site burial, which has been a commonly accepted means of disposal, may be an inexpensive and biosecure method of disposal that minimizes the transportation of infected materials. However, on-site methods may be significantly limited by several factors and the potential for environmental contamination, such as topography, soil type, soil depth to bedrock, seasonal high-water table, and environmental regulations.

Other disposal methods such as composting, incineration, and rendering may also be employed, as indicated by the circumstances of the outbreak and disposal requirements. These methods may address the need to minimize negative environmental impact while also mitigating virus spread; they are also considered viable alternatives for both large and small ruminants. Please note, written verification that disposal operations are approved by the state environmental regulatory agency will be required if APHIS pays for disposal. For the disposal of syringes and unused but opened vaccine vials, disposal through routine medical waste service provider is recommended.

In the event that available personnel are insufficient for disposal requirements in an FMD outbreak, the IC can request emergency 3D contractor support from the
NVS. *NAHEMS Guidelines: Disposal* contains further guidance on preparation for disposal activities.

### 4.15 CLEANING AND DISINFECTION

Because of FMDV’s high survival rate on both organic and inorganic materials, aggressive cleaning and disinfection practices are required for control and eradication. Cleaning and disinfection are to be conducted within 48 hours of the disposal of depopulated animals. The FAD PReP Cleaning and Disinfection SOP provides information on

- the FMD cleaning and disinfection effort,
- optimal cleaning and disinfection methods for FMD,
- processes used to inactivate FMD viruses from organic materials,
- how to clean and disinfect equipment and premises after FMD detection, and
- Environmental Protection Agency (EPA)-approved disinfectants for FMDV.

Because the aerosol transmission of FMD is a concern, care should be taken to reduce the generation and dispersal of potentially infective dust and aerosolized materials during cleaning and disinfection procedures. If items cannot be cleaned and disinfected adequately, they will be disposed of using burial, incineration, or other appropriate means. All disinfectants must be EPA-approved for FMD; off-label use of disinfectants is illegal.

If available personnel or materials are insufficient for cleaning and disinfection in an FMD outbreak, the IC can request emergency 3D contractor support from NVS.

*NAHEMS Guidelines: Cleaning and Disinfection* contains additional information.
4.16 **VACCINATION**

The use of emergency vaccination in the event of FMD is discussed in Chapter 3. This section explains important additional details in the event emergency vaccination is approved for use in an FMD outbreak.

In addition to having a sufficient quantity of vaccine that can be delivered quickly, effectively implementing a vaccination strategy and plan requires other significant resources and infrastructure, including the following:

- Regulatory infrastructure (for procurement, licensing, permitting, distribution, and use).
- Logistics capabilities, including vaccination teams and cold chain management
- Animal identification (per requirements for FMD emergency vaccine use).
- Communication (strategy and messaging).
- Information management.
- Incident management system capabilities.
- Resources to continue execution other critical activities, including surveillance, biosecurity, and cleaning and disinfection.

### 4.16.1 Vaccination Plan

Limited quantities of vaccine will be available early in the response, and APHIS VS may receive requests for vaccine from multiple States. A well-defined State vaccination plan will assist decision makers in prioritizing and distributing vaccine to States that are ready and able to handle the vaccine appropriately and rapidly administer doses based on well-grounded epidemiological principles.

The State vaccine request should include an estimate of the number of vaccine doses desired in the first shipment (first two weeks), and for subsequent shipments (3 months and beyond). The projection may be made based on all
susceptible animals in the State, or of the population for which vaccine is planned, dairy cattle, for instance.

In plan development, consult Table 4-11 for assumptions used to calculate vaccine quantity needed:

*Table 4-11. Projected Vaccine Dose Need*

<table>
<thead>
<tr>
<th>Species</th>
<th>Dose</th>
<th>Booster</th>
<th>Repeat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>2 ml IM</td>
<td>-</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Feeder pigs</td>
<td>2 ml IM*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sows &amp; Boars</td>
<td>2 ml IM</td>
<td>10-14 days</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Sheep &amp; Goat</td>
<td>1 ml IM</td>
<td>-</td>
<td>6 mos.</td>
</tr>
<tr>
<td>Zoo — TBD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Feeder pigs—3 mos. immunity, to slaughter*

The vaccination plan should contain this request, as well as describe the vaccination strategy and schedule; policies for identification and movement of vaccinates; and logistics for receipt and proper administration of vaccine. See Appendix E for an example of information that should be included in a State vaccination plan.

4.16.2 Zone, Area, and Premises Designations

Vaccination strategies are presented in Chapter 3 of this document. This section provides additional detail and figures to illustrate the use of emergency vaccination in an FMD outbreak.

4.16.2.1 Containment Vaccination Zone

The CVZ is an emergency vaccination zone typically within the CA, and may include the IZ and/or the BZ. A CVZ is often observed with stamping-out modified with emergency vaccination to kill or to slaughter. Figure 4-5 shows examples of a CVZ.
4.16.2.2 PROTECTION VACCINATION ZONE

The PVZ is an emergency vaccination zone typically in the FA. It is consistent with the OIE *Terrestrial Code* (2019) definition for a Protection Zone:

A zone where specific biosecurity and sanitary measures are implemented to prevent the entry of a pathogenic agent into a free country or zone from a neighboring country or zone of a different animal health status.

Typically, a PVZ would be observed with stamping-out modified with emergency vaccination-to-live. Figure 4-6 shows examples of a PVZ.
4.16.2.3 Vaccinated Premises (VP)

VP may be a secondary designation to another premises designation and is only used if emergency vaccination is employed in an outbreak. A VP may be located in a CVZ, typically inside a CA (IZ or BZ) or in a PVZ, typically in the FA. Figure 4-7 shows VP in a CVZ (left) and in a PVZ (right).
4.16.3 Movement Restrictions for Vaccinates

If emergency vaccination is used in a response to an FMD outbreak, a vaccination plan will define procedures to prevent the spread of FMD by vaccination teams. Emergency vaccination occurs within a CVZ or a PVZ. All vaccinates will be identified with specific and permanent (tamper-proof) identification. When vaccine is used, surveillance must continue to assess vaccination effectiveness and detect any antigenic change. Movement restrictions for vaccinates are as follows:

- VP may be subject to the movement restrictions of their primary premises designation.
- Animals receiving emergency vaccination on the VP may be subject to vaccinated animal identification, traceability, and DIVA testing.
- For movement of emergency vaccinated animals, consideration must be given to any national or international standards or conditions for such movement.

4.16.4 Cessation of Vaccination

FMD emergency vaccination should cease as soon as possible to allow the region or State to return quickly to a favorable trade status. The decision to cease emergency vaccination will be made by the IC, SAHO, and VSDA/CVO, who will consider national and international standards for movement in making this determination.
4.17 LOGISTICS

The NVS provides veterinary countermeasures—supplies, equipment, vaccines, and response support services—that States, Tribes, and Territories need to respond to damaging animal disease outbreaks. Its website provides information on NVS capabilities and overviews the required steps to request countermeasures from the NVS. It also provides materials which State preparedness officials and responders can download to help them understand the NVS. This website provides:

- a planning guide for Federal, State, and local authorities;
- a template for a State NVS plan; and
- outreach and exercise programs.

In addition to physical countermeasures, the NVS maintains contracts with all-hazard response companies that are capable of supporting depopulation, disposal, and decontamination (3D) activities. 3D represents activities commonly demanding rapid deployment of response personnel and equipment. NVS contractors are trained in emergency response, and are self-sufficient with their own equipment and supplies. The contractors can deploy within 24 hours, and are capable of providing large numbers of personnel over time (weeks); however, in a widespread outbreak, personnel shortages can still occur.

4.18 WILDLIFE MANAGEMENT AND VECTOR CONTROL

USDA APHIS will work in close collaboration, communication, and coordination with DOI and other Federal, State, Tribal, and local agencies that have primary jurisdictional authority and subject matter expertise for wildlife. This collaboration, communication, and coordination will occur in both the Unified Command and MPC.

The NAHEMS Guidelines: Wildlife Management and Vector Control for an FAD Response in Domestic Livestock also discusses personnel and equipment required...
for wildlife management, quarantine and movement control for wildlife, wildlife risk assessment, wildlife surveillance, and related activities.

### 4.18.1 Wildlife Management

A wildlife management plan that addresses transmission of FMD in both captive and free-ranging wildlife will be developed as soon as possible after identification of the index case in livestock. An assessment of the risk that wildlife poses for the transmission of FMDV to susceptible livestock will be conducted in the first week of an outbreak. Assessment of the risks posed by wildlife will require information on

- density and distribution,
- social organization,
- habitat,
- contact with domestic livestock, and
- length of time wild animals could have been exposed to the virus.

If wildlife populations are determined to be infected with FMDV or otherwise pose a biological risk for transmission, appropriate wildlife management principles will be applied as needed to reduce exposure of wildlife to livestock. If wildlife populations are determined not to be infected or be a biological risk for transmission of FMDV to livestock, wildlife management tools will be implemented to keep wildlife populations from acting as mechanical vectors.

### 4.18.2 Vector Control

FMD can be transmitted mechanically by mice, vultures, and other vectors. To-date, there is no evidence that insects can biologically transmit the FMDV to susceptible animals. Appropriate biosecurity measures should be in place during an FMD outbreak to ensure that mechanical vectors do not have contact with infected herds or other infected material.

### 4.19 Animal Welfare

During an FMD outbreak, humane treatment must be provided to animals given the specific circumstances of the outbreak, particularly from the time they are identified for destruction or vaccination activities until they are depopulated, euthanized, or slaughtered, as prescribed by veterinary authorities of the affected States or Tribal nations. The FAD PReP Overview of Animal Welfare SOP available at www.aphis.usda.gov/fadprep and the AVMA mass depopulation guidance document referenced in Section 4.13 contain additional information.
4.20 **MODELING AND ASSESSMENT TOOLS**

The development of models and risk assessments are critical in a successful FMD response. These tools give decision makers valuable insight. During an outbreak, one or more multidisciplinary teams (consisting of epidemiologists, disease agent experts, economists, affected commodity experts, and others) will be established to perform risk assessments as needed.

Presently, CEAH is conducting modeling work associated with FMD control strategies for detected feedlots. A few of the initial scenarios to be evaluated follow:

- Total depopulation of feedlot with no animals moved to controlled slaughter.
- Segmented harvest: targeted animals moved to controlled slaughter.
- Selective and/or welfare depopulation followed by controlled slaughter of recovered animals.
- Vaccination followed by controlled slaughter of vaccinated animals.
- Vaccination with selective depopulation and controlled slaughter of remaining vaccinated animals.
- Controlled burn through with no depopulation of infected animals.

The FAD PReP Overview of Modeling and Assessment Tools SOP provides information on modeling and risk assessment, covering:

- Key roles and responsibilities in modeling and risk analysis,
- Uses of epidemiological models,
- Proactive risk assessments,
- Risk assessment during and after an outbreak, and
- Examples of current models and assessment tools.

4.21 **APPRAISAL AND COMPENSATION**

The AHPA gives APHIS authority to establish and implement an indemnification program to prevent or eradicate an FMD outbreak (See Section 2.2). Indemnity payments are made to encourage disease reporting, reduce the spread of animal disease, and compensate owners on the basis of fair market value. Fair market value appraisals are provided to owners of destroyed animals and materials.
The best practices for containment and eradication of FMD will in many instances require depopulation, disposal, and decontamination to be carried out faster than can be achieved with slow appraisal processes. In some circumstances, appraisals will not be required to be signed prior to destruction if APHIS and the cooperating State agree that the livestock must be destroyed immediately to mitigate the potential spread or amplification of FMDV during a response to a confirmed or presumptive FMD incident. In this case, APHIS will require that the livestock owner/producer sign an appraisal and indemnity request form, which captures basic information and confirms that the producer will accept fair market value for depopulated animals. Data required to determine fair market value will be collected prior to depopulation, including a complete inventory of livestock being destroyed and any relevant value information.

APHIS may also reimburse owners for materials that cannot be cleaned and disinfected and must be destroyed, e.g. feed. Payment processing for materials destroyed requires receipts or documents to substantiate fair market value. Incident personnel—Case Managers and Federal Reimbursement Specialists—will be available to assist owners with appraisal and compensation processes.

4.22 **FINANCE**

During an FMD outbreak, a funding source will need to be identified quickly. For responding to specific emergency situations, VS has access to a variety of sources for funding. The two most common sources are the Commodity Credit Corporation (CCC) and the APHIS Contingency Fund (CF).

### 4.22.1 Federal Funding Sources

The two most common sources are the APHIS Contingency Fund (CF) and the Commodity Credit Corporation (CCC). During an emergency, the Secretary is authorized to transfer funds from the CCC. Before APHIS can ask the Secretary to transfer funds, however, it must consider whether it can redirect funds from a budget line item or if other funding sources are available.

The APHIS CF is available for unforeseen, unpredictable program activities. The following four conditions must exist to qualify for the release of agency contingency funds:

1. The outbreak must pose an economic threat.
2. Eradication technology must be feasible and cost-effective.
3. No program or no effective program must currently exist.
4. The proposed program must have industry support.
For funds in excess of $1 million, CCC funding is typically requested. The funds are provided to APHIS as no-year funds. APHIS considers the total estimated amount of funding needed to address the issue and the degree of political support for funding before deciding whether or not to seek a CCC transfer.

The FAD PReP Overview of Finance SOP contains additional guidance on

- key roles and responsibilities in finance,
- emergency funding processes for foreign animal disease outbreaks, and
- triggering events for APHIS emergency funding.

### 4.22.2 Supplemental Cooperative Agreements

In an animal disease response, USDA APHIS will engage in supplemental or emergency cooperative agreements with States for conducting disease control measures. The following guidelines on types of reimbursements under a supplemental agreement provide details on what costs are covered during an animal health disease response.

**Staffing.** Salaries of existing State employees working on the response will not be covered by supplemental funds, but overtime worked in association with the disease event is eligible for reimbursement. Travel, housing, and per diem costs incurred by State employees responding to the event outside their normal districts are also covered. New staff brought on to assist in response activities should be term or temporary staff working directly on the response.

**Supplies.** PPE, cleaning and disinfection materials, shipping materials and costs, swabs and biological media, outreach materials, and office supplies needed to handle the response are covered by a supplemental agreement. Approval would be needed in advance for single purchases costing over $5000.

**Expenses.** A variety of other expenses may also be covered, but it is important to note that one State being reimbursed for something does not ensure that another State will be covered for the same expense.

**Communications and Information Technology.** Communication and information technology needs will be covered if they are directly related to the response and require resources beyond the normal expenses already undertaken by the cooperator. However, procurements of new IT systems or investments in major upgrades for existing State systems will not be provided. If a State needs to set up an emergency operations center, the cost of leasing and outfitting a space with the appropriate information technology equipment needed would be covered. Similarly, while APHIS will not pay the cost of cell phones or lines already in place for normal use, additional lines, phones, or usage costs associated with the outbreak would be paid for.
Additional information may be found in the FAD PReP Finance SOP available at www.aphis.usda.gov/fadprep.

4.23 INCIDENT MANAGEMENT

In any FAD outbreak, the capability to rapidly scale up the size of an IC and integrate veterinary functions and countermeasures is critical for an effective response. NRF and NIMS, already discussed in this plan, allow such scalability.

In an FMD outbreak, in particular a widespread one, national policy guidance will be distributed to NIMTs, the SAHOs of affected States, all States via NASAHO, and the APHIS FAD PReP website (www.aphis.usda.gov/fadprep).
Appendix A
FAD PReP Materials to Support FMD Response

This appendix provides a broad overview of the Foreign Animal Disease Preparedness and Response Plan (FAD PReP), and lists the FAD PReP documents that support this Foot-and-Mouth Disease (FMD) Response Plan (2019). The document list below may be useful for all stakeholders in preparedness and response planning related to FMD. The documents listed within may be found at www.aphis.usda.gov/fadprep.

(Note: Click on the image and the document will open.)
The World Organization for Animal Health (OIE) updates chapters in its *Terrestrial Animal Health Code (Terrestrial Code)* as needed on an annual basis. Planners and responders will want to refer to the OIE Code frequently. The 2019 update for foot-and-mouth disease (FMD) is available at www.oie.int and is embedded here for convenience.

(Note: Click on the image, and the complete document will open.)
Appendix C
Laboratory Network List for FMD

The list of laboratories in the National Animal Health Laboratory Network (NAHLN) embedded in this document is found here: http://www.aphis.usda.gov/animal_health/nahln/downloads/fmd_lab_list.pdf. This list was last updated in August 2020.

The following laboratories can currently perform testing for foot-and-mouth disease (FMD) virus after National Veterinary Services Laboratories (NVSL) confirmation of FMD.

(Note: Click on the image and the document will open.)

<table>
<thead>
<tr>
<th>State</th>
<th>Laboratory</th>
<th>Address</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Auburn University Veterinary Diagnostic Laboratory</td>
<td>500 Samford Road, Auburn, AL 36849-5255</td>
<td><a href="http://www.au.edu">Website</a></td>
</tr>
<tr>
<td>Arizona</td>
<td>Arizona Veterinary Diagnostic Laboratory</td>
<td>1101 N. 45th Ave, Phoenix, AZ 85003</td>
<td><a href="http://www.az.vetmed">Website</a></td>
</tr>
<tr>
<td>California</td>
<td>California Animal Health &amp; Food Safety</td>
<td>University of California, Davis 545 Hinds Hall, One Shields Ave, Davis, CA 95616</td>
<td><a href="http://www.ca.hinds.edu">Website</a></td>
</tr>
<tr>
<td>Colorado</td>
<td>Colorado State University Veterinary Diagnostic Laboratory</td>
<td>221 Old Market St, Fort Collins, CO 80521-1090</td>
<td><a href="http://www.csu.edu">Website</a></td>
</tr>
<tr>
<td>Connecticut</td>
<td>Connecticut Veterinary Medical Diagnostic Laboratory</td>
<td>333 Cedar Street, New Haven, CT 06510</td>
<td><a href="http://www.cvmi.com">Website</a></td>
</tr>
<tr>
<td>Florida</td>
<td>Florida Animal Disease Diagnostic Laboratory</td>
<td>3000 E. 13th Street, Gainesville, FL 32610</td>
<td><a href="http://www.faddl.com">Website</a></td>
</tr>
<tr>
<td>Georgia</td>
<td>Georgia Veterinary Diagnostic Laboratory</td>
<td>University of Georgia, Athens, GA 30602</td>
<td><a href="http://www.georgia.edu">Website</a></td>
</tr>
<tr>
<td>Georgia</td>
<td>University of Georgia College of Veterinary Medicine</td>
<td>Athens, GA 30602-0500</td>
<td><a href="http://www.uga.edu">Website</a></td>
</tr>
</tbody>
</table>

(Note: Click on the image and the document will open.)
Appendix D
Procedures for FMD Investigation and Specimen Submission

VS Guidance Document 12001.x provides Veterinary Services (VS) policy for the field investigation and communication of a potential Foreign Animal Disease/Emerging Disease Incident (FAD/EDI). Specific communication and operational procedures are provided in the Foreign Animal Disease Investigation Manual.

(Note: Click on the image and the document will open.)
Appendix E
Emergency Vaccine Request and Vaccination Priorities

The use of emergency vaccination to respond to a foot-and-mouth disease (FMD) outbreak within a State will be determined by the Unified Command, the State (or Tribal) Animal Health Officials (SAHO), and the APHIS VS Deputy Administrator. This guidance is intended to assist in the rapid assessment of any request(s) for FMD vaccine use that are made to the APHIS VS Deputy Administrator.

Given the highly populated nature and mobility of livestock in the United States, it is unlikely that enough FMD vaccine will be available to vaccinate all (or most) susceptible animals, even in a moderate FMD outbreak. APHIS provides general guidance for determining which premises and animal groups should be prioritized for vaccination.

(Note: Click on the image and the document will open.)

Vaccine Plan and Request

Vaccine Prioritization
Appendix F

FMD Outbreak Surveillance Guidance and Rationale

These are guidelines and example sampling schemes for foot-and-mouth disease (FMD) outbreak surveillance, prepared by the Center for Epidemiology and Animal Health, Veterinary Services (VS), Animal and Plant Health Inspection Service (APHIS). These guidelines may periodically be updated to reflect new knowledge about the epidemiology of FMD or changes in approved diagnostic tests or other response tools.

(Note: Click on the image and the document will open.)
Appendix G
Epidemiological questionnaires

Epidemiological investigation and movement tracing during an outbreak are critical in controlling and eradicating FMD. In an FMD outbreak, there are several goals, as outlined in Section 4.5 of this publication.

The templates below are epidemiological questionnaires that may be useful in planning. It is likely that any epidemiological questionnaire will need to be modified and tailored to the specific outbreak.

(Note: Click on the image and the document will open.)

Beef Epi Questionnaire

Sheep & Goat Epi Questionnaire

Swine (ASF) Epi Questionnaire
Appendix H
Movement Control Notice Examples

Upon report of a highly suspicious or presumptive positive case of FMD, the State or Tribal Animal Health Official will immediately issue a quarantine or hold order on the premises. In some cases, USDA may impose a Federal quarantine or other movement control by Federal Order. Examples of these notices are attached.

(Note: Click on the image and the document will open.)
Appendix I

FMD Vaccines and Vaccination


(Note: Click on the image and the document will open.)
Note: This appendix lists documents related to foot-and-mouth disease (FMD) response. All related FAD PReP documents listed in Appendix A, the selected references listed in Appendix F, and the resources listed in document footnotes are also references for this FMD Response Plan.
## Appendix K
### FMD Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D</td>
<td>depopulation, disposal, and decontamination</td>
</tr>
<tr>
<td>AGID</td>
<td>agar-gel immunodiffusion</td>
</tr>
<tr>
<td>AHPA</td>
<td>Animal Health Protection Act</td>
</tr>
<tr>
<td>AMT</td>
<td>APHIS Management Team</td>
</tr>
<tr>
<td>AOS</td>
<td>active observational surveillance</td>
</tr>
<tr>
<td>APHIS</td>
<td>Animal and Plant Health Inspection Service</td>
</tr>
<tr>
<td>ARMAR</td>
<td>Agriculture and Response Management and Resources</td>
</tr>
<tr>
<td>ARP</td>
<td>At-Risk Premises</td>
</tr>
<tr>
<td>AVIC</td>
<td>Area Veterinarian in Charge</td>
</tr>
<tr>
<td>AVMA</td>
<td>American Veterinary Medical Association</td>
</tr>
<tr>
<td>BZ</td>
<td>Buffer Zone</td>
</tr>
<tr>
<td>CA</td>
<td>Control Area</td>
</tr>
<tr>
<td>CCC</td>
<td>Commodity Credit Corporation</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>CEAH</td>
<td>Center for Epidemiology and Animal Health</td>
</tr>
<tr>
<td>CF</td>
<td>Contingency Fund</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CP</td>
<td>Contact Premises</td>
</tr>
<tr>
<td>CVO</td>
<td>Chief Veterinary Officer</td>
</tr>
<tr>
<td>CVZ</td>
<td>Containment Vaccination Zone</td>
</tr>
<tr>
<td>DEFRA</td>
<td>Department for Environment, Food, and Rural Affairs</td>
</tr>
<tr>
<td>DF</td>
<td>disease freedom</td>
</tr>
<tr>
<td>DHS</td>
<td>Department of Homeland Security</td>
</tr>
<tr>
<td>DIVA</td>
<td>differentiation of infected from vaccinated animals</td>
</tr>
<tr>
<td>DOI</td>
<td>Department of Interior</td>
</tr>
<tr>
<td>EITB</td>
<td>enzyme-linked immunoelectrotransfer blot</td>
</tr>
<tr>
<td>ELISA</td>
<td>enzyme-linked immunosorbent assay</td>
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<tr>
<td>EMRS2</td>
<td>Emergency Management Response System 2.0</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>EPC</td>
<td>Emergency Preparedness Committee</td>
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<tr>
<td>EQS</td>
<td>Emergency Qualifications System</td>
</tr>
<tr>
<td>EuFMD</td>
<td>European Commission for the Control of FMD</td>
</tr>
<tr>
<td>ESF</td>
<td>Emergency Support Function</td>
</tr>
<tr>
<td>FA</td>
<td>Free Area</td>
</tr>
<tr>
<td>FAD</td>
<td>foreign animal disease</td>
</tr>
<tr>
<td>FADD</td>
<td>Foreign Animal Disease Diagnostician</td>
</tr>
<tr>
<td>FADLL</td>
<td>Foreign Animal Disease Diagnostic Laboratory (also NVSL-FADDL)</td>
</tr>
<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
</tr>
<tr>
<td>FMD</td>
<td>foot-and-mouth disease</td>
</tr>
<tr>
<td>FMDV</td>
<td>foot-and-mouth disease virus</td>
</tr>
<tr>
<td>FP</td>
<td>Free Premises</td>
</tr>
<tr>
<td>FSIS</td>
<td>Food Safety and Inspection Service</td>
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<tr>
<td>GFRA</td>
<td>Global Foot-and-Mouth Disease Research Alliance</td>
</tr>
<tr>
<td>HHS</td>
<td>Department of Health and Human Services</td>
</tr>
<tr>
<td>HPD</td>
<td>high probability of disease</td>
</tr>
<tr>
<td>HTST</td>
<td>high temperature—short time pasteurization</td>
</tr>
<tr>
<td>IAHER</td>
<td>International Animal Health Emergency Reserve</td>
</tr>
<tr>
<td>IC</td>
<td>Incident Command(er)</td>
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<tr>
<td>ICG</td>
<td>Incident Coordination Group</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>---------</td>
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<tr>
<td>ICP</td>
<td>Incident Command Post</td>
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<tr>
<td>ICS</td>
<td>Incident Command System</td>
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<tr>
<td>IMT</td>
<td>Incident Management Team</td>
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<tr>
<td>IP</td>
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<tr>
<td>IZ</td>
<td>Infected Zone</td>
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<tr>
<td>JIC</td>
<td>Joint Information Center</td>
</tr>
<tr>
<td>LK</td>
<td>lamb-kidney secondary cells</td>
</tr>
<tr>
<td>LPA</td>
<td>Legislative and Public Affairs</td>
</tr>
<tr>
<td>LPAI</td>
<td>low pathogenicity avian influenza</td>
</tr>
<tr>
<td>LPBE</td>
<td>liquid phase blocking ELISA</td>
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<tr>
<td>MAC</td>
<td>Multiagency Coordination</td>
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<tr>
<td>MP</td>
<td>Monitored Premises</td>
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<tr>
<td>MPC</td>
<td>Multiprogram Committee</td>
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<tr>
<td>NAFMDVB</td>
<td>North American Foot-and-Mouth Disease Vaccine Bank</td>
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<tr>
<td>NAHEMS</td>
<td>National Animal Health Emergency Management System</td>
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<tr>
<td>NAHLN</td>
<td>National Animal Health Laboratory Network</td>
</tr>
<tr>
<td>NASAHO</td>
<td>National Assembly of State Animal Health Officials</td>
</tr>
<tr>
<td>NASDA</td>
<td>National Association of State Departments of Agriculture</td>
</tr>
<tr>
<td>NIC</td>
<td>National Incident Coordinator</td>
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<td>NIMS</td>
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<tr>
<td>NIMT</td>
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<tr>
<td>NPIC</td>
<td>National Preparedness and Incident Coordination</td>
</tr>
<tr>
<td>NRF</td>
<td>National Response Framework</td>
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<tr>
<td>NSP</td>
<td>Nonstructural protein</td>
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<tr>
<td>NVS</td>
<td>National Veterinary Stockpile</td>
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<tr>
<td>NVSL</td>
<td>National Veterinary Services Laboratories</td>
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<tr>
<td>OIE</td>
<td>World Organization for Animal Health</td>
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<tr>
<td>PCR</td>
<td>Polymerase chain reaction</td>
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<tr>
<td>PD50</td>
<td>50 percent protective dose</td>
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<tr>
<td>PIO</td>
<td>Public Information Officer</td>
</tr>
<tr>
<td>PGP</td>
<td>Percentage of protection</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal protective equipment</td>
</tr>
<tr>
<td>PPV</td>
<td>Positive predictive value</td>
</tr>
<tr>
<td>PVZ</td>
<td>Protection Vaccination Zone</td>
</tr>
<tr>
<td>QMC</td>
<td>Quarantine &amp; movement control</td>
</tr>
<tr>
<td>RNA</td>
<td>Ribonucleic acid</td>
</tr>
<tr>
<td>rRT-PCR</td>
<td>Real-time reverse transcriptase polymerase chain reaction</td>
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<tr>
<td>SAHO</td>
<td>State Animal Health Official</td>
</tr>
<tr>
<td>SAT</td>
<td>South African Territories (FMD serotypes)</td>
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<tr>
<td>SITC</td>
<td>Smuggling Interdiction and Trade Compliance</td>
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<tr>
<td>SBS</td>
<td>Secure Beef Supply</td>
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<td>SMS</td>
<td>Secure Milk Supply</td>
</tr>
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<td>SPS</td>
<td>Secure Pork Supply</td>
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<tr>
<td>SOP</td>
<td>Standard operating procedure</td>
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<tr>
<td>SP</td>
<td>Suspect Premises</td>
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<tr>
<td>SPCE</td>
<td>Solid phase competitive ELISA</td>
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<tr>
<td>SVA</td>
<td>Senecavirus A</td>
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<tr>
<td>SZ</td>
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<tr>
<td>TDD</td>
<td>Telecommunications device for the deaf</td>
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<tr>
<td>UHT</td>
<td>Ultra-high temperature</td>
</tr>
<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
</tr>
<tr>
<td>VAC</td>
<td>Vaccines antigen concentrate</td>
</tr>
<tr>
<td>VERRC</td>
<td>Voluntary Emergency Ready Response Corps</td>
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<tr>
<td>VI</td>
<td>Virus isolation</td>
</tr>
<tr>
<td>VIAA</td>
<td>Virus infection association antigen</td>
</tr>
<tr>
<td>VNT</td>
<td>Virus neutralization test</td>
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<tr>
<td>VP</td>
<td>Vaccinated Premises</td>
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<tr>
<td>VS</td>
<td>Veterinary Services</td>
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<tr>
<td>VSDA</td>
<td>VS Deputy Administrator</td>
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<tr>
<td>VSDA/CVO</td>
<td>VS Deputy Administrator / Chief Veterinary Officer</td>
</tr>
<tr>
<td>VSET</td>
<td>VS Executive Team</td>
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<tr>
<td>VZ</td>
<td>Vaccination Zone</td>
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<tr>
<td>WRLFMD</td>
<td>World Reference Laboratory for Foot-and-Mouth Disease</td>
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