DISEASE RESPONSE STRATEGY
RIFT VALLEY FEVER

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

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The Foreign Animal Disease Preparedness and Response Plan (FAD PReP)—*Disease Response Strategy: Rift Valley Fever (2013)* provides strategic guidance for responding to an animal health emergency caused by Rift Valley fever (RVF) in the United States.

This *RVF Disease Response Strategy* was last updated in **August 2013**. Please send questions or comments to:

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Contents

Disease Strategy: Rift Valley Fever

INTRODUCTION

Rift Valley fever (RVF), first reported in 1931 as an outbreak of enzootic hepatitis in the Rift Valley of Kenya, is a viral disease of domestic ruminants and is capable of causing disease in humans. In recognition of its potential to have serious consequences for agriculture as well as public health, RVF is listed as a notifiable disease by the World Organization for Animal Health (OIE). Similarly, the United States classifies RVF virus (RVFV) as a select agent and it is thus regulated by the U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services (HHS).[1]

This disease strategy is intended to provide responders with the critical information necessary to mount an effective response effort against RVF in domestic livestock in the United States. Additional resources on RVF, including in-depth reviews of RVF etiology and ecology and foreign animal disease (FAD) response information, are listed at the end of this document.

Other Foreign Animal Disease Preparedness and Response Plan (FAD PReP) documents provide further detail on incident coordination and general FAD response. The *Animal and Plant Health Inspection Service (APHIS) Foreign Animal Disease Framework: Roles and Coordination* (FAD PReP Manual 1-0) provides an introduction to APHIS FAD preparedness and response, an overview of the roles and responsibilities of different government agencies involved in an FAD response effort, as well as information on funding, incident management, and communication strategy. Additionally, an overview of FAD response strategies is available in the *APHIS Foreign Animal Disease Framework: Response Strategies* (FAD PReP Manual 2-0). These documents are available on the APHIS Intranet (http://inside.aphis.usda.gov/vs/em/fadprep.shtml, for APHIS employees). The public may access these documents at the following link: http://www.aphis.usda.gov/animal_health/emergency_management/.

NATURE OF THE DISEASE

RVFV belongs to the *Phlebovirus* genus of the *Bunyaviridae* family and is an enveloped virus with a segmented, RNA genome. Important species in the United States susceptible to RVFV infection include sheep, cattle, goats, buffalo, and

[1] Agricultural Bioterrorism Protection Act of 2002; 7 CFR Part 331 and 9 CFR Part 121.

humans. Susceptibility varies amongst species and by age as younger animals are more susceptible to disease; genotype of the virus also affects susceptibility.[2]

Currently, distribution of RVF is restricted to the African continent, Madagascar, and Arabian Peninsula. It is especially prevalent in sub-Saharan Africa with major epizootics occurring every 5–20 years. RVFV is maintained in a cyclical pattern in Africa, resulting in significant epizootics of the disease during favorable climatic conditions. Unusually heavy rainfall and localized flooding predict ideal conditions for an outbreak.[3]

Transmission

RVF is predominately a vector-borne disease. Major vectors are certain species of mosquitoes, most commonly of the *Aedes* species; *Culex, Eretmopodites, Mansonia,* and multiple other species are also considered capable vectors. The virus has also been isolated from biting midges, black flies, and ticks, though this does not conclusively implicate them as competent biological vectors. Sheep and cattle are the primary amplifying hosts of the virus. RVFV is capable of vertical transmission between generations of mosquitoes without cycling through a vertebrate host. In human infections, exposure to the virus can occur through the bite of a mosquito or more likely, through contact with infected animal tissue or blood. Mechanical transmission, aerosol exposure in the laboratory, fomites, and consumption of animal products (uncooked meat, unpasteurized milk) represent other transmission risks.[2]

Factors Influencing Transmission

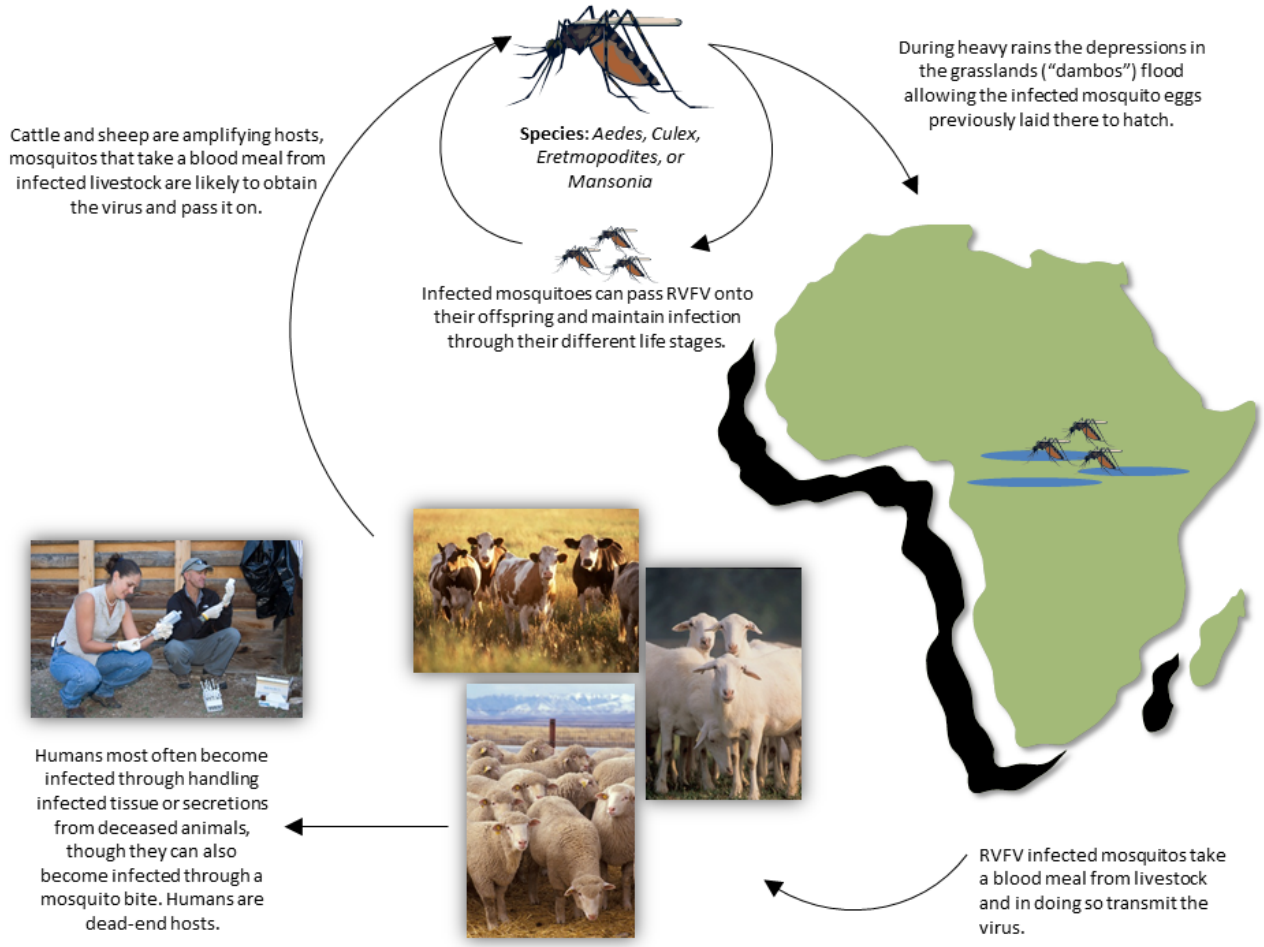
Climate and weather certainly influence the transmission patterns of RVF. In East Africa, outbreaks are significantly associated with heavy rainfall which causes natural depressions ("dambos")—where RVF infected *Aedes* mosquito eggs are laid—to flood. Flooding of the dambos causes the eggs of already infected mosquitoes to hatch and initiate an outbreak. Heavy rainfall also provides breeding sites for other mosquito species, such as *Culex, Anopheles,* and *Mansonia*. Figure 1 below, provides an overview of the transmission life cycle of RVFV.[4]

[2] United States Animal Health Association (USAHA). 2008. *Foreign Animal Diseases*. 7th Ed. Boca Raton, FL: Boca Publications Group. 369 – 375.

[3] World Organization for Animal Health (OIE). 2009. "Rift Valley Fever." *Technical Disease Card.* www.oie.int.

[4] USDA APHIS. 2011. *Rift Valley Fever SOP: Etiology and Ecology*.

Figure 1. Transmission Lifecycle of Rift Valley Fever Virus



Incubation Period

The incubation period varies from 1 to 6 days. The incubation period is 12–72 hours for newborn lambs, 24–72 hours in adult sheep, goats, and cattle, and 3–6 days in humans. For purposes of the OIE *Terrestrial Animal Health Code* (2012), the infective period (the time an animal is contagious) is 30 days.

Clinical Signs

RVF is characterized by high abortion rates and high mortality in neonates usually occurring after periods of heavy rainfall. Pathology typically finds hepatic necrosis, splenomegaly, and gastrointestinal hemorrhage.

In cattle: Calves experience fever (104–106°F/40–41°C), inappetence, weakness, depression, diarrhea, and jaundice. Adults often experience inapparent infection; clinical disease is characterized by fever lasting 24–96 hours, dry and/or dull coat,

lachrymation, nasal discharge, excessive salivation, anorexia, weakness, bloody diarrhea, low milk yield, and high abortion rates in pregnant cows.

In sheep and goats: Newborn lambs (less than 2 weeks of age) experience biphasic fever (104–106°F/ 40–41°C), anorexia, weakness, abdominal pain, rapid respiration, and death within 24–36 hours. Lambs (over 2 weeks of age), adult sheep, and goats experience fever lasting 24–96 hours, anorexia, weakness, depression, increased respiratory rate, vomiting, bloody diarrhea, mucopurulent nasal discharge, jaundice, and abortion rates approaching 100 percent.

In humans: RVF presents in humans as influenza-like syndrome characterized by fever (100–104°F, 37.8–40°C), headache, myalgia, weakness, nausea, and light sensitivity. Complications can arise and result in retinopathy, blindness, meningoencephalitis, hemorrhagic syndrome with jaundice, petechiae, and death.[6]

Morbidity and Mortality

Morbidity is highly variable, depending on host susceptibility and other factors. According to the OIE, young animals, such as lambs, kids, puppies, and kittens are considered "extremely susceptible" with mortality of 70–100 percent. Sheep and calves are considered "highly susceptible" with mortality rates between 20–70 percent. Adult cattle, goats, buffalo, and humans are considered "moderately susceptible" and mortality is typically less than 10 percent; for humans the case fatality rate is typically less than 1 percent. Equids, pigs, dogs, and cats are categorized as "resistant"—infection is inapparent.[5]

Differential Diagnosis

When considering a diagnosis of RVF in animals in the United States, the following diseases should also be included in the differential diagnosis:[6]

- anthrax,
- bacterial septicemias,
- bluetongue,
- brucellosis,
- heartwater,
- ephemeral fever,
- enterotoxemia of sheep,
- Nairobi sheep disease,
- ovine enzootic abortion,
- peste des petits ruminants,

[5] USAHA. 2008. *Foreign Animal Diseases*. 7th Ed. Boca Raton, FL: Boca Publications Group. 369 – 375.

[6] OIE, 2009, Technical Disease Card, Rift Valley Fever, www.oie.int.

- toxic plants,
- trichomonosis,
- vibriosis, and
- Wesselsbron disease.

Laboratory Diagnosis

Diagnostic testing will be performed at the National Veterinary Services Laboratories, Foreign Animal Disease Diagnostic Laboratory (NVSL FADDL) at Plum Island.[7] Because of the risk of aerosol exposure, laboratory procedures should be performed at the appropriate biosafety level (BSL-3). Veterinary practitioners involved in the collection of suspected RVF samples from infected animals should take appropriate biosecurity precautions. See the *National Animal Health Emergency Management System (NAHEMS) Guidelines: Personal Protective Equipment* for more information.

The diagnostic tests for identification of RVFV listed in the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (2012) include virus isolation, enzyme-linked immunosorbant assay (ELISA), agar gel immunodiffusion (AGID), reverse transcriptase polymerase chain reaction (RT-PCR), and immunohistochemistry. The OIE prescribes using virus neutralization (VN) for international trade due to its high specificity and the ability to test any species' sera. Antibodies are detectable in domestic ruminants 4–5 days post infection.[8]

Table 1 details what specimens should be collected for diagnostic testing at FADDL. Table 2 provides possible diagnostics that could be used at NVSL FADDL to positively identify RVFV infection and the relevant requirements for specimen shipping and testing.

Table 1. List of Specimens for Diagnostic Testing and the Appropriate Medium

Specimen	Medium
Serum	Red top tube (10 ml)
Whole blood	Green top tube (10 ml)\Purple top tube (10 ml)
Fresh tissue: liver, spleen, brain, placenta	Separate Whirl-pak® bag per tissue
Set of tissues	Formalin (10:1)

Source: Chapter 4: Diagnostic Sampling. *FAD Investigation Manual.* 2012.

[7] As of December 2012, NVSL FADDL has capacity to perform ELISA, RT-PCR, electron microscopy, and virus isolation for the identification of RVFV.

[8] OIE, Chapter 2.1.14, *Manual of Diagnostic Tests and Vaccines Terrestrial Animal*, 2008.

Table 2. Diagnostics for Identification of RVFV and Associated Requirements

Procedure	Specimens	Shipping preservative	Minimum test time (days)	Comments
Antibody ELISA	Serum	Ice pack	1	5 ml minimum
Histopathology	Fixed tissue	Formalin (10:1)	7	Complete set of tissues
Virus Isolation	Serum and blood (febrile stage) Fresh tissues (dead animals): liver, spleen, brain, placenta	Red, green, purple top tubes Separate Whirl-pak® bag per tissue	Cytopathic effect within 24 hours; 5-6 days to conclude test	

Source: Plum Island, New York (FADDL). Catalog of Services/Fees http://www.aphis.usda.gov/animal_health/lab_info_services/downloads/FADDLDiagnosticTestingCatalog.pdf.

For detailed information concerning the handling and shipping of diagnostic specimens as well as guidance on FAD investigations please see Veterinary Services (VS) Guidance Document 12001.1 (previously APHIS VS Memorandum 580.4) and the *FAD Investigation Manual*.

Treatment and Vaccination

There is no specific treatment for RVF. However, two vaccines are available and are commonly used for control of RVF in endemic countries: a live attenuated vaccine and a formalin-inactivated vaccine. The live attenuated Smithburn vaccine induces lifelong immunity in sheep and goats. The Smithburn vaccine has a potential for reversion, so it is not recommended for widespread use in non-endemic countries or during outbreaks.

The inactivated vaccine does not confer long-term immunity and thus requires booster vaccination and annual revaccination for continued protection against infection. The inactivated vaccine is recommended for use in pregnant animals and in RVF-free countries experiencing outbreaks.[9] Novel RVF vaccine research and development is being pursued by the USDA to meet the needs of the United States in the event of an RVF outbreak in this country.[10] Currently, there is no RVF vaccine available for use in the United States.

[9] Ikegami T, Makin S., 2009, "Rift Valley fever vaccines," *Vaccine*. 27: D69–D72.

[10] USDA, Agricultural Research Service. 2011. "Rift Valley fever diagnosis and vaccine development and evaluation." *2011 Annual Report.* http://www.ars.usda.gov/research/projects/projects.htm?ACCN_NO=418710&showpars=true&fy=2011

Persistence of RVFV

The OIE *Terrestrial Animal Health Code* (2012) categorizes hides, skins, wool and fiber as well as products made from them as "safe commodities" which do not require any special import or transit restrictions as related to RVF. Table 2 demonstrates RVFV resistance to physical and chemical action.

Table 3. Physical and Chemical Action against RVFV

Action	Resistance
Temperature	Virus recoverable from serum after several months at 4°C (39.2°F) or 120 minutes at 56°C (132.8°F).
pH	Resistant in alkaline environments but inactivated at pH < 6.8.
Chemicals/ Disinfectants	Inactivated by lipid solvents (i.e., ether, chloroform, sodium deoxycholate), low concentrations of formalin and by strong solutions of sodium or calcium hypochlorite (residual chlorine should exceed 5,000 ppm).
Survival	Survives in freeze dried form and aerosols at 23°C (73.4°F) and 50–85% humidity. Virus maintained in the eggs of certain arthropod vectors during inter-epidemic periods. Can survive contact with 0.5% phenol at 4°C (39.2°F) for 6 months.

2009, Technical Disease Cards, Rift Valley Fever, www.oie.int.

Criteria for Proof of Freedom

According to the OIE *Terrestrial Animal Health Code* (2012)

> A country or zone may be considered free from RVF infection when the disease is notifiable in animals through the country and either: 1) the country or zone lies outside the historically infected regions, and not adjacent to historically infections; or 2) a surveillance program as described in Article 8.11.1. has demonstrated no evidence of RVF infection in humans, animals, or mosquitoes in the country or zone during the past four years following a RVF epidemic.
>
> The provisions of the last paragraph of Article 8.11.1. may need to be complied with on a continuous basis in order to maintain freedom from infection, depending on the geographical location of the country or zone.
>
> A RVF infection free country or zone in which surveillance and monitoring has found no evidence that RVF infection is present will not lose its free status through the importation of permanently marked seropositive animals or those destined for direct slaughter.

RVF RESPONSE: CONTROL AND ERADICATION

The APHIS goals of an FAD response are to (1) detect, control, and contain the disease in animals as quickly as possible; (2) eradicate the disease using strategies that seek to stabilize animal agriculture, the food supply, and the economy, and to

protect public health and the environment; 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. They will also allow the United States to regain RVF-free status without the response effort causing more disruption and damage than the outbreak itself.

Case Definitions

The following case definitions are APHIS VS Centers for Epidemiology and Animal Health, National Surveillance Unit draft definitions for RVF (February 2011) and are currently under review.

Suspect case: An animal with clinical signs and epidemiological information consistent with RVF.

Presumptive positive case: A suspect case tests positive for RVF virus (RT-PCR, or ELISA, or VN).

Confirmed positive case: An animal from which RVF virus has been isolated and identified at the NVSL FADDL or a laboratory designated by the Secretary of Agriculture.

REPORTING

RVF is a U.S. FAD and an OIE-notifiable disease. Suspect cases should be reported to a State Animal Health Official or Assistant District Director (formerly Area Veterinarian in Charge) who will decide if the report is credible and assign a Foreign Animal Disease Diagnostician to further investigate the possibility of RVF infection. For more information on the conduct of FAD investigations please refer to VS Guidance Document 12001.1 (previously VS Memorandum 580.4) and the *FAD Investigation Manual*.

Control and Eradication Strategies

Control and eradication strategies are based on four epidemiological principles:

1. Prevent contact between RVFV and susceptible animals.
2. Stop the production of RVFV by infected or exposed animals.
3. Stop the production of RVFV by insect vectors.
4. Increase the disease resistance of susceptible animals to RVFV.

If RVF is limited to a small number of premises or animals, a stamping-out strategy (see box below) may be pursued. If it becomes apparent at any time during the outbreak that stamping-out will not achieve control, containment, and ultimately eradication of RVF, the response strategy will shift to focus on vector (primarily mosquito) control and quarantine and movement control measures.

Stamping-Out: Critical Goals

- Within 24 hours of (or as soon as possible after) a premises being classified as an Infected Premises (IP), animals will be depopulated in the quickest, safest, and most humane way possible. In some cases, animals on Contact Premises (CP) may also be depopulated as soon as possible.
- Public concerns about stamping-out require a well-planned and 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.

SURVEILLANCE

Visual and diagnostic surveillance is essential for control and eradication of RVF. The purpose of surveillance is to define the extent of the disease, detect new outbreaks, and establish disease-free zones. Surveillance activities can aid in establishing priorities in terms of control and mitigation strategies and help evaluate the efficacy of response efforts. They are also critical to maintaining continuity of business and proving disease freedom following an outbreak.

Surveillance personnel are involved in the case definition development and classification process, premises classification, and collection, assessment, and reporting of surveillance findings. Therefore, coordination between personnel conducting surveillance activities and those responsible for quarantine and movement control, biosecurity, disease reporting, and health and safety is critical for an effective response effort.

Animals on Infected, Suspect, and Monitored Premises may be monitored daily for clinical signs compatible with RVF; serum and tissue samples may undergo diagnostic testing for the presence of RVFV. Currently there is no active surveillance being conducted in the United States for RVFV.

EPIDEMIOLOGY INVESTIGATION AND TRACING

Epidemiological investigation and movement tracing during an outbreak are critical in controlling and eradicating RVF. These measures are important to get ahead of the disease and determine its origin. The epidemiological investigation involves identifying the index case, characterizing the nature of the outbreak, identifying risk factors for transmission, and developing mitigation strategies. The results of the investigation and tracing lead to identification of all IP and CP and

subsequent premises classification. Tracing identifies all movements from or onto an IP. In the case of RVF, it will be necessary to trace both animal and human movements since both can play a role in disease transmission. Public health agencies will be involved in tracing the movements of people who may have contracted RVFV.

Tracing

Trace Back: Identifying the origin of all animals, animal products, suspected contaminated fomites, people, vehicles, and possible vectors that have been imported onto an IP in order to establish the original source of infection.

Trace Forward: The tracing of all animals, people, and fomites that have left an IP and could have possibly transmitted infection to new premises. The premises that received the animals and goods should be investigated and kept under surveillance or quarantine.

Epidemiological investigations and tracing are the responsibility of two staff components within the Incident Command System (ICS): the Epidemiology Cell (Situation Unit, Planning Section) and the Tactical Epidemiology Group (Disease Surveillance Branch, Operations Section).

QUARANTINE AND MOVEMENT CONTROL

Quarantine refers to imposing restrictions on entering or leaving a premises, area, or region where disease exists or is suspected. Quarantine stops the movement of infected animals, contaminated animal products, and fomites from Infected, Contact, and Suspect Premises.

Movement control refers to activities regulating the movement of people, animals, animal products, vehicles, and equipment in an area subject to certain criteria. Movement control is accomplished through a permit system that allows entities to make necessary movements without creating an unacceptable risk of disease spread.

The first epidemiological principle, to prevent contact between RVFV and susceptible animals, can be partly accomplished through quarantine and movement control. Quarantines and movement controls are effective measures to stop the spread of RVF. In a widespread RVF outbreak, because there is no RVF vaccine currently available for use in the United States, quarantines and movement controls will be the focus of an RVF response, along with vector control.

Each State's animal health emergency response plan should describe the implementation of quarantine and movement controls, including a permit system. USDA may impose a Federal quarantine and restrict interstate commerce from the

infected States, asking the States (or adjoining countries) to provide resources to maintain and enforce the quarantine.

All decisions in regard to quarantine and movement control will be based on science-based assessments of the disease agent, routes and risk of transmission, and the interaction of other factors such as available vectors and weather.

Zone, Area, and Premises Designations

Appropriate premises designations are required for implementation of quarantine and movement control measures. The Incident Commander will work with the Disease Surveillance Branch (Operations Section) and Situation Unit (Planning Section) to establish an Infected Zone (IZ) and a Buffer Zone (BZ) within 12 hours of the identification of the index case. Once the Control Area [CA (IZ + BZ)] is established, quarantine and movement controls, including a permit system will be implemented. See Attachment A for further information on zone, area, and premises designations.

Because RVF is spread by vector, the CA is likely to be at least 30 km (18.6 miles) beyond a known IP. The CA size should consider the range of a particular species of insect, if such information is available.

VACCINATION

Depending on the circumstances of the outbreak and the availability of RVF vaccine, vaccination may be employed as an adjunct or complementary control strategy. The intent of vaccination is to increase the disease resistance of susceptible animals and to prevent further disease spread to naïve animals. Overall, the goal of vaccination is to prevent transmission of RVF to susceptible populations. For more information see the *NAHEMS Guidelines: Vaccination for Contagious Diseases.*

If the decision to vaccinate is made, the vaccine must meet the standards in the OIE *Manual of Standards for Diagnostic Tests and Vaccines.* The final decision to vaccinate will be made by the APHIS VS Deputy Administrator (U.S. Chief Veterinary Officer); however, the Vaccination Group (Disease Surveillance Branch, Operations Section) plays a major role in collecting the information on which this decision is made. The decision to vaccinate will take into account many factors such as resources available, economic feasibility, and public opinion. However, a key factor will be the ability of vaccination to reduce the rate of disease transmission among susceptible animals.

Due to the current unavailability of licensed RVF vaccine for use in the United States, it is unlikely that this strategy would be pursued.

WILDLIFE MANAGEMENT

Wildlife management is a component of any FAD outbreak response effort. Wild animals may become exposed, serve as a reservoir, or contribute to the transmission of the disease to domestic animals or humans either as biological or mechanical vectors. Furthermore, wild animals may potentially complicate efforts to establish freedom from disease. Wildlife management involves identifying susceptible wildlife species, determining how many species may be infected, and preventing the spread by implementing appropriate control measures.

VECTOR CONTROL

Vector control will be a critical issue during an RVF outbreak, and may be immediately instituted upon detection of RVF in the United States. While mosquitoes are the primary concern for transmission, consideration must be given to the potential of other insects that may come into contact with blood, urine, or other materials. Vector control should be considered if any of the following questions can be answered in the affirmative:

- Are large amounts of virus are being shed and available for potential vectors?
- Is there a high population density of potential vector species present, and are they in contact with the virus?
- Are there large populations of susceptible animals within the effective flight range of the contaminated potential vectors?

Field surveys and systematic collections of mosquitoes and other vectors may be necessary to accurately identify the potential role of arthropod vectors in spreading RVF in a given area. The general concept of mosquito control during an RVF outbreak is to reduce the mosquito population to insignificant levels as quickly as possible until the opportunity for RVFV transmission is eliminated.

In order to effectively control the mosquito population and threat of RVF transmission, both mosquito larvae and adults will need to be controlled. For further information on the Environmental Protection Agency (EPA) registered insecticides for mosquitoes, please see the following:

- For larvacides: http://www.epa.gov/mosquitocontrol/Larvicides.html
- For adulticides: http://www.epa.gov/mosquitocontrol/Adulticides.html
- For misting systems: http://www.epa.gov/pesticides/factsheets/misting_systems.htm.

State and local laws and regulations for vector-control and insecticide use, including any relevant environmental regulations, must be considered in any

vector control efforts. In addition, personal protection measures should be adhered to when using insecticides of any type.

In the United States, controlling insect vectors is primarily left to the discretion of county or municipal governments; public health departments typically take the lead on vector control issues. The following resources cover the public health aspect of vector control:

- The Centers for Disease Control and Prevention: http://www.cdc.gov/nceh/ehs/ETP/vector.htm
- The World Health Organization guide on "Pesticides and their Applications": http://whqlibdoc.who.int/hq/2006/WHO_CDS_NTD_WHOPES_GCDPP_2006.1_eng.pdf
- Center for Food Security and Public Health (English and Spanish): http://www.cfsph.iastate.edu/Infection_Control/route-specific-information-for-producers.php.

HEALTH & SAFETY AND PERSONAL PROTECTIVE EQUIPMENT

Because RVF is zoonotic and a threat to public health, it is important that appropriate precautions are taken against contracting RVF during a response effort. Typically, humans can be infected through the handling of animal tissue; RVFV can also be aerosolized during slaughter or necropsy procedures, resulting in aerosol-based RVF infection in laboratory workers (World Health Organization, 2010).

Upon confirmation of RVF, public health authorities should implement appropriate public health measures, including surveillance, prevention, and case management (as required). APHIS will work closely with public health authorities in a response.

Personal protective equipment (PPE) is fundamental to ensure personnel are protected from RVF as well as other hazards during a response. Disposable or reusable outerwear may be acceptable, and all workers involved in the depopulation, transport, or disposal of RVF-infected animals must be provided with appropriate PPE. This PPE must be appropriately disposed of and/or cleaned and disinfected when leaving an IP.

Responders may also be exposed to other health hazards; prevention of adverse human health events related to emergency response efforts is important. For further information, please see the *NAHEMS Guidelines: Health and Safety* and *NAHEMS Guidelines: Personal Protective Equipment.*

EUTHANASIA/MASS DEPOPULATION

USDA APHIS personnel, in coordination with Incident Command, make the final decision on whether to euthanize or depopulate animals. In an RVF outbreak, euthanasia or mass depopulation should be provided to the affected animals as safely, quickly, efficiently, and humanely as possible. In addition, the emotional and psychological impact on owners, caretakers, their families, and other personnel should be minimized. The method of depopulation will depend on animal considerations, facility characteristics, method characteristics (practicality, reliability, irreversibility, compatibility), personnel considerations, carcass considerations, equipment considerations, and the environment where the animals are maintained.

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

DISPOSAL

Proper disposal of animal carcasses and materials (e.g., bedding, feed) is important to prevent or mitigate pathogen spread. The goal is to conduct disposal operations in a timely, safe, biosecure, aesthetically acceptable, and environmentally responsible manner. Wastes requiring disposal in an RVF outbreak include carcasses, animal products, contaminated manure, litter, bedding, contaminated feed, contaminated personal protective equipment, contaminated materials, and equipment that cannot be cleaned and disinfected.

Disposal will involve multiple Federal agencies due to its wider reaching impact on health and the environment. USDA will coordinate with other federal entities, as well as State and local stakeholders, to develop disposal procedures in accordance with Federal, State, and local regulations.

More information and disposal resources are provided in the *NAHEMS Guidelines: Disposal*.

CLEANING AND DISINFECTION

The goal of cleaning and disinfection (C&D) is to inactivate pathogens and prevent further spread of RVFV. When performing C&D procedures, it is vitally important to do so in the safest manner possible. When planning for C&D, consider the following: the area to be cleaned and disinfected, C&D methods, personnel, regulatory permits, and materials, supplies, and equipment needed. The plan should also include the scientific rationale for C&D parameters, the process by which the premises will be certified and recorded as successfully cleaned and disinfected, protocols for C&D, and procedures for handling damaged private property due to activities.

There are various methods of C&D that may be applied to a site. Examples include steam cleaning, pressure washing, or scrubbing by hand; shoveling, vacuuming, or sweeping out bulk materials; chemical disinfection, and physical (heat, ultraviolet light, or desiccation) methods. See Table 2 for OIE guidance on physical and chemical action against RVFV. Currently, there are no EPA registered products for use against RVFV. C&D protocols, procedures, and methods, along with safety issues and precautions are more thoroughly discussed in the *NAHEMS Guidelines: Cleaning and Disinfection*.

APPRAISAL AND COMPENSATION

Appraisal and compensation for assets lost during a disease response effort reduce the spread of disease by encouraging owners to report suspected disease. USDA is authorized by the Animal Health Protection Act (7 U.S.C. 8301 et seq.) to pay claims to owners for any assets taken or destroyed in the course of a response effort. Title 9 of the Code of Federal Regulations (CFR) Part 53 outlines the expenses that the Department may pay for purchasing, destroying, and disposing of animals and materials in these situations. Fair market value appraisals will be made for animals and materials destroyed to prevent the spread of RVF. Please refer to the APHIS Livestock Appraisal, Indemnity, and Compensation website for further information.

REFERENCES AND RESOURCES

APHIS-USDA. *Rift Valley Fever SOP: Etiology and Ecology.*

APHIS-USDA. 2011. *NAHEMS Guidelines: Cleaning and Disinfection.* http://www.aphis.usda.gov/animal_health/emergency_management/.

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Attachment A Zone, Area, and Premises Designations for Rift Valley Fever

Table A-1 and A-2 contain a summary of the zone, area, and premises designations; Figure A-1 illustrates these designations. For more information please refer to the *APHIS Foreign Animal Disease Framework: Response Strategies* (FAD PReP Manual 2-0) at http://inside.aphis.usda.gov/vs/em/fadprep.shtml (for APHIS employees), or http://www.aphis.usda.gov/animal_health/emergency_management/ (publicly available).

Table A-1. Summary of Premises Designations

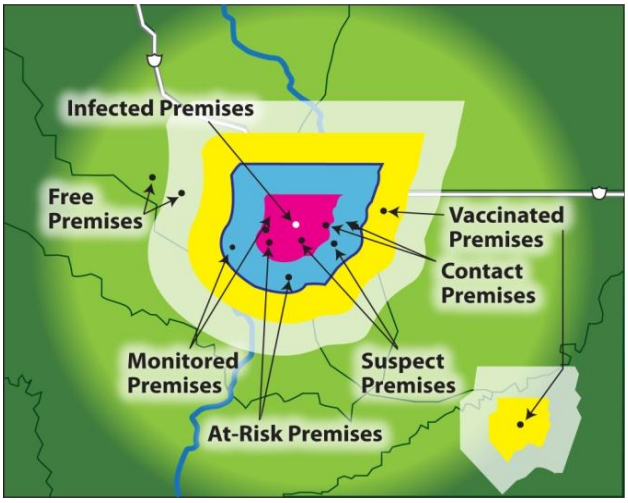
Premises	Definition	Zone
Infected Premises (IP)	Premises where a presumptive positive case or confirmed positive case exists based on laboratory results, compatible clinical signs, case definition, and international standards.	Infected Zone
Contact Premises (CP)	Premises with susceptible swine that may have been exposed to RVF, either directly or indirectly, including but not limited to animals, arthropod vectors, or potential reservoir hosts from Infected Premises.	Infected Zone, Buffer Zone
Suspect Premises (SP)	Premises under investigation due to the presence of animals reported to have clinical signs compatible with RVF. This is intended to be a short-term premises designation.	Infected Zone, Buffer Zone, Surveillance Zone, Vaccination Zone
At-Risk Premises (ARP)	Premises with susceptible animals, but none of those susceptible animals have clinical signs compatible with RVF. Premises objectively demonstrates that it is not an Infected Premises, Contact Premises, or Suspect Premises. At-Risk Premises seek to move susceptible animals within the Control Area by permit. Only At-Risk Premises are eligible to become Monitored Premises.	Infected Zone, Buffer Zone
Monitored Premises (MP)	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.	Infected Zone, Buffer Zone
Free Premises (FP)	Premises outside of a Control Area and not a Contact or Suspect Premises.	Surveillance Zone, Free Area
Vaccinated Premises (VP)	Premises where emergency vaccination has been performed. This may be a secondary premises designation.	Containment Vaccination Zone, Protection Vaccination Zone

Table A-2. Summary of Zone and Area Designations

Zone/Area	Definition
Infected Zone (IZ)	Zone that immediately surrounds an Infected Premises.
Buffer Zone (BZ)	Zone that immediately surrounds an Infected Zone or a Contact Premises.
Control Area (CA)	Consists of an Infected Zone and a Buffer Zone.
Surveillance Zone (SZ)	Zone outside and along the border of a Control Area.
Free Area (FA)	Area not included in any Control Area.
Vaccination Zone (VZ)	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.

Figure A-1. Example Premises, Zones, and Areas

Premises



Zones and Areas

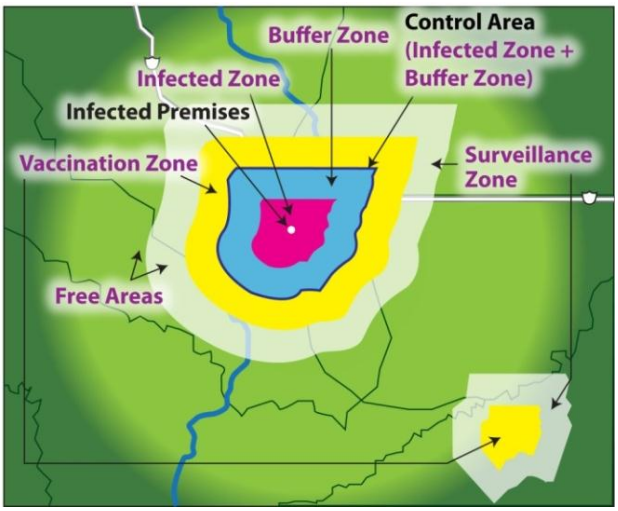


Table A-3 lists the minimum sizes of zones and areas during vector-borne outbreaks (spread by mosquitoes).

Table A-3. Minimum Sizes of Zones and Areas for Mosquito-Borne Disease

Zone or area	Minimum size and details
Infected Zone (IZ)	◆ Perimeter should be at least 10 km (~6.2 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.
Buffer Zone (BZ)	◆ Perimeter should be at least 20 km (~12.4 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.
Control Area (CA)	◆ Perimeter should be at least 30 km (~18.6 miles) beyond the perimeter of the closest Infected Premises. Please see Table 3-1 in *FAD PReP Manual 2-0* for factors to consider in determining the size of a Control Area. This area may be redefined as the outbreak continues.
Surveillance Zone (SZ)	◆ Width should be at least 20 km (~12.4 miles) but may be larger depending on the known geographic range of vector.

Attachment B Abbreviations

AGID	agar gel immunodiffusion
APHIS	Animal and Plant Health Inspection Service
BSL	biosafety level
BZ	Buffer Zone
C&D	cleaning and disinfection
CA	Control Area
CFR	Code of Federal Regulations
CP	Contact Premises
ELISA	enzyme-linked immunosorbent assay
EPA	Environmental Protection Agency
FAD	foreign animal disease
FAD PReP	Foreign Animal Disease Preparedness and Response Plan
FADDL	Foreign Animal Disease Diagnostic Laboratory
HHS	Department of Health and Human Services
ICS	Incident Command System
IP	Infected Premises
IZ	Infected Zone
NAHEMS	National Animal Health Emergency Management System
NVSL	National Veterinary Services Laboratories
OIE	World Organization for Animal Health
PPE	personal protective equipment
RNA	ribonucleic acid
RT-PCR	reverse transcriptase polymerase chain reaction
RVF	Rift Valley fever
RVFV	Rift Valley fever virus
SOP	standard operating procedure
TDD	telecommunications device for the deaf
USDA	U.S. Department of Agriculture
VN	virus neutralization

VS	Veterinary Services
WHO	World Health Organization