The information provided in this guide is offered *only* as guidance. Any outbreak response will depend on the circumstances surrounding the outbreak, including but not limited to outbreak epidemiology, diagnostic capacity and capability, response strategies, social and political issues, and resources. The approach may shift as the outbreak progresses and new information becomes available. During an outbreak, responders need to adhere to the guidance provided by Incident Command. For more information on surveillance in an FMD outbreak, please see the FMD Surveillance Standard Operating Procedure (SOP) and the National Animal Health Emergency Management System Guidelines: Surveillance, Epidemiology, and Tracing.

Purpose

The purpose of these guidelines is to provide recommendations for surveillance activities in an FMD outbreak in domestic livestock. These are sample guidelines that will be adapted during an outbreak using the most current scientific information and best practice guidance available.

Objectives

The objectives of FMD outbreak surveillance:

- Detect FMD Infected Premises during an outbreak.
- Determine the size and extent of an FMD outbreak.
- Supply information to evaluate outbreak control activities.
- Provide information for animal and product movement within Control Area(s).
- Prove that Control Area(s) are free of disease.
- Prove disease-freedom to regain FMD-free status after eradication of the outbreak.

Definitions

Clinically ill animals: Animals with signs of illness compatible with FMD.

Detection probability: Likelihood that the sampling scheme will detect at least one infected animal in each premises or epidemiological unit with 95 percent confidence at the selected design prevalence, population size, and sensitivity of the chosen validated test.

General Considerations in Choosing a Design Prevalence for the Surveillance Sampling Scheme

- Outbreak or disease related factors:
  - Prevalence
  - Incubation period
  - Transmission and generation
  - Ease of recognition
  - Time
  - Herd size
  - Density of premises.
- Surveillance plan factors:
  - Resources
  - Diagnostics
  - Detection time
  - Test sensitivity and specificity
  - Frequency
  - Goal of surveillance
  - Confidence level.

Factors that Influence Diagnostic Test Choice

- Resources
- FMD prevalence
- Test characteristics (speed, sensitivity, specificity, frequency).

Interaction of Disease/Outbreak and Surveillance Factors, with Suggested Adaptations in Surveillance Scheme

Disease/ Outbreak Factor	Surveillance Factors						
	Design prevalence	**Sampling frequency**	**Visual/ observational exam (lower sensitivity test)**	**Animal handling**	**Test sensitivity**	**Early detection**	**Tissue testing (higher sensitivity test)**
Shorter incubation period	Increase	Increase	Use, depending on strength of clinical signs	Decrease	Less important	Increased likelihood	Less important
Strong clinical signs	Increase	Depends	Use	Decrease	Less important	Increased likelihood	Less important
Size of epidemiological unit	Decrease	Frequent	Depends	Depends	More important	Depends	More important
Increased prevalence	Decrease	Less frequent	Depends	Depends	Less important	Depends	Less important

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Estimated Incubation Period Based on Field Information for FMD		
Incubation Period	Frequency of Sampling (days between sampling)	
	Minimum (days)	Maximum (days)
1 to 2 Days	1	1
3 to 4 Days	2	3
5 to 7 Days	4	6
8 to 14 Days	7	10
> 14 Days	10	

For more information, please go to
http://www.aphis.usda.gov/animal_health/emergency_management/
or
http://inside.aphis.usda.gov/vs/em/fadprep.shtml
(for APHIS employees).

For the Veterinary Services Outbreak Surveillance Toolbox from the National Surveillance Unit, please email National.Surveillance.Unit@aphis.usda.gov.

Surveillance Objectives 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.

1. **The initial 72 hours post outbreak FMD declaration.** The objective is to detect existing infected animals and premises as quickly as possible. Incident Command should have three goals during this period.
   - A. Create the initial Buffer Zone designation and the boundary of the Control Area(s).
   - B. Create a list of premises with susceptible herds (and species) in the Control Area(s).
   - C. Determine the boundary of the Surveillance Zone and start developing a surveillance plan to be used in this zone.
2. **The control and eradication period (from initial 72-hours until last case is detected and eradicated).** Incident Command should have four goals during this period.
   - A. Detect Infected Premises, new and existing, so that control measures can be put in place.
   - B. Provide evidence that premises are free of FMD, thereby permitting animal and product movements in the Control Area(s).
   - C. Evaluate the outbreak management control activities.
   - D. Provide evidence that the Free Area is free of disease thereby enabling unrestricted animal and animal product movement.
3. **Post-eradication.** Using World Organization for Animal Health (OIE) recommendations and surveillance requirements, the objective is to prove disease-freedom in the Control Area(s) and Free Area. Incident Command should have three goals during this period.
   - A. Prove disease-freedom on depopulated premises.
   - B. Prove disease-freedom on At-Risk Premises in the Control Area(s) by random sampling or targeted sampling (choosing populations based on risk) on selected premises and selected herds.
   - C. Prove disease-freedom in the Free Area, following OIE guidelines.

Diagnostics

It is critically important that all surveillance planning is fully integrated with current diagnostic sample collection, sample testing, surge capacity, and reporting capabilities. In the event of an FMD outbreak, confirmation of FMD on any premises not currently in an FMD Control Area will be completed by the Foreign Animal Disease Diagnostic Laboratory of the National Veterinary Services Laboratories (NVSL). After this confirmation of FMD on a premises, subsequent swab samples may be sent to USDA-approved laboratories which are part of the National Animal Health Laboratory Network. Incident Command 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 from outside an established Control Area will be tested and confirmed by NVSL, and (3) NVSL will receive samples routinely from inside the Control Area(s) to monitor for changes in the FMDV.

Disease Detection

FMD Outbreak Response

Sampling	Commercial			Noncommercial		
	Infected Zone	**Buffer Zone**	**Surveillance Zone[a]**	**Infected Zone**	**Buffer Zone**	**Surveillance Zone[a]**
Number of Premises	Census	Census	1% Prevalence Threshold[b]	Census	Census	1% Prevalence Threshold[b]
Unit	Individual Animal Sample	Individual Animal Sample	Individual Animal Sample	Observation or Individual Animal Sample[c]	Observation or Individual Animal Sample[c]	Observation or Individual Animal Sample[c]
Frequency						
Free Premises	—	—	21 Days	—	—	21 Days
Monitored Premises	Every 5th Day for 28 Days		—	Every 5th Day for 28 Days		—
At-Risk Premises	7 Days	7 Days	—	7 Days	7 Days	—
Contact and Suspect Premises[a]	Every 5th Day for 28 Days		—	Every 5th Day for 28 Days		—
Product Movement	Daily evaluation for daily product movement; evaluation each day, 3 days prior for non-daily movement.			Daily evaluation for daily product movement; evaluation each day, 3 days prior for non-daily movement.		

[a] Suspect Premises in a Surveillance Zone will be subject to surveillance procedures and diagnostic testing as indicated by relevant authorities.

[b] Prevalence threshold is a predetermined proportion of Infected Premises (for example, 5 percent) used to calculate the number of premises to be sampled at a specific confidence level (for example, 95 percent) in a population of a given size (for example, 1,000 premises) based on detecting at least one Infected Premises.

[c] Types of sample depend on available tests. Observational sampling followed 3ABC enzyme-linked immunosorbent assay (ELISA).

Proof of Disease Freedom[a]

FMD Outbreak Response

Sampling[e]	Commercial			Noncommercial		
	Infected Zone[b]	**Buffer Zone[b]**	**Surveillance Zone[b]**	**Infected Zone[b]**	**Buffer Zone[b]**	**Surveillance Zone[b]**
Number of Samples per Premises	5% Prevalence Threshold[c]	5% Prevalence Threshold[c]	5% Prevalence Threshold[c]	1% Prevalence Threshold[c]	1% Prevalence Threshold[c]	1% Prevalence Threshold[c]
Number of Premises	1% Prevalence Threshold[d]	1% Prevalence Threshold[d]	1% Prevalence Threshold[d]	1% Prevalence Threshold[d]	1% Prevalence Threshold[d]	1% Prevalence Threshold[d]
Frequency	Sample each premises of the calculated number of premises once during a 3-month period.					

[a] Sero-surveillance conducted in the area to be proved disease free in addition to any other animal sampling.

[b] Infected, Buffer, and Surveillance Zones combine as one unit for proof of disease freedom.

[c] Number of animals sero-sampled based on 5 percent prevalence in herd at the 95 percent confidence level where the maximum number of animals sampled per epidemiological unit does not exceed 60 animals.

[d] Prevalence threshold is a predetermined proportion of Infected Premises (for example, 5 percent) used to calculate the number of premises to be sampled at a specific confidence level (for example, 95 percent) in a population of a given size (for example, 1,000 premises) based on detecting at least one Infected Premises. A census of the premises in a zone will be sampled if there are few premises. Sample premises in order as by epidemiological investigation and continuity of business requirements.

[e] Sampling unit used in all surveillance schemes: Individual animal observation, appropriate individual animal sample or, if available, mass population sampling techniques (for example, bulk tank).