National Pseudorabies Surveillance Plan
Final Draft

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Table of Contents

Introductory Information

1.1 Disease Description

Pseudorabies virus (PRV), also known as Aujeszky's disease, emerged as an economically important disease of swine in the late 1960s. Over the ensuing years, this herpesvirus spread throughout the major swine production areas of the United States [1].

Pigs are the primary host and reservoir of PRV, making them the principal source of infection for a diverse range of secondary hosts such as cattle, sheep, goats, dogs, cats, rats, and mice. Horses, birds, and humans are considered resistant to PRV infection[1]. Non-swine species infected with PRV often experience an intense pruritis at the site of virus entry, which led to the disease being called “mad itch” in infected non-porcine species. Death usually occurs within 48 hours of onset of clinical signs in non-swine species. Sometimes, the only sign noticed is sudden death.

Etiology

The pseudorabies virus (PRV) is a herpesvirus of the *Alphaviridae* subfamily. PRV is a relatively stable enveloped DNA virus. PRV environmental survivability is considered low. PRV can survive for a short time in cool moist environments with a pH between 6 and 8. Drying and sunlight almost immediately inactivate the virus.

Clinical Signs

Clinical signs in swine relate to the animal’s age and the strain of the infecting virus. Neonatal pigs are highly susceptible and often show clinical signs. Clinical signs associated with PRV include respiratory and central nervous system (CNS) disorders. Young piglets may exhibit listlessness, decreased appetites, and pyrexia. However, central nervous disorders are the predominant clinical signs in young piglets including dog sitting, circling, paddling, incoordination, ataxia, and hypersalivation. Young animals showing severe nervous disorders usually die within 24 hours with mortality in neonatal piglets usually approaching 100 percent.

Clinical symptoms are age-dependent. While death is often observed in young animals, grow-finish and market animals tend to survive and may only exhibit respiratory signs. Morbidity in grow-finish swine may reach 100 percent. In severe cases, respiratory illness demonstrated by sneezing, nasal discharges, coughing, and labored breathing is observed. These animals tend to be febrile with a decreased appetite.

Sows and boars infected during adulthood develop respiratory illness and anorexia similar to grow-finish hogs. However, if the animals are pregnant, depending on the stage of

pregnancy, the animals may experience fetus absorption, mummification, abortion, stillbirth, or birth of weak piglets that often die shortly after birth. [1]

Epidemiology

PRV will persist in a latent form for the lifetime of the infected animal. Trigeminal ganglia, olfactory bulbs, the medulla, brain stem, lungs, lymph nodes, and spinal cord are tissues most apt to contain latent virus. At times of stress such as parturition, the virus may be reactivated and shed. These swine may also experience mild clinical signs termed recrudescence. When PRV is present in herds, virus latency and subsequent reactivation are important when studying the spread of the virus between farms or between groups of swine located on the same premises.

PRV spread occurs through various routes. Those routes include:

- Direct contact
    - Nose to nose contact [2]
    - Venereal contact including infected semen [2, 3]
- Indirect transmission
    - Inhalation of droplets propelled short distances
    - Inhalation of aerosolized virus (dried droplet nuclei) over longer distances (airborne transmission of over 2-km distance has been demonstrated) [4]
    - Inanimate objects and fomites [5]
        - People
        - Vehicles, equipment, etc.

PRV virus maintains a venereal cycle in feral swine. Sexual contact by PRV-infected feral boars with susceptible females is presumed to be the primary means of PRV transmission among such swine[3]. However, nose-to-nose or droplet transmission cannot be ruled out. The potential exposure of domestic swine from feral swine is thought to occur by these routes. Exposure may occur via contact through open barriers or through outright co-mingling of domestic pigs with feral pigs. Free-roaming feral swine are currently found in at least 34 States [6].

Diagnosis

In postmortem examination, gross lesions are often absent, complicating diagnosis of pseudorabies [1]. Possible observed lesions include necrotic tonsillitis, tracheal lesions, mild rhinitis and small focal areas of pulmonary necrosis and edema. Tiny white areas of necrosis are sometimes noted in the liver of affected swine. When gross lesions are present, they aid in diagnosis when combined with herd history, clinical signs, and diagnostic serology.

The incubation period for PRV is approximately 2-5 days. Excretion of virus starts prior to the onset of clinical signs. Virus isolation techniques can detect infection in acutely infected animals with isolation possible from nasal or oropharyngeal swabs for 8-25 days from

inception of infection. In convalescent pigs, the virus persists as a latent infection of trigeminal ganglia and other nervous tissue for life. Isolation of the virus from the trigeminal ganglia is possible but difficult.

Surviving swine will produce a detectable antibody response within 6-10 days post infection [7]. Furthermore, antibody titers persist for the life of the animal. Antibody detection assays are highly sensitive and specific, making serology the diagnostic method of choice for recovered swine.

Other PRV-Related Information

During the mid-1970s, U.S. swine industry leadership sought government assistance to eradicate PRV infection. Beginning in 1989, a State-Federal-industry cooperative program was launched to eradicate PRV from all domestic swine [8]. It was scheduled for completion by 2000. PRV-infected herds were discovered via PRV tissue isolation from clinically ill swine and serological statistical sampling of herds. Serological testing of herds included on-farm testing and testing at first points of concentration (sow-boar abattoirs). Upon detection, newly infected herds were epidemiologically investigated. Neighboring herds within close proximity were also serologically tested (circle testing). Movement of swine from infected herds was restricted. Individualized herd cleanup plans were later developed, using test and removal, vaccination, offspring segregation, or depopulation protocols to eliminate infected animals.

In 2004, all 50 States attained pseudorabies-free status in commercial production swine herds [9]. Commercial production swine herds are defined as those swine herds that are continuously managed and have adequate facilities and practices to prevent exposure to either transitional production or feral swine. Feral swine are defined as those swine that are free-roaming. Transitional production swine are defined as captive feral swine or swine that have reasonable opportunities to be exposed to feral swine [10]. Feral swine remain the primary potential source for introducing PRV in commercial production swine herds.

1.2 Purpose and Rationale for Surveillance

PRV surveillance has been exclusively based on cull sow-boar slaughter surveillance serology testing since the inception of the eradication program. Surveillance sampling was set by program standards at an annual level of 5-10 percent of each State's breeding animal population, depending on stage of program progress. This high level of sampling was designed to find infected herds for epidemiological investigation and cleanup. The surveillance system worked as designed. PRV infection was eliminated from commercial swine herds in the United States.

The U.S. pork industry supports an estimated 550,200 domestic jobs, generates more than $97.4 billion annually in total U.S. economic activity, and contributes $34.5 billion to the

U.S. gross national product. In 2006, the United States exported 1,262,499 metric tons of pork valued at $2.864 billion[11]. Pork exports depend directly upon open and transparent disclosure of the commercial segment's disease status to all trading partners.

PRV was formerly an economically important swine viral disease. PRV-infected herds earned an average of $6/cwt less than non-infected herds when the disease was prevalent. The United States Department of Agriculture (USDA) eradication program expenditures are estimated at approximately $200 million. However, consumers gained approximately $336.5 million due to lower retail prices and producers gained over $35 million from the PRV eradication program[12].

1.3 Surveillance Objectives: Principal Uses of Data for Decisionmaking

This surveillance plan has two main objectives and one minor objective. These objectives are:

- Objective I- Rapidly detect PRV in cases of entry and infection in a commercial herd.
- Objective II- Demonstrate freedom from PRV in U.S. commercial herds.
- Objective III – Monitor the risk of introduction of PRV into U.S. commercial swine.
    - Monitoring the feral swine reservoir
        - The distribution and numbers of the feral swine in the United States.
        - The monitoring of feral swine for presence of PRV.
    - Routine summary of number and distribution of swine hunting preserves.
    - Monitoring international PRV status.

The purpose of objective I is to rapidly identify an infected herd. Consultations with industry led to a detection target for finding PRV at the level of 1 case out of 1 million within in 1 month at a 95 percent confidence level [13]. To accomplish this task in an economical and practical manner, multiple targeted surveillance streams are analyzed via a structured weighing methodology. This methodology is described in Appendix One.

The purpose of objective II is to use surveillance data to demonstrate freedom from PRV infection. USDA Animal and Plant Health Inspection Service (APHIS) Veterinary Services (VS) National Center for Import and Export (NCIE) routinely files reportable disease and disease prevalence data to the World Organization for Animal Health (OIE). The reports derived from this surveillance will be based primarily on slaughter surveillance data in both sow and market swine populations. Surveillance systems designed to meet objective I will also contribute information to objective II. Ideally, a random surveillance component should be present to meet world trading requirements, however, alternate strategies are necessary until adequate herd identification is present to define a sample frame for randomization [14].

Random surveillance methods also appear to be more cost-efficient for this second objective [13].

Objective III is considered a minor objective and will be limited in scope and resources. This objective monitors the risk of PRV introduction from other countries and feral swine. This objective also provides support to the first two objectives. For example, knowing the geographical location of feral swine reservoirs assists States in identifying and classifying high-risk herds. Monitoring feral swine for presence of PRV provides information on whether PRV is surviving in or disappearing from feral swine populations. Other countries also may be interested in feral pig monitoring efforts.

1.4 Expected Outcomes: Products, Decisions, and Actions

The surveillance program bases proposed sample stream volumes on methods described in Appendix One, which explains the methodology of valuing streams based on relative value, cost, and attainment of surveillance goals [13].

This surveillance system and associated evaluation methodology will provide useful information to Federal and State decision makers in determining possible changes in surveillance levels or streams. Surveillance for rapid detection of PRV infection in commercial swine herds will determine whether additional eradication efforts are needed.

The surveillance plan will also deliver necessary information for PRV status reporting requirements. The NCIE may use this information for OIE reporting requirements. The National Center for Animal Health Programs (NCAHP) staff, VS regional epidemiologists and State animal health officials may use surveillance results to report PRV status as described in current or future pseudorabies program standards or equivalent documentation. Any revised PRV program standards should follow the concepts of this current or revised surveillance plan.

If an infected herd is detected via surveillance, the PRV program standards outline procedures necessary to maintain State status. States are responsible for identifying the infected premises, epidemiologically- and geographically-linked herds, and for controlling the infection(s) disclosed in a timely manner [10]. The PRV program standards also outline procedures for notifying other States of discovery of infected herds.

1.5 Stakeholders and Responsible Parties

Stakeholders include industry representatives and individuals responsible for designing, implementing, managing, and disseminating information with the surveillance plan. Specific parties with an interest in the PRV surveillance plan include:

- National Pork Board, representing industry scientific issues
- National Pork Producers Council, representing industry policy issues
- State pork associations, representing industry State-specific issues
- State Veterinarians, representing State veterinary regulatory programs and jointly responsible with VS area veterinarians-in-charge (AVICs) for State-based cooperative surveillance efforts
- American Association of Swine Veterinarians, representing swine practitioners
- All swine practitioners, representing practicing veterinarians and their clients
- Commercial companies manufacturing and selling PRV vaccines or commercial reagents and assays in the U.S. market
- USDA-APHIS-VS
    - National Animal Health Policy and Programs staff, consisting of:
        - NCAHP- policy, budget and implementation of eradication and surveillance programs
        - NCIE- import, export, and international health status management and reporting
    - Eastern and Western Regional Directors, swine epidemiologists and area office AVICs and staffs- implementation of surveillance programs in the field, including reporting of necessary data
    - Centers for Epidemiology and Animal Health (CEAH)- Epidemiology and risk-based analysis of surveillance and related data
        - National Surveillance Unit (NSU)- development and maintenance of surveillance plans and data analysis
        - CEAH Center for Animal Disease Information and Analysis (CADIA)- responsible for developing IT systems to monitor PRV surveillance information. (In early 2008, CADIA will report directly to the VS Chief Information Officer instead of CEAH)
    - National Center for Animal Health Emergency Management and Diagnostics- representing animal health emergency program management
    - National Veterinary Services Laboratory- diagnostic laboratory support and reference laboratory services
    - Center for Veterinary Biologics- PRV vaccine and commercial reagent licensing and testing
- Department of Homeland Security (Customs and Border Patrol), responsible for protecting the Nation's borders from animal disease incursions
- National Animal Health Laboratory Network (NAHLN), responsible for sample assay testing and electronic data reporting
- Meat and slaughter establishments, collection points for VS-directed collection of appropriate surveillance samples

Population Description and Sampling Methods

1.6 Population Definitions

The U.S. swine population can be divided into three general categories. These categories are listed below with a brief description.

- Feral swine: Defined as those swine that are free-roaming [10], these pigs are considered potential carriers of pseudorabies. Rapidly expanding populations of feral swine are now known to reside in at least 34 States. An interactive map outlining feral swine populations is being developed by the Southeastern Cooperative Wildlife Disease Study (SCWDS) group. This map can be found at the following Web site: http://www.uga.edu/scwds/dist_maps/swine04.html. True prevalence of pseudorabies infection in feral swine is unknown and varies from region to region. One study demonstrated 38 percent of feral swine were seropositive [15]. However, due to their risk and freedom of movement, this surveillance plan and the current pseudorabies program standards assume all feral swine to be potential PRV carriers. Prudent program risk assessment requires that feral swine continue to be considered potentially infected at all times. Even though selective sampling of populations not previously proven positive can provide apparent negative population status data, this is only valuable in assessing short-term nearby commercial herd risks.
- High-risk domestic (formerly transitional) swine: Defined as those captive swine located in feral swine areas in which management practices allow for possible PRV exposure via direct or indirect feral swine contact. According to the 2006 National Animal Health Monitoring System (NAHMS) data, nationally, approximately 52.1 percent of sows have outside access at some point of production [16]. However, not all outside animals are located near feral swine populations. Accurate data is not available to assess the scope of this population. Nearly all of this population fails to enter interstate commerce streams, as evidenced by very rare findings of PRV and swine brucellosis infections in current market swine surveillance streams.
- Commercial production swine: Defined in PRV program standards as those swine that are continuously managed and have adequate facilities and practices to prevent exposure to high-risk domestic (transitional) production or feral swine. Nearly all swine (on a volume basis) marketed in the United States in interstate commerce are considered commercial swine [10]. PRV was declared eradicated from this population in October 2004 by the PRV Control Board, a Federal-State-industry PRV oversight committee established at the onset of the program by national leaders and formalized in the PRV program standards document [9].

1.7 Case Definitions, 1.8 Data Sources, and 1.9 Sampling Methods combined for each surveillance stream

Surveillance Streams Primarily for Objective I: Rapid Detection

Each stream listed below contains an outline of the population description, case definition, data sources, and sampling methods. The major streams are:

- Reporting/investigation/diagnosis of suspicious PRV cases;
- Antigen testing of tissues from sick pigs submitted to diagnostic laboratories;

- Serological testing of swine cases submitted to diagnostic laboratories for other than PRV-suspect cases;
- Serological testing of herds classified as high-risk; and
- Voluntary reporting and serological testing of herds with known exposure to feral swine.

A. Reporting/Investigation/Diagnosis of Suspicious PRV Cases

This surveillance stream relies on the expertise of practitioners, producers, and persons directly observing swine herds to report suspicious PRV cases to the AVIC, State Veterinarian, or their designee(s).

Population Description

This eligible sample population is all U.S. domestic swine herds.

Case Definition and Diagnosis

Diagnosis of PRV can only be accomplished when herd history, clinical signs, and diagnostic sampling results are combined [1]. The following possible clinical signs may be exhibited in a PRV-infected herd:

- Mortality in suckling pigs approaching 100 percent, accompanied by either CNS symptoms or gross lesions consistent with PRV;
- Sows with respiratory signs and/or reproductive failure consistent with PRV; and
- Respiratory signs in weaned market pigs accompanied by either some evidence of CNS symptoms or increased mortality consistent with PRV.

A case will be considered positive or negative based upon the recommendation of a trained area epidemiologist as confirmed by an AVIC or State Veterinarian. Detailed case classification criteria are defined in PRV program standards.

Data Sources

All producers, practitioners, and laboratory personnel observing swine in the United States and territories are responsible for reporting suspected reportable diseases, including PRV. Officials retained to investigate a reported potential infection should report the following information:

- Premises location;
- Date of reported infection;
- Clinical symptoms observed in the herd, including temperatures;
- Herd history, including PRV vaccination history;
- Number of animals affected and number of animals on the premises;
- Tissues or samples submitted to laboratory; and

- Diagnostic test results.

Data obtained from this sampling stream will be entered in an incident management module of the Animal Health and Surveillance Management (AHSM) program disease database to be developed[1]. Negative as well as positive cases reported to the AVIC or State Veterinarian must be entered into the database to demonstrate an active investigation process.

Sampling Methods

Suspicious cases are voluntarily reported to the AVIC and State Veterinarian, who retain overall responsibility for sample submissions and case management. Thirty cases per year are expected in this sampling stream. Appendix One addresses costs and relative value of sampling this stream.

B. Antigen Testing of Tissues from Sick Pigs Submitted to Diagnostic Laboratories

Population Description

The 2006 NAHMS study indicated 69.1 percent of swine premises used the services of a veterinarian [16]. This surveillance stream includes all domestic swine premises that submit tissues to diagnostic laboratories for disease diagnosis. Tissues and/or disease symptoms qualifying for surveillance are described below.

Case Definition

All tissues submitted to veterinary diagnostic laboratories associated with the NAHLN meeting the following case definition standards qualify for PRV testing:

- Any swine accessions related to dramatic respiratory disease clinical signs in market or breeding swine;
- Any swine accessions containing either or both of the following tissues: tonsil and brain; and
- Swine accessions related to sow abortions.

Due to the volume of samples submitted to Iowa and Minnesota veterinary diagnostic laboratories, cases must meet the above selection criteria to be eligible for PRV analysis. In addition, these cases must have tissues set aside for fluorescent antibody or possible future polymerase chain reaction (PCR) testing at a PRV surveillance-approved laboratory, and possess one or more of the following attributes:

- Dramatic respiratory diseases in market swine or breeding swine;
- Abortions and reproductive failure;

[1] The AHSM system will require development of additional modules for PRV sampling.

- Undiagnosed cases with CNS clinical signs; and
- Other undefined cases that the pathologist wishes to submit.

Data Sources

NAHLN laboratories sampling qualifying tissues for PRV will collect and electronically report information and antigen assay results via the NAHLN electronic messaging system for surveillance purposes. This information will be transferred electronically to the AHSM PRV program disease database. Data submitted will include all tested samples (both negative and positive). Sample data required includes:

- Premises information (geographic location);
- Dates of collection, submission, and testing;
- Reason for performing the screening test;
- Clinical symptoms observed in the herd;
- Herd history including vaccination history;
- Number of animals affected and number of animals on the premises;
- Tissues or samples submitted to laboratory; and
- Diagnostic test results.

Sampling Methods

Historical data of diagnostic laboratory swine submissions meeting the case definition from the 30 largest swine States and diagnostic laboratories are outlined in Table 1 below. Samples may also be received from States not represented on this table.

Table 1. Historical data of diagnostic lab swine submissions

Region	State	Historical number of possible qualifying submissions
Eastern Region	Alabama	10
	Florida	10
	Georgia	150
	Illinois	1200
	Indiana	800
	Kentucky	44
	Minnesota	1300
	Mississippi	10
	New Jersey	50
	New York	10
	North Carolina	460
	Ohio	42
	Pennsylvania	174
	South Carolina	32
	Tennessee	50
	Virginia	1,802
	Wisconsin	12
	Subtotal	6,156
Western Region	Arkansas	7
	California	250
	Hawaii	0
	Iowa	1,300
	Kansas	150
	Missouri	1,000
	Nebraska	700
	New Mexico	10
	Oklahoma	120
	South Dakota	850
	Texas	100
	Louisiana	10
	Subtotal	4,497
	Total	10,653

This sample stream is projected by the structured relative weighting methodology (see Appendix One) to be the most valuable stream for rapid detection. Nationwide, approximately 8,600 cases meeting the case definition are projected to be analyzed for PRV from this stream. According to projections made in Appendix One, this stream alone could provide 100 percent of the proposed surveillance target for rapid detection, although it is not prudent to rely on one stream in a comprehensive surveillance system.

Appendix One describes statistical, mathematical, and epidemiological justification for this sample stream. Projected sample numbers from this newly formed surveillance stream will be evaluated after 1 year to determine its contribution to meeting the stated criteria for rapid detection.

C. Serological Testing of Swine Cases Submitted to Diagnostic Laboratories

Population Description

The swine population included in this surveillance stream includes any domestic swine premises submitting serology samples. Serum samples submitted to laboratories for diagnostic or routine monitoring of diseases other than PRV qualify for selection.

Case Definition

Serological samples submitted to laboratories from premises with animals experiencing respiratory, reproductive, or other clinical signs similar to those caused by PRV qualify for surveillance. Serological samples submitted for herd antibody profiling for various diseases also qualify to be tested. Cases will be randomly selected for PRV surveillance from these submissions.

Data Sources

Data from this sampling stream include serological analysis from serum samples selected for PRV surveillance, along with supporting information. NAHLN laboratories receiving swine serological submissions will randomly select serological cases from the submissions for PRV analysis, and electronically report submission information and test results via the NAHLN electronic messaging system for surveillance purposes. This information will be transferred electronically to the AHSM program disease database. Data submitted will include all tested samples (both negative and positive). Sample data required includes:

- Premises information (geographic location);
- Date collected, submitted and tested;
- Diagnostic test results; and
- Reason for performing the screening test.

Sampling Methods

A maximum of five samples from each randomly selected submission will be analyzed for PRV. If the serological submission consists of less than five samples, all received serological samples will be tested.

The PRV weighting methodology described in Appendix One targets 8,000 cases from this stream for rapid detection. With a maximum of five samples per submission, 40,000 samples could be analyzed.

Many laboratories receive thousands of serum samples per year. Total swine serum submissions to NAHLN laboratories will be analyzed yearly to assure proper U.S. geographical representation. To meet the annual goal of 8,000 cases for this stream,

laboratories will subsequently be assigned targeted numbers of samples for representative selection.

D. Serological Testing of Herds Classified as High-Risk

Population Description

This surveillance stream is comprised of swine from high-risk commercial herds (premises with potential exposure to feral swine), including such herds that ship pigs interstate.

Case Definition

A high-risk domestic herd is defined as those swine in feral swine areas where management practices allow for possible PRV infection via feral swine contact. However, for this surveillance stream, the following herds or premises are classified as high-risk:

- Commercial herds/premises with known outdoor access located in feral swine high-risk areas, defined as areas within 10 miles of program-designated feral swine populations as reported and certified by State, Federal or other regulatory personnel;
- Commercial herds/premises located within 10 miles of a wild boar hunt club; or,
- Commercial herds/premises located in high risk areas that have interstate animal movement history.

These herds are eligible for sampling. The AVIC, State Veterinarian or their designees will be responsible for classifying herds within their State. Certificates of veterinary inspection or interstate movement within a production system will assist in identifying high-risk herds moving animals across State boundaries.

Data Sources

Data from this sampling stream include statistical serological sampling and supporting information from eligible herds selected for PRV surveillance by State/area regulatory personnel. NSU, NCAHP staff and regional epidemiologists will assist States in establishing sampling criteria based on the number of eligible herds and State sampling targets (see next section). Sample collection data will be submitted by Federal-State Cooperative Program personnel via electronic submissions of required data to the AHSM program disease database, including:

- Premises information (geographic location);
- Date; and
- Reason for performing the screening test.

Sample collection serum tubes will be bar-coded according to APHIS standards with submissions forwarded to the assigned participating NAHLN facility. NAHLN laboratories receiving swine serological submissions will electronically report all test results (individual sample results, positive and negative) via the NAHLN electronic messaging system. This information will be transferred electronically to the AHSM PRV program disease database.

Sampling Methods

AVICs, State Veterinarians or their designees will authorize farm testing of selected high-risk herds. Herds for testing should be selected such that herds are representative of this population and all known sources of bias avoided. The sampling frequency for eligible herds will be weighted based on facility type in high-risk areas. Frequency of sampling in premises with adequate biosecurity practices will be less than those without adequate biosecurity. Table 2 below describes the sampling frequencies.

Table 2. Sampling Frequencies

Housing type	Sampling interval
Facilities with any outdoor access w/o perimeter fence	Once every 2 years
Total confinement facilities w/o perimeter fence or outdoor facilities with effective perimeter fence	Once every 5 years
Total confinement facilities + perimeter fence	Not sampled

The 95/10 statistical sampling procedure will be used in each segregated group to determine the number of serum samples to collect. The 95/10 sampling procedures provides a 95 percent probability of detecting infection in a herd in which at least 10 percent of the herd is seropositive. Herds should be sampled as follows:

- Less than 100 head - test 25 animals
- 100 to 200 animals – test 27 animals
- 201 to 999 animals – test 28 animals
- 1,000 or more animals – test 29 animals [10]

On-farm sampling may be eventually waived if market and/or sow-boar slaughter samples can be matched to identified high-risk premises of origin and successfully collected at a 95/10 confidence level.

Mathematical and statistical analysis of this sampling stream has been determined. Described in Appendix One, this stream is subdivided into three groups:

- Herds in high-risk areas moving swine interstate;
- Premises located near wild boar hunt clubs; and
- Surveillance of herds with outdoor sites in counties with feral swine.

For rapid detection of infection, the weighting methodology calculator assumed 1,000 herds from high-risk areas moving interstate, 75 herds within 10 miles of hunt clubs and 500 outdoor production sites located in high-risk areas will be tested annually. Appendix Two provides details on this sampling stream.

E. Reporting and Serological Testing of Herds Exposed to Feral Swine

Population Description

The population qualifying for this surveillance stream includes all high-risk outdoor herds located in feral swine counties where producers report feral or potential feral swine exposure to regulatory authorities. This stream is based on voluntary reporting of feral swine incursions into domestic swine herds.

Case Definition

Producers who observe feral swine in or around their swine herd and report the observation to authorities may qualify for surveillance. Surveillance testing will proceed when a producer's herd is classified as exposed to feral swine. Exposure includes:

- Direct physical exposure, including feral boar incursions into pens of reproduction-age females; and
- Visual evidence of fence line contact with feral swine, including probable swine tracks.

Data Sources

Data from this sampling stream includes serological and/or antigenic analysis and supporting information from exposed herds meeting the case definition.

Sampling Methods

The AVIC, State Veterinarian, or designee will determine if the reported feral swine sighting qualifies for sampling and, if so, the optimum sampling time and method. If the swine herd qualifies, on-farm sero-surveillance at a 95/10 sampling level (as defined earlier) is encouraged 30 to 60 days after the direct exposure event. If clinical signs develop in the herd, immediate pathological and antigenic sampling should occur.

Data obtained from this investigation will be entered into an incident management module of the AHSM program disease database. To demonstrate an active investigation process and maintain a recorded history of the reported possible exposure event, both qualified and non-qualified cases reported to the AVIC or State Veterinarian must be entered into the database.

Sample collection data, if conducted, will be submitted by Federal-State Cooperative Program personnel via electronic submission to the AHSM PRV program disease database, including:

- Premises information (geographic location);
- Dates of exposure, sample collection, and sample submission;
- Reason for performing the screening test; and
- Degree of exposure (area, fence line, venereal).

NAHLN laboratories receiving swine submissions from this stream will electronically report test results via the NAHLN electronic messaging system for surveillance purposes. This information will be transferred electronically to the AHSM PRV program disease database.

This sampling stream has minimal effects on the overall goal of rapid detection, relying on visual sighting and voluntary reporting. In determining rapid detection, this stream accounts for approximately 2 percent of the goal, although it may be an important stream for individual case finding. As described in Appendix One, an estimated 30 herds will be tested per year at a cost of $300 per herd.

Surveillance Streams Primarily for Objective II: Demonstrating Freedom

Objective II's purpose is to document PRV freedom in the U.S. commercial swine population. It is based primarily on slaughter surveillance in both cull sow/boars and finishers.

F. Serological Testing of Cull Sows-Boars at Slaughter

Population Description

The population under surveillance includes all cull sows identified by official swine program identification methods and slaughtered at the largest selected federally inspected slaughter establishments. Additional cull sow slaughter establishments may later be selected to ensure adequate population geographic coverage. Commercial sows, along with some high-risk sows, make up this group.

Case Definition

Serum samples from representative sows/boars at selected slaughter establishments will be tested using approved program serological assays at NAHLN-approved diagnostic facilities. Targeted sampling of specific high-risk herds identified via premises identification by NSU-directed State sampling schemes may also be developed as voluntary program identification standards are initiated by industry.

Data Sources

Data from this sampling stream includes serological sample information, including dates collected and shipped, slaughter establishment identification, and the animal's swine program identification number. Program staff will direct the methodology development and seek funding to allow electronic capture of slaughter plant sample collection information, including the premises identification number of selected samples. Electronic hardware will be obtained and software developed by the CADIA Application Information Management

(AIM) unit that will allow selective collection of bar-coded serum samples to meet program targets developed by the NSU.

NAHLN laboratories receiving bar-coded swine submissions from this stream will electronically report individual animal test results (both negative and positive) via the NAHLN electronic messaging system for surveillance purposes. This information will be transferred electronically to the AHSM PRV program disease database.

Required sample data includes:

- Premises information (geographic location);
- Date of collection, shipment, and testing; and
- Diagnostic test results (via NAHLN electronic messaging system).

Sampling Methods

Based on FSIS electronic Animal Disposition Reporting System (eADRS) data for FY 2007, there were 659 federally inspected slaughter establishments that slaughtered swine. The number of plants slaughtering market swine, boars, and sows are listed in Table 3.

Table 3. Swine Slaughter Establishments

Type of swine slaughtered	Number of establishments
Market swine	575
Stags and Boars	197
Sows	382

Of the 382 slaughter establishments that harvest sows, all but 32 also harvest market swine. A total of 3,306,962 sows were slaughtered in these plants in FY 2007. There were 25 slaughter establishments that primarily harvest sows, accounting for 3,125,074 head or 94.5 percent of the total sow slaughter. We will target sampling in these 25 plants to cover at least 90 percent of the sow herd in a representative manner. Many of these same plants are a part of the current long-running market swine (sow-boar) surveillance (MSS) sampling program.

A newly updated list of sow slaughter facilities will be constructed from current electronic animal disease reporting system (eADRS) data. eADRS is a USDA Food Safety Inspection Service (FSIS) database. Selected plants will be placed in three to four strata based on number of cull sows slaughtered. A relatively lower sampling frequency will occur at the larger establishments to avoid over-sampling. The smaller establishments will be sampled at a relatively higher sampling frequency. Total sampling volume will be graduated downward over a 5-year period from the current level for approximately 790,000 to approximately 5,000-6,000 samples. To allow for the economic and sample volume adjustments required by current MSS participants, a transition period will be established. The transition period will also allow for official changes in program surveillance standards and PRV surveillance database development.

Appendix One describes the relative weight, surveillance goals, and optimization of streams. Sow-boar testing at slaughter is described as stream eight. Using the weighting methodology, this stream's current sampling volume is 8,000 percent over requirements to

prove freedom, yet only accomplishes 12 percent of the goal for rapid detection. Using the methodology described in Appendix One, only 5,000 samples are needed to demonstrate freedom from PRV infection in commercial production herds.

Voluntarily adoption of swine program premises identification tags for cull animals in interstate commerce will allow for targeted testing based on premises PRV infection risk as well as representative sampling of the commercial sow population. NSU and NCAHP urge voluntary adoption of program identification by industry participants in the next 2 years. Adoption of identification standards will assist in both risk-based and random surveillance collection and testing of cull animal serum samples.

G. Testing of Meat Juice from Market Hogs at Slaughter

Population Description

The population under surveillance includes all market swine slaughtered at selected federally inspected slaughter establishments. Animals delivered to FSIS inspected establishments represent commercial production swine because these facilities may legally trade product in interstate and / or international commerce.

Case Definition

Meat juice samples from representative lot-identified market swine at the selected slaughter establishments will be tested using approved program meat juice assays.

In addition, adoption of swine program premises identification numbers voluntarily tied by abattoir records to visible lot identification (tattoos in most cases) will allow targeted sampling of high-risk herds, selection of representative herds for demonstrating freedom of infection, or selections of herds falling under NSU formulated State-directed sampling schemes (Part D of Objective I- Rapid Detection).

Data Sources

Data from this sampling stream includes the dates of sample collection and shipping, the slaughter establishment, the animal's premises identification number, and test results from premises-identified carcasses (tattoo or rail ID tied by abattoir records to program premises ID) meeting the case definition.

Program staff will develop methodology and seek funding to allow electronic capture of premises information on ALL lots of swine presented for slaughter. These lots must be electronically associated with voluntary swine program premises identification number from the last premises of residence. Special attention will be directed toward meeting industry concerns regarding protection of confidential proprietary information. This may occur via use of a cooperatively-accepted private third party to disaggregate sensitive swine premises

data from associated slaughter facility collection data. Once the data has been stripped to contain only needed premises identification data, it can be transferred to NSU and CADIA for use in surveillance algorithm development. Electronic hardware will be obtained and software developed by CADIA-AIM to allow selective real-time identification of lot numbers (tattoos) of interest for sampling tied to premises of interest. Hardware, software and procedures developed will alert sample collectors when carcasses from desired lots approach the collection point.

VS-employed animal health technicians and/or contracted personnel will then collect the following:

- Specified diaphragm samples from identified lots, placed into bar-coded collection bags tied to the specified lot number;
- Date of collection; and
- Date of shipment.

NAHLN laboratories receiving bar-coded swine submissions from this stream will electronically report test results via the NAHLN electronic messaging system for surveillance purposes. This information will be transferred electronically to the AHSM PRV program disease database. Data submitted will include all tested samples, both negative and positive.

Sampling Methods

Sampling will initially occur in the 14 market swine surveillance plants already online. These plants harvest about 50 percent of the total market swine population. Additional slaughter establishments may be selected to ensure adequate geographic coverage. Table 4 below outlines the current plants collecting meat juice samples and sample numbers for FY 2008.

Table 4. Current schedule of sample collection FY 2008

Region	State	City	Slaughter Plant	Number of Swine to Sample
Eastern Region	Minnesota	Austin	'Quality Pork (Hormel Meats)	750
		Worthington	Swift	500
	Kentucky	Louisville	Swift	1,000
	Pennsylvania	Hatfield	Hatfield Foods	1,000
	North Carolina	Tar Heel	Smithfield Foods	1,000
	Subtotal			Subtotal……..4,250
Western Region	Iowa	Storm Lake	Tyson Fresh Meats	500
		Waterloo	Tyson Fresh Meats	750
		Columbus Junction	Tyson Fresh Meats	1000
		Perry	Tyson Fresh Meats	500
		Marshalltown	Swift	500
		Ottumwa	Excel Meats	750
		Sioux City	John Morrell	750
		Denison	Farmland	500
	Nebraska	Madison	Tyson Fresh Meats	750
				Subtotal……..6,000
				Total……..10,250

To meet objective II, 5,000 meat juice samples must be collected. For samples used to demonstrate freedom, no more than one sample will be taken from an individual lot or premises number on the same day. Appendix One outlines the relative risk of this sampling stream and statistical methodology used to determine the 5,000 samples.

Monitoring Methods for Objective III: Monitoring International or Domestic Sources of PRV

The purpose of this objective is to monitor potential sources of PRV infection for the commercial swine population. This objective does not involve surveillance streams but includes efforts to determine applicable high-risk sampling targets and assess the probability of PRV introduction from foreign sources. Objective III has three components:

- Monitoring the feral swine reservoir:
  - The number and distribution of feral swine in the United States.
  - The monitoring of feral swine for presence of PRV.
- Routine summary of number and distribution of swine hunting preserves.
- Monitoring international PRV status.

Since objective III supports surveillance but does not involve formal sampling streams, the descriptions of this objective vary from the earlier format. Population description, case definition, data sources, and sampling resource categories may not apply for all components in objective III.

H. Monitoring the Feral Swine Reservoir

These components inform Federal regulatory personnel and State Veterinarians of the location and potential risk that feral swine pose in identified areas of each State. The monitoring of the feral swine reservoir has been subdivided into two subsets: the distribution of known feral swine population and monitoring of the PRV status of known feral swine populations. However, as previously mentioned in the feral swine definition (section 1.6), for purposes of assessing potential PRV exposure risk, all feral swine are considered positive for PRV. Sero-surveillance data from convenience sampling provides a little uncertain additional information regarding risk of herd infection from resident feral swine populations.

Distribution of the Feral Swine Population and Monitoring Feral Swine for Presence of PRV

Population Description

The population in this monitoring program includes all feral swine populations that are designated by a State, Federal regulatory agency, or wildlife agency. Feral swine (defined in section 1.6) are those swine that are not confined and are free-roaming.

Case Definitions

Reported feral swine sightings and populations will be identified on a national designated feral swine population map. Sightings reported to State or Federal agencies, if possible, should be verified as authentic prior to mapping. The mapping will assist State and Federal agencies in determining locations of high-risk domestic herds.

To determine the presence of PRV in feral swine populations, swine populations defined as feral by State and Federal government agencies may be sampled by APHIS Wildlife Services (WS) for PRV testing, subject to agreement by WS, VS area, and State regulatory personnel. This monitoring program serves to determine whether PRV is present in a location, whether PRV positive populations are surging, or whether PRV has disappeared from a local feral swine population.

Data Sources

Data pertaining to mapping of all feral swine populations will be collected and maintained by VS or a VS cooperator, using a real-time mapping system to track and monitor movements of feral swine. This map is currently accessible at the following Web site: http://www.uga.edu/scwds/dist_maps.htm.

Data from monitoring feral swine serology or tissue submission includes collection date, tissue or sample type submitted, estimated age or maturity of the sampled swine, and geographical location of sampled feral swine. WS personnel will electronically enter sample collection data into the feral swine section of the AHSM PRV program database.

NAHLN and other PRV-approved laboratories receiving assigned bar-coded feral swine samples will report results in the AHMS database via electronic messaging from the NAHLN database. Results will be viewable (via permission rules) for appropriate State, Federal, and WS personnel.

Findings and information received from PRV serological monitoring of feral swine will be mapped to show locations where positive feral swine have been identified. Program staff will monitor the AHMS database and provide mapping information to the appropriate local authorities.

Monitoring Resources

Samples for determining the presence of PRV in feral swine will be provided by APHIS Wildlife Services. The samples currently collected for classical swine fever (CSF) surveillance monitoring by Wildlife Services may also be tested for PRV and swine brucellosis. Limited sample-size targets will be determined for each State each year through collaboration between VS and Wildlife Services and will depend on available funds, the CSF program, and other needs of the agencies.

Feral swine sightings will be mapped by VS or a VS cooperator (currently SCWDS). Federal and State government agencies should report feral swine populations at this Web site: http://www.uga.edu/scwds/dist_maps.htm/. Reports of feral swine should be verified, if possible.

I. Routine Summary of the Number and Distribution of Swine Hunting Preserves

Population Description

The population qualifying for this component of objective III includes all wild game hunting preserves containing swine or feral swine.

Case Definition

Hunting preserves with feral swine of unknown status serve as a potential risk to commercial swine with direct or indirect contact. Knowing the location of hunting preserves allows State and Federal government agencies to identify high-risk herds. This component assists the other objectives. High-risk herds located near hunt clubs may qualify for the "serological testing of herds classified as high-risk" stream in objective I.

Data and Monitoring Resources

Hunting preserve locations will be collected and mapped by the appropriate regulatory authority in the States. Data should include whether the hunting preserve is active and contains swine, as well as county and geographical location. State, Federal or other government agencies within each State should annually include hunting preserve location and information in their feral/transitional swine management plan as part of their PRV recertification report. This information will be made available to NSU and may be included on a national map at NSU or provided to VS cooperators for mapping. A summary map may be available upon request to NSU.

If determined necessary, States holding testing authority may wish to conduct periodic PRV sero-surveillance of swine confined to previously identified hunting preserves.

J. Monitoring International PRV Status

The risk of PRV introduction through imported swine, swine products, or other animals imported from international sources is minimal. To monitor the risks from international sources, the CEAH Center for Emerging Issues (CEI) works with industry and collaborates with the OIE to keep the public abreast of disease issues that may impact the United States. CEI identifies risks and monitors those risks for changes that may affect imported live swine and swine products. If CEI detects an increased risk for the presence of pseudorabies virus in imported swine or swine products, CEI will inform the NSU and appropriate program staff of the increased risk. The national PRV surveillance plan may then be modified to reflect the identified increased risk.

In addition, the National Animal Health Policy and Program Staff, the NCIE, and the OIE liaison, in concert with APHIS' presence in other countries by VS International Services, will monitor the animal health situation abroad. Information about changes in animal health status is circulated by these groups with other members of VS and cooperating State animal health agencies. Pseudorabies is one of many conditions of interest in this general international monitoring network. The NSU and appropriate program staff will be notified if an international source risk is identified. NSU will assess the risk and may modify the national surveillance plan to account for the identified risk.

Analysis, Reporting and Presentation

1.10 Data Analysis and Interpretation, 1.11 Data Presentation and Reporting

Data from all surveillance streams will be entered into the PRV module of the AHSM database module, a Web-based data entry system similar to the Web-based CSF laboratory

submission module. NSU will provide data analysis from this module to national program managers, regional epidemiologists, and industry officials.

Annual reports from data collected should include:

- Number of samples collected from each stream versus targeted sample numbers contained in this surveillance plan;
- Reporting of actual versus projected national surveillance coverage as indicated in the performance metric;
- Analysis of problems or issues within the sampling streams (streams and case definitions may have to be reweighted or redefined as experience is gained);
- Reporting and analysis of individual States' data. AVICs and State Veterinarians will rely on this information for PRV status reapplication;
- Reporting sample numbers for demonstration of freedom (to include appropriate NCIE personnel);
- Reevaluation of appropriate sample streams and levels to identify newly discovered risks, if positive animals are repeatedly discovered;
- Analysis of feral swine submissions from Wildlife Services under the direction of program staff for an ad hoc report on the characterization of PRV in the feral swine population; and
- Reporting on location and number of wild game hunting preserves that contain swine for hunting.

Daily reports (via appropriate database permissions for regional epidemiologists, AVICs, designated area epidemiologists, and State Veterinarians) should include:

- Surveillance data collected, samples shipped and samples tested to current date, including actual versus targeted numbers; and
- Officially designated feral swine areas, with a list and map of premises ID numbers found in official high-risk areas.

Implementation, Budget and Evaluation

1.12 Surveillance System Implementation: Priorities, Timelines, and Internal Communications

Priorities

Objective II (demonstration of freedom) is currently implemented. However, sample collections are 8,000 percent above the objective's recommended rate. The National Center for Animal Health Programs, VS regional and area staff, and State cooperators will jointly develop a 5-year sample reduction transition plan, beginning in FY 2009 as part of the implementation of this surveillance plan.

Database development is an early priority. The current PRV program Automated Web-Based Data Services (AWBDS) State databases are improperly structured to handle proposed PRV data needs. Data existing in AWBDS will be archived for future reference, but not migrated to the proposed AHSM-UDB platform.

A PRV AHSM database Change Control Board, consisting of diverse segments of the swine and information technology (IT) regulatory community, will be formed. This board will guide a broad-based requirements assessment and implementation plan for staged development and delivery of the PRV sub-module of a comprehensive and integrated swine surveillance database. This database will be built on the common AHSM-Unified Database (UDB) national data platform.

The writing of an initial specifications charter with CADIA is scheduled for completion by September 2008. Initial contracting and software development is planned for FY 2009.

The formalization and implementation of this plan requires industry and State partners' acceptance. Support for the plan will be solicited by NCAHP and NSU personnel via formal and informal presentations. If necessary, industry may seek resolutions of support at the April 2008 National Institute for Animal Agriculture (NIAA) and October 2008 United States Animal Health Association (USAHA) meetings.

Following modifications, acceptance, and demonstrated support, NSU, NCAHP (with regional epidemiologist assistance) and NAHLN personnel will collaborate in the assembly of a PRV (and swine brucellosis) surveillance manual. This manual will be similar in scope and structure to the CSF surveillance manual. All relevant information will also be posted on appropriate Web sites (NSU and VS program sites) for awareness and training purposes.

NCAHP and VS regional staff will have primary responsibility for implementing the objective I (rapid detection) streams. Laboratory based sampling and serological sampling plans should be outlined and implemented in FY 2009.

Since high-risk herds must be identified prior to developing a surveillance scheme, implementation of on-farm or slaughter testing of at-risk herds may be delayed until States are able to assess the risks posed to their individual herds. A recent review by the Risk Analysis Team at CEAH concluded that there is currently insufficient data available to assess high-risk herd status from a national perspective (see Appendix Two).

Implementation of this surveillance stream is projected to be fully completed by the end of FY 2010. An electronic certificate for veterinary inspection (eCVI) for interstate movement and program premises ID would enhance the performance of this and other streams. Program staff will work with stakeholders to encourage industry acceptance and regulatory implementation of these components.

Timelines

We recommend phased transformation from the long-standing PRV eradication program to a surveillance model to assure the following:

- **No gaps in surveillance coverage**: Although PRV surveillance in the sow-boar slaughter program is excessive, a rapid discontinuance would risk too little surveillance occurring while other streams are ramped up.
- **Budgetary and human resource adaptation**: Federal, State and industry entities involved in this long-standing program need time to transition resources and adjust to budgetary changes. Implementation of the plan reduces sample collections from over 700,000 to fewer than 20,000 samples per year. The animal health regulatory infrastructure will need a 5-year transition period to adapt.
- **Time for adoption of premises identification and electronic movement records**: The swine industry has indicated they support and will cooperate in adoption of program-based premises identification and electronic reporting of interstate movement records. However, under ideal circumstances, this will take at least 24 months to be effectively adopted. Once a premises identification system has been implemented, the existing streams may be able to utilize this system and be more effective. This emphasizes the need for periodic re-evaluation of the streams of this surveillance plan.
- **Adequate time for database development**: Effective targeted surveillance requires an accurate, premises-based database with developed algorithms. This allows selection of proper numbers and locations for risk-based sample collection. Database development will start soon, but will be of limited value until populated with accurate data.

Appendix Three contains a complete 3-year implementation timeline, with responsible parties, measurable outputs and deadlines.

Internal Communications

A PRV leadership group will be developed with NSU, NCAHP, NAHLN and regional office staff. This group will focus on the surveillance plan, implementation activities, and concerns. Surveillance plan updates may arise from these discussions to correct unforeseen concerns. All proposed changes to the surveillance plan will be reviewed by the PRV leadership group.

In early June 2008, NCAHP has scheduled a swine programs training meeting in Ames, IA. The PRV surveillance plan and associated proposed regulatory changes will be discussed in detail with Federal regulatory staff and State cooperators at this meeting.

1.13 Resources and Budget

Surveillance stream sample numbers and cost estimates were obtained from Appendix One. After implementation, the assumptions made in Appendix One may need to be reanalyzed to account for changing costs and actual obtainable numbers in various surveillance streams.

The spreadsheet below is a ***rough cost estimate***, generated by estimated surveillance stream costs and not divided in detail by budget object code or VS units. The actual surveillance costs may be higher or lower than this estimate. To account for inflation, a 5 percent increase was added to sample costs.

Currently, VS regions are automatically allocated equal shares of the field funds. However, since laboratory and collection locations vary, equal allocations of PRV funds may not be appropriate. Funding recommendations will be made on a risk-based analysis of program needs conducted on a State-by-State basis.

Estimated PRV Surveillance Plan Cost Expenses

	Number of Samples	FY 2009 Costs in Dollars	Number of Samples	FY 2010 Costs in Dollars	Number of Samples	FY 2011 Costs in Dollars
Objective I						
Suspicious PRV cases	30	$ 15,000	30	$ 15,750	30	$ 16,538
Antigen Testing of Tissues submitted to Diagnostic Laboratories	8,600	$ 860,000	8600	$ 903,000	8600	$ 948,150
Serological Testing submitted to diagnostic Laboratories	8,000	$ 96,000	8000	$ 100,800	8000	$ 105,840
Serological testing of High Risk herds	200	$ 60,000	1000	$ 315,000	1575	$ 520,930
Serological testing of herds exposed to feral swine	30	$ 9,000	30	$ 9,450	30	$ 9,923
Objective I Total		$ 1,040,000		$ 1,344,000		$ 1,411,200
Objective II						
Serological Testing of Cull Sows at Slaughter	350,000	$ 2,450,000	125000	$ 875,000	62,500	$ 437,000
Testing of Meat Juice from Market Hogs at Slaughter	5,000	$ 35,000	5000	$ 36,750	5000	$ 38,588
Objective II Total		$ 2,485,000		$ 911,750		$ 475,588
Objective III						
Mapping of Feral Swine Locations by SCWDS		$ 25,000		$ 25,000		$ 25,000
Monitoring international PRV prevalence		$ 1,000		$ 1,000		$ 1,000
Objective III total		$ 26,000		$ 26,000		$ 26,000
Other						
Information technology		$ 500,000		$ 500,000		$ 150,000
Travel		$ 50,000		$ 52,500		$ 55,125
Miscellaneous		$ 50,000		$ 50,000		$ 50,000
Other costs total		$ 600,000		$ 602,500		$ 255,125
Total estimated cost of the surveillance program		$ 4,151,000		$ 2,884,250		$ 2,167,913

In FY 2010 and FY 2011 cost of testing was increased by 5% to account for inflation.

1.14 Surveillance Plan Performance Metrics

The goal of objective I is rapid detection. When the sample streams outlined in objective I are combined, they perform at the level of detection of ***1 infected animal out of 1 million in 1 month at a 95 percent confidence level within one month***. The same confidence and threshold applies for objective II in effectively demonstrating freedom of disease for trading purposes.

Surveillance plan performance metrics will be evaluated by entering the number of samples collected and reported into the weighting methodology calculator described in Appendix One. If the performance metrics are acceptable, the calculator will indicate a minimum of 100 percent of coverage in demonstrating both rapid detection and demonstration of freedom at the above confidence level.

1.15 Surveillance System Evaluation

The NSU will evaluate the surveillance plan for effectiveness in meeting the plan's outlined objectives and goals. NSU personnel, along with the PRV Leadership Group, will assess implementation progress, actual obtained sample numbers, budgets, and performance metrics. Yearly modifications to the plan will occur based on decisions made at these meetings. All changes to the plan and/or calculator will be documented for later retrospective analysis.

An independent formal review of the design, implementation, performance, and cost-effectiveness of this surveillance plan will occur within 3 years of its implementation. This review will be conducted by qualified independent Federal and State regulatory personnel and industry representatives. Pertinent results and recommendations from the review will be provided to all parties and supervisory personnel associated with the program, as well as to the Veterinary Services Management Team.

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Appendix One

Evaluation of pseudorabies surveillance, current and proposed, based on a structured relative weighting methodology
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Draft

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Methodology

The purpose of the methodology is to assist in optimizing a multi-streamed surveillance plan for sample sizes, performance, and least cost. The method, Structured Relative Weighting (SRW), utilizes a framework for weighing the values of surveillance pieces with regard to meeting certain objectives of the surveillance. Surveillance is the ongoing collection of data, taking action when appropriate with regard to the data. Many current surveillance plans are made up of different complementary data streams, each of which contributes partially to one or more objectives. Information derived from some of the streams is more valuable than information from others. This methodology involves using available data and expert opinion in weighing aspects of the plan to improve decisions about sample sizes that impact performance and cost. The following is an overview of the considerations.

System/ Stream	Relative population risk or prevalence	Relative value of sample for objective 1	Relative value of sample for objective x	Cost per sampling unit	Proposed or actual sample sizes for the streams
Baseline	t_0	s_{10}	s_{xy}	c_0	n_{x0}
Stream 1	t_1	s_{11}	s_{xy}	c_1	n_1
Stream y	t_y	s_{1y}	s_{xy}	c_y	n_y

- There are one or more objectives for surveillance, *i* for $i = 1$ to x objectives.
- There are one or more surveillance streams, *j* for $j = 0$ to y surveillance streams
- There are quantifiable sampling levels for streams, n_j, for $_j = 1$ to y streams
- Surveillance stream $j = 0$ is the baseline and
    - A random sample design that is theoretical for setting the goals or targets for each objective
    - The goals for objectives, n_{i0}, $i = 1$ to x, are the number of random samples from the entire population with a desired probability/confidence of detection
- Relative weights, s_{ij} and t_j (for $i = 1$ to x objectives, $j = 0$ to y surveillance streams)
    - s_{ij} is the relative weight of samples collected from stream *j* towards meeting objective *i*. Factors such as sensitivity, specificity, timeliness, flexibility, etc. of the stream are considered for this weight.
    - t_j is the relative weight of the risk/prevalence of the condition of interest in the population sampled by stream *j*

    - Since weight ratios are used, the actual value of the weights is not important, only the values in relation to others in the plan
    - Weights s and t are considered equally important in valuing surveillance samples
    - The baseline stream, $j = 0$, is included in weighting process and used to judge equivalency of other streams
- Desire a surveillance plan with capability equivalent to the goals including:
    - A diversified surveillance plan with different data streams
    - Different streams contributing to each goal and in an additive fashion based on the number of samples
    - Weighting each sample from objectives/streams on a relative scale (with $s_{ij}t_i$)
    - Relative weights as determined by data when available or expert opinion
    - Weight ratios, *r*, based on the relative weights of each stream and the baseline, expressing the relative value of the samples, $r_{ij} = s_{ij}t_i/s_{i0}t_0$ (for $i = 1$ to x objectives, and $j = 1$ to y streams)
    - Equating the goal for each objective *i* to the diversified surveillance plan. $n_{i0} = \boxtimes r_{ij}n_j$ (for $i = 1$ to x objectives, j=1 to y streams)
- Expected achievement of the goal (EAG) for objective *i*
    - A measure of proposed or current surveillance plans in meeting each objective
    - $EAG_i = \boxtimes r_{ij}n_j / n_{j0}$ (for specific objective *i*, and for $j = 1$ to y streams)
    - For currently conducted surveillance, the numbers of samples, n_j, for each stream ($j = 1$ to y) are specified to determine the EAG for each objective
    - For proposed surveillance plans, the numbers of samples per stream, n_j, are optimized (within known constraints) for each objective/stream
- Optimization of the n_j, samples sizes for the streams
    - Highest EAG scores for the plan based on calculations above
    - Lowest cost for the plan given that
        - Total cost for objective *i*, $\boxtimes n_{ij}c_j$, for $j = 1$ to y streams
        - Samples collected for one objective can also be used to meet other objectives
        - Expected total cost for surveillance plan = $\boxtimes$ Max(n_{ij}, for $i = 1$ to x objectives)c_j, for $j = 1$ to y streams
    - Study the cost/effectiveness of different streams in the plan in meeting a particular objective
        - Stream score per dollar (SSD) is calculated as, $SSD_{ij} = s_{ij}t_i / c_j$
        - SSD is the expected amount of surveillance a sample from a given stream provides per unit cost. The score is relative to other SSD's under an objective.

Pseudorabies surveillance plan – Results

Streams identified and updated in April 2007

1. Population-based passive reporting of suspicious PRV cases (FAD). Population: unusual swine cases reported to State/Federal Authorities. Sampling unit: case.

2. Laboratory-based testing of tissues submitted from sick pigs (Diagnostic labs). Population: pigs submitted to diagnostic lab that meets case definition. Sampling unit: case.
3. Laboratory-based sero-surveillance of swine cases (Sero-surveillance). Population: samples submitted to diagnostic labs at 4 or 5 highest volume diagnostic labs for sick pigs, for serum profiles, etc. Sampling unit: case with multiple animal samples (n = 5).
4. Population-based surveillance of herds shipping pigs interstate from high-risk counties (Interstate). Population: animals moving interstate. Sampling unit: herd test.
5. Population-based surveillance of outdoor swine raised near wild boar hunting clubs (Hunt club). Population: outdoor operations near hunting clubs in northern and middle states. Sampling unit: herd test.
6. Passive reporting of swine directly exposed to feral swine (Feral exposure). Population: herds in northern and middle tier States that report feral swine contact. Sampling unit: herd test.
7. Population-based surveillance of outdoor sites in counties with feral swine (Outdoor sites). Population: 72 counties with feral swine and more than 1,000 breeding animals - outdoor commercial operations in those counties. Sampling unit: herd test.
8. Sow/boar testing at slaughter (Sow/boar slaughter). Population: sows/boars culled from herds and identified with backtag and slaughtered at collecting Federal plants. Sampling units: single blood sample.
9. Finishing pig testing at slaughter (Finisher slaughter). Population: finishing pigs slaughtered at selected federally inspected slaughter plants. Sampling unit: single blood sample.
10. Certification testing (Certification). Population: testing for qualified-negative or monitored status for individual herds. Sampling unit: herd test.

Table 1. Proposed surveillance plan 2 with ratings and costs for all streams

System/ Stream	Relative population risk or prevalence	Relative value of sample for objective 1	Relative value of sample for objective 2	Cost per sampling unit	Proposed sample sizes for the streams
0-Random baseline	1	1	100	n/a	35,066,088* 29,949**
1-FAD	50	100	20	$500	30 cases
2-Diag labs	80	60	8	$100	8,600 cases
3-Serosurveillance	20	20	8	$12	8,000 cases
4- Interstate	30	30	8	$300	1000 herd-tests
5- Hunt club	40	10	8	$300	75 herd-tests
6-Feral exposure	40	15	8	$300	30 herd-tests
7-Outdoor sites	40	20	8	$300	500 herd-tests
8-Sow/boar slaughter	5	1	90	$7	5,000 samples
9-Finisher slaughter	0.9	5	80	$7	5,000 samples
10-Certification	10	8	8	$5	1,000 herd-tests

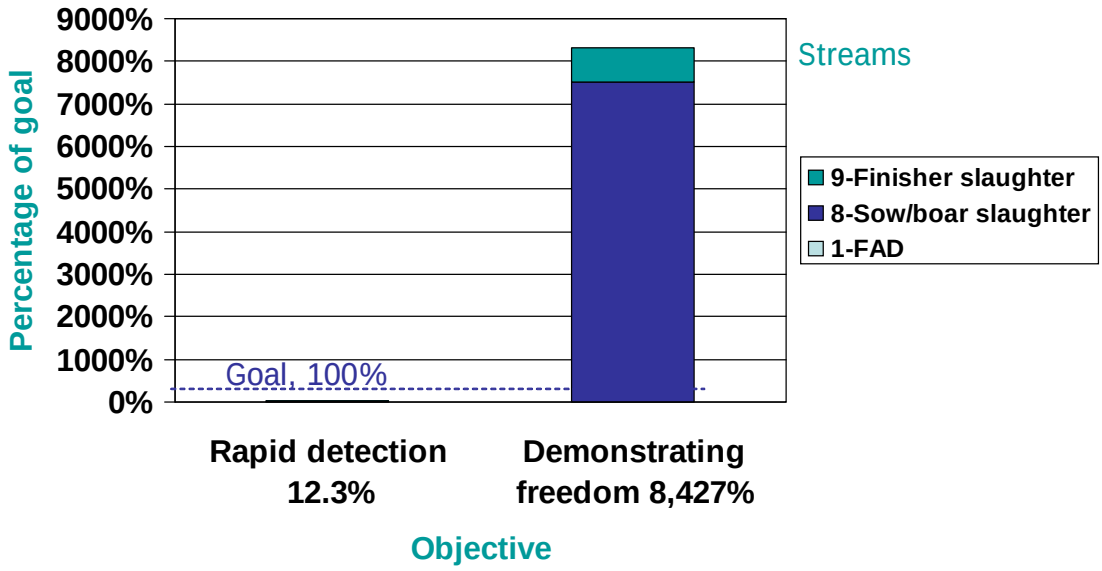
*Objective 1, rapid detection. This testing level conveys 95% confidence of detecting static prevalence of 1 in a million or more within 1 month.
**Objective 2, demonstrating freedom. This testing level conveys 95% confidence of detecting static 0.05% prevalence within 1 year.

Table 2. Surveillance effort using three of the streams, 2006

System/ Stream	Relative population risk or prevalence	Relative value of sample for objective 1	Relative value of sample for objective 2	Cost per sampling unit	Actual sample sizes for the streams
0-Random baseline	1	1	100	n/a	35,066,088* 29,949**
1-FAD	50	100	20	$500	20 cases
8-Sow/boar slaughter	5	1	90	$7	500,000 samples
9-Finisher slaughter	0.9	5	80	$7	380,000 samples

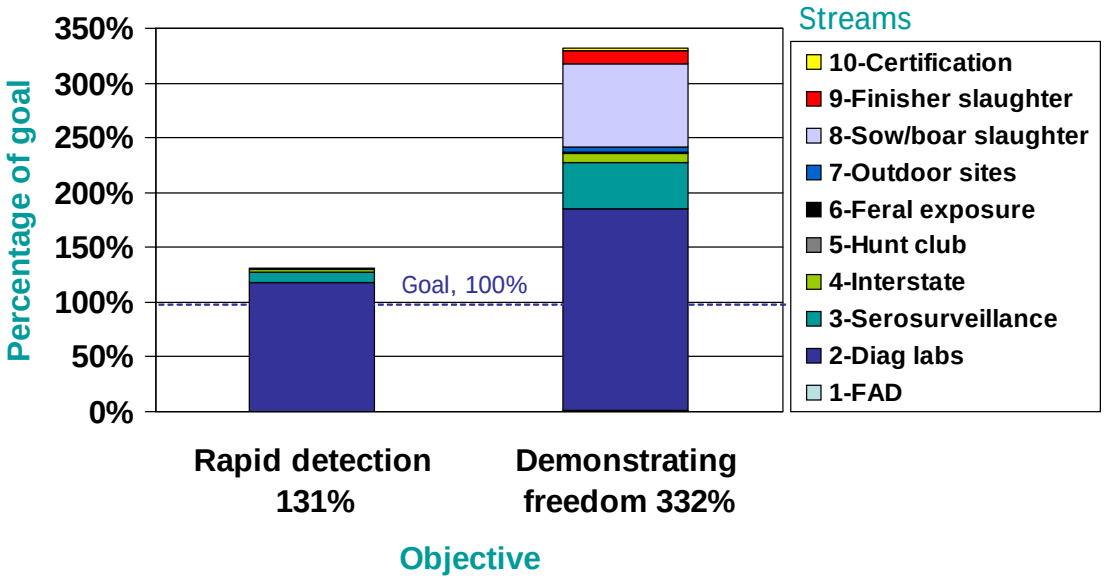
*Objective 1, rapid detection. This testing level conveys 95% confidence of detecting static prevalence of 1 in a million or more within 1 month.
**Objective 2, demonstrating freedom. This testing level conveys 95% confidence of detecting static 0.05% mean prevalence within 1 year.

Figure 1. Expected achievement of the goal* of two PRV objectives for three streams in 2006 surveillance



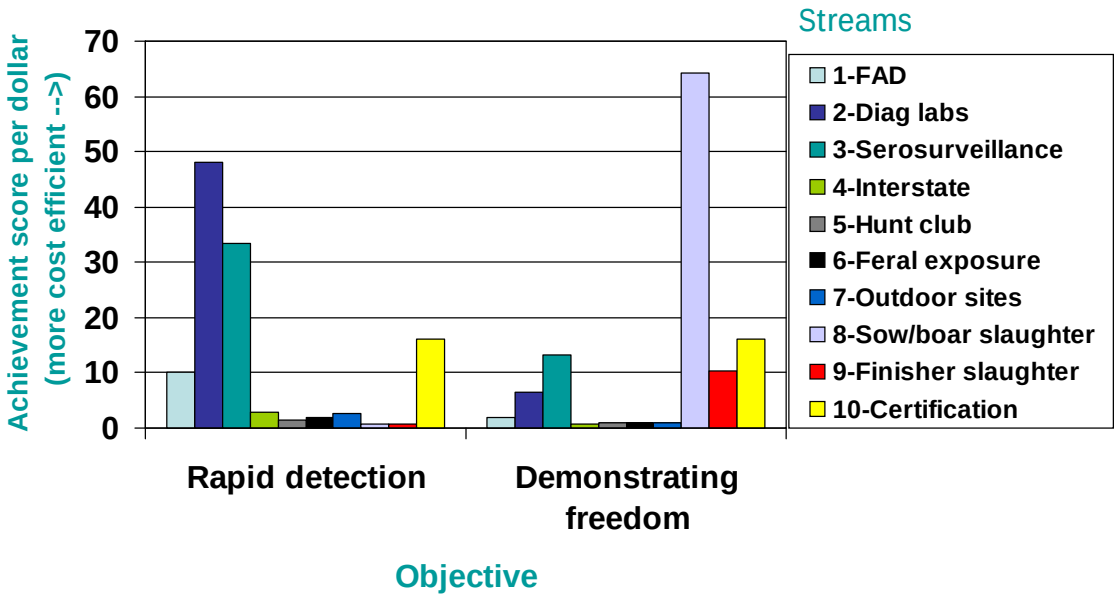
*Measure of how the surveillance plan meets the goals specified for the objectives

Figure 2. Expected achievement of the goal* of two PRV objectives for proposed surveillance option 2



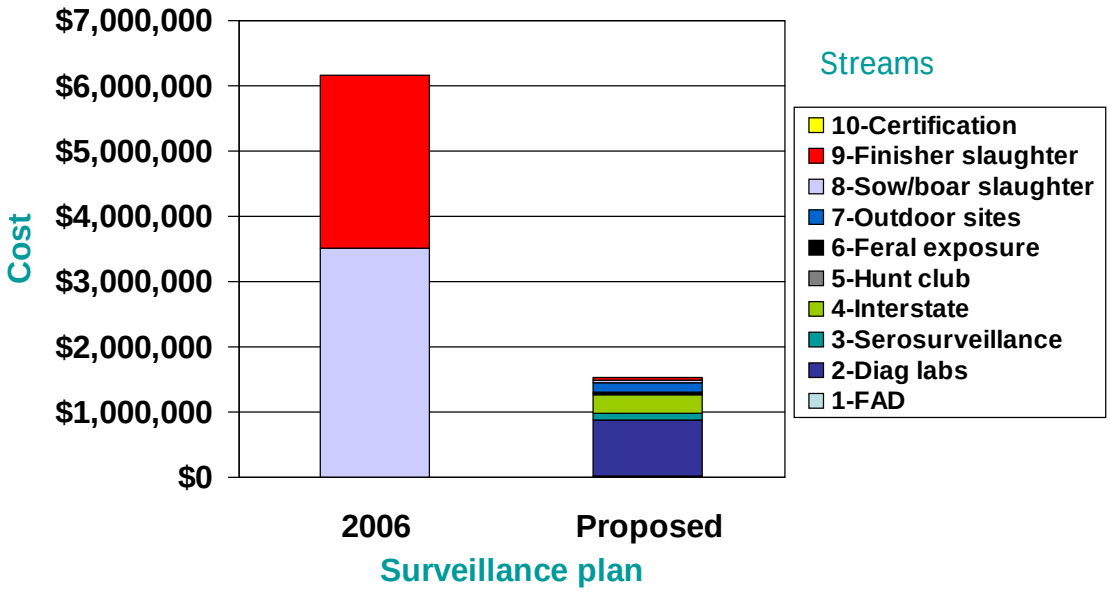
*Measure of how the surveillance plan meets the goals specified for the objectives

Figure 3. Stream score per dollar* for two objectives in proposed PRV surveillance plan



*Relative measure of cost effectiveness of the stream

Figure 4. Expected cost of 2006 PRV surveillance effort versus proposed option 2



Discussion and conclusions

A group of PRV experts was assembled by the NSU in 2005 to assist in writing the surveillance plan. The group consisted of Drs. Lowell Anderson, Mark Schoenbaum, and John Korslund, and was led by Eric Bush. These persons characterized the surveillance streams, characterized the risk/prevalence of the populations sampling by the streams, rated the values of the sampling methods of the streams, and proposed sampling options for the surveillance planning framework previously described.

Current surveillance for PRV is based on slaughter testing of sows/boars and finishing pigs with a contribution from the passive reporting of unusual swine cases to regulatory officials (FAD investigations). These surveillance approaches carry on from a time where PRV was common in the swine population. At that time, scanning surveillance based on these approaches was effective in detecting PRV.

The experts concluded, and this is reflected in their scorings, that more targeted approaches are now preferred for both rapid detection and cost efficiency. The two most important objectives identified at a PRV surveillance summit in Des Moines in 2005 were 1) rapid detection of PRV in commercial swine, and 2) demonstrating freedom of PRV in commercial swine.

Tables 1 and 2 list the weights for each objective and stream, based on several discussions by the experts in face-to-face meetings. In the most recent meeting, April 2007, the goal for rapid detection was changed from (95 percent of detection of 1 in 1 million) 2 months to 1 month; this reflects the desire for more rapid detection. The demonstrating freedom objective's goal remained the same at 95 percent confidence of detecting 0.05 percent prevalence within 1 year.

Figure 1 substantiates the idea a change is needed in current surveillance methods for PRV. Given the ratings of the experts, current surveillance falls short of the goal set for rapid detection (expected to be 12.3 percent of the goal). Demonstrating freedom effort is very much over the goal at 8,427 percent. Switching to more targeted approaches would booster the first objective and reduces the second.

Optional surveillance plans were discussed in the past several meetings. Surveillance plan option 2 is the plan discussed at the last face-to-face meetings of the experts and is the subject of Figure 2. Option 2, with 10 streams at the sampling levels discussed by the experts, has expected achievement of the goals of 131 percent (rapid detection), and 332 percent (demonstrating freedom).

Cost effectiveness was part of the discussion of the sampling levels of each stream. Figure 3 rates the cost effectiveness of each stream under each objective. A higher stream score per dollar indicates a more cost-effective stream as compared to the other streams under that objective. As expected, the slaughter streams were very cost-effective for demonstrating

freedom but more targeted streams such as diagnostic lab samples and sero-surveillance were much more cost-effective for rapid detection of PRV.

Finally, Figure 4 compares the overall cost of our current surveillance effort (based on 2006) and proposed option 2. Possible reductions in cost might approach one-third of current costs.

The material presented here on PRV surveillance is a work in progress. Further work is necessary. I would expect reevaluating, reweighing, reoptimization of samples sizes and costs, and other adjustments may be necessary to reflect knowledge gained during the life of any surveillance plan. For example, quite a few of the streams have been proposed but have not been implemented. These streams might perform much differently than originally expected. Such information might not be available until a plan has been implemented for a year or two. Such adjustments to the surveillance plan should be ongoing.

More work might also be necessary before implementation of a new surveillance plan for PRV. It may not be possible to implement some streams. Other streams may be modified or added. Significant changes would require the experts to reweigh the streams. We have always had a face-to-face meeting to update the weights – perhaps this could be done on conference call but direct meetings would be preferred. Reoptimization of the sample sizes and resulting costs might be needed if streams are dropped, added or combined. PRV program managers and veterinary epidemiologists with knowledge of the virus and commonly used surveillance mechanisms and sampling approaches are considered experts.

One of the strengths of this SRW planning framework is that changes to the parameters of the plan can be made relatively rapidly. A new modified plan can be devised with surveillance streams, sample sizes, and expected cost, and expected performance. The experts spent considerable time to objectively come to a consensus on weighting the surveillance streams and objectives. The result is a surveillance plan with parameters that are more realistic and acceptable to a broader audience.

Appendix Two

Response to Risk Analysis Request

Pseudorabies Surveillance Implementation: High-Risk Herd Surveillance Stream

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Background

Pseudorabies virus (PRV), also known as Aujeszky's disease, was eradicated from the commercial swine population in 2003. In spite of this, the virus is still maintained in the feral swine population and may be found occasionally in swine operations exposed to feral swine.

In light of the eradication of PRV from the commercial population, the need to create a post-eradication pseudorabies surveillance plan was recognized at the 2004 United States Animal Health Association meeting. The NSU was charged with developing a comprehensive surveillance plan for PRV, primarily to consolidate State-based case-finding activities into a coordinated national plan for surveillance testing to detect PRV infection in the commercial sector and prove disease freedom.

One objective of the National Pseudorabies Surveillance Plan is to monitor the risk of disease introduction. In 2005, a risk assessment was conducted at the USDA's Centers for Epidemiology and Animal Health (CEAH). This assessment, titled "Assessment of the Risk on a State-by-State Basis for Reexposure of Commercial Production Swine Herds in the United States to Pseudorabies Virus," identified States at high risk for PRV exposure or disease spread in commercial herds.

The National Pseudorabies Surveillance Plan used this risk assessment as the basis for a targeted surveillance stream, which focuses on herds shipping pigs interstate from high-risk counties in the 24 States identified. The targeted surveillance of high-risk herds has been identified as an important stream for rapid detection of PRV reintroduction.

As the PRV Surveillance Plan reaches completion, the APHIS-VS swine program staff is preparing for implementation beginning in 2008. In an effort to allocate resources for surveillance implementation, the swine staff and PRV surveillance team need an accurate description of the resources and information available at the State and county level. In order to implement the targeted surveillance stream for high-risk herds, the swine staff requested the assistance of the Risk Analysis Team at CEAH (June 12, 2007).

Objectives

The objective of the request was to determine the time, information and funds needed to accomplish targeted surveillance in commercial swine in high-risk counties (counties documented to contain feral swine).

Currently, little information is available to determine how many high-risk herds are located in these counties, or their proximity to feral swine. In order to determine the resources needed to implement the surveillance plan and determine the status of the herds in high-risk counties, the Risk Analysis Team was asked to answer four questions:

1. What data we currently have and what is still required to obtain lists of susceptible farms, particularly "commercial" farms by county and State;
2. The value of GIS technologies in obtaining this information;
3. An estimate of the manpower required in acquiring this information in counties with no, low, medium, or high numbers of commercial swine premises; and
4. Numbers of shipments and numbers of pigs shipped interstate from each State.

Methods

Upon evaluation of the request, there were questions about what role the Risk Analysis Team would play advising the implementation and resource allocation of the PRV surveillance plan. However, in order to assist swine staff and others, we evaluated each of the four questions to determine the current resources available. We also made recommendations on what resources would be needed in an effort to answer these questions.

Evaluation and recommendations:

1. What data we currently have and what is still required to obtain lists of susceptible farms, particularly "commercial" farms by county and State.
    a. The most current data for feral pig distribution are from 2004 (SCWDS). The surveillance plan relies heavily on the accuracy of determining feral swine populations to define risk.
    b. The domestic swine population data available to the Risk Analysis Team are census data from the National Agricultural Statistics Service (2002). These data include the number of animals, number of premises, and some indication of proportion of production types at the county level. This data, however, does not capture the production systems used, the location of animals, or the level of biosecurity on these premises.
    c. In order to classify "susceptible" farms, we need a consistent definition of "susceptible" farms. The current surveillance plan identifies "exposed" commercial swine as domestic swine raised in facilities with outdoor access in areas with feral swine. This level of information is not available through NASS; however, State or industry groups may have some of this information.
    d. The sampling design of the surveillance plan is based on three characteristics:
        i. Facilities with any outdoor access;
        ii. Total confinement facilities; and
        iii. Total confinement facilities plus perimeter fence.

    If sampling is to occur based on these characteristics, the classification of farms would also have to be based on these characteristics. No data are

available at the national level to do this. The results of the NAHMS Swine 2007 Small-Enterprise Swine study may provide some information to help make generalizations, but this information would not provide the county-level information needed to implement this sampling technique.

e. An agreed-upon classification system for premises needs to be developed, and this definition used consistently, to classify farms according to their level of risk, creating a compartment effect.
f. The process of identifying and classifying premises would be streamlined through an animal and premises identification system. However, without participation in the National Animal Identification System or similar system, this option will not be universally available. Therefore, field personnel (animal health technicians or veterinary medical officers) would need to identify each farm in each county with feral pigs to assign the farm to the appropriate compartment (based on set definitions rather than subjectively). The burden of obtaining this level of information would vary with each State and can only be estimated by the States.
g. If the susceptibility of farms is dependent on the distribution of feral pigs in a county, a more consistent method for reporting feral pig populations must be agreed upon. An effective passive reporting system would require public education to ensure reporting.
h. Animal movements, from an area where domestic swine may be exposed to feral swine, may spread PRV in domestic populations. So it is important to note that the sampling design noted in d) above does not reflect the movement of pigs within a production system, intrastate, interstate, or through sale barns. Data appropriate to this risk factor will also be required. These data are not currently available in a single national system, although some States maintain databases of interstate movements. We are not aware of reliable, centralized data sources for swine intrastate movements, although some States may have those data (see 4 below).

2. The value of Geographical Information System (GIS) technologies in obtaining this information
    a. GIS would be extremely helpful in analyzing risk in a geographic area. However, these analyses would be dependent on information obtained in question 1, particularly the location, biosecurity, and classification of farms as well as feral swine distribution. Without this information, the usefulness of GIS would be limited.
    b. The use of Global Positioning Systems (GPS) would be valuable to collect farm locations if a survey is conducted to obtain the answers from question 1. All field personnel would need to be trained in the use of GPS units and enter the data in a standard VS format.

3. An estimate of the manpower required in acquiring this information in counties with no, low, medium, or high numbers of commercial swine premises.

a. The manpower required to obtain this information would be determined at the State level, as each State will have varying swine populations and current staff available for survey work.

4. Numbers of shipments and numbers of pigs shipped interstate from each State.
    a. Generalizations of interstate pig movements have been obtained from the 2006 NAHMS study, but this cannot be applied to the county level (or even state level in some instances).
    b. Obtaining accurate information at this level depends on the participation of the AVIC, State Veterinarian and accredited veterinarians with electronic Certificate of Veterinary Inspection (eCVI).
    c. An Outlook Report by the Economic Research Service (ERS) was done in 2003 titled "Interstate Livestock Movements." The paper is based heavily on a survey administered in 2001 to each State AVIC. Summary results of certificates of inspection were reported back for each major livestock commodity including hogs. There are some major concerns with the use of these data. Due to response rates and the change in the hog industry since 2001, these data may not accurately reflect the industry today. Mandatory use of the eCVI national database will help in obtaining this information electronically and more completely. At a minimum, a new survey of States would be helpful in determining the current capacity in their State to perform this function.

Further Recommendations

The Risk Analysis Team is effective in analyzing data; however, we cannot generate this data. In order to determine the resources needed in each high-risk state, as defined by the previous risk assessment, an accurate picture of each State must be obtained.

In order to obtain this information, a few suggestions are made. First, all parties participating in the PRV surveillance plan must agree on what definitions will be used to classify premises and their risk levels. Second, a survey of the high-risk States, through the regional offices, would identify current resources in each State. This would also be used to determine availability of data on interstate transport and other information needed for classification of premises, according to the agreed-upon standard definition.

After the results of this survey have been analyzed, a determination can be made to see if a field survey of each premises is needed or if the data available at the State level are adequate.

It is possible that "expert opinion" could be used to identify relative classifications for the domestic swine farms in counties, based on general information about the population in those counties. However, such data can be difficult to document, and will not be as valuable as accurate information about the characteristics of interest in this population.

In addition, maintaining an accurate description of feral swine populations is necessary if risk is defined as proximity to feral swine and this database should be maintained on a regular basis.

Conclusion

Based on the limited available data, the Risk Analysis Team believes little analysis can be done at this time. For now, we can offer our assistance in helping the surveillance team define risky populations, add economic questions within surveys, and help edit surveys to the States. If data become available, the Risk Analysis Team would be in favor of revisiting possible analysis opportunities.

Appendix Three

PRV Surveillance Implementation Plan FY 2008

Year	Item	Target Beginning Date	Target Completion Date	Responsible Parties	Measure of Success
2008	Develop and seek approval of a Regulatory Work Plan that is compatible with the revised surveillance plan	12/1/2007	1/31/2008	NCAHP staff with consultation with WERC staff and RAD-PPD	Approved regulatory work plan
2008	Submission and official validation of a PRV PCR test for antigen detection in diagnostic labs	1/1/2008	3/31/2009	NVSL (NAHLN coordinator)	Successful validation or 1 PCR antigen diagnostic test for program work
2008	Discussion, revisions, and approval of the PRV Surveillance plan	1/31/2008	1/31/2008	NSU-> VSMT	VSMT Plan Approval
2008	Formation of information technology (IT) PRV-SB Change Control Board (CCB) to address IT development issues.	3/1/2008	6/30/2008	NCAHP staff, NSU, Regional Swine Epidemiologists, CADIA IT staff	Submission and approval of CCB board list by NCAHP and CADIA-AIM staffs
2008	Dialogue with Regional staffs, Area Offices, and State partners regarding business rules for sample collection, shipment, and data submission / handling in the cooperative PRV surveillance program.	3/1/2008	9/30/2008	NCAHP staff, Regional Swine Epidemiologists, CADIA IT staff	Document with NCAHP staff and Regional Epidemiologist-approved state sampling plans
2008	Dialogue and decision-making with APHIS-WS regarding business rules and funding needs for cooperative sample collection and diagnostics for targeted feral swine surveillance activities	3/1/2008	9/30/2008	ASEP staff and Wildlife Services (Seth Swafford, Brandon Schmit)	Signed MOU between WS and NCAHP
2008	Dialogue and decision-making with NAHLN-NVSL regarding business rules and funding needs for integration of PRV assay testing into the NAHLN network, leading to informal MOU between NVSL (NAHLN) and NCAHP.	3/1/2008	9/30/2008	NCAHP staff and NAHPP ADA (Dr.Dick), NAHLN	Signed MOU between NVSL and NCAHP
2008	Discussions with regulatory and laboratory stakeholders on surveillance program transition (much less serology, different surveillance streams, re-directed funding), leading to an acceptable 5-year transition plan.	3/1/2008	10/31/2008	NCAHP Directors and NAHPP ADA (Dr.Dick)	2008 USAHA Resolution approval
2008	Dialogue with industry and regulatory partners regarding adoption of premises-based program ID and eCVI interstate movement reporting for program management	4/1/2008	10/31/2008	NCAHP and SIP staff and NAHPP ADA (Dr.Dick)	2008 USAHA Resolution approval
2008	Development by PRV-CCB of a detailed IT compact (specifications) for AHSM-UDB PRV database and Integrated Swine Surveillance front-end interface.	8/1/2008	9/30/2008	NCAHP staff, NSU, Regional Swine Epidemiologists, CADIA IT staff	Signed compact with detailed development specifications between NCAHP and CADIA-AIM

PRV Surveillance Implementation Plan FY2009-2010

Year	Item	Target Beginning Date	Target Completion Date	Responsible Parties	Measure of Success
2009	Initiate cutback in cull sow-boar sampling to 50% of 2008 levels **(350,000)**	10/1/2008	12/31/2008	NCAHP staff and Regional Epidemiologists	Drop in volume of samples collected at legacy PRV testing labs to 350,000
2009	Complete development of D-Lab modules of AHSM PRV database tied in with NAHLN HL-7 messaging	10/1/2008	3/31/2009	CADIA IT, PRV CCB	Functioning database capable of receiving serology and tissue results from 10 NAHLN Labs
2009	Initiate contracts to collect samples from diagnostic lab streams	1/1/2009	3/31/2009	NCAHP staff and Regional Epidemiologists	Have 10 signed cooperative agreements or contracts in place by 3/31/2009
2009	Initiate contracts with NAHLN labs to test PRV D-Lab and feral swine samples	1/1/2009	3/31/2009	NAHLN	Have 10 signed cooperative agreements or contracts in place by 3/31/2009
2009	Plan and coordinate development of premises-based slaughter surveillance program for sows/boars- infrastructure	1/1/2009	9/30/2010	NCAHP/ Regional Epidemiologists, SIP (ID) staff, industry (NPB, individual slaughter facilities	20 largest sow slaughter plants capable of ***targeted*** collections of premises-tagged sow blood into bar-coded tubes
2009	Plan and coordinate development of premises-based slaughter surveillance program for market swine-infrastructure	1/1/2009	9/30/2010	NCAHP/ Regional Epidemiologists, SIP (ID) staff, industry (NPB, individual slaughter facilities	15 largest market slaughter plants capable of ***targeted*** collections of premises-tagged meat juice samples into bar-coded tubes
2009	Complete development of premises ID and eCVI input modules of AHSM PRV database tied in with field web-based and MIM inputting NAHLN HL-7 messaging	5/1/2009	12/31/2009	CADIA IT, PRV CCB	Functioning database capable of receiving premises and movement data from individual states.
2010	Initiate cutback in cull sow-boar sampling to 50% of 2009 levels **(175,000)**	10/1/2009	12/31/2009	NCAHP staff and Regional Epidemiologists	Drop in volume of samples collected at legacy PRV testing labs to 175,000
2010	Initiate contracts with NAHLN labs to test PRV D-Lab, slaughter serology and meat juice samples	1/1/2010	3/31/2010	NAHLN	Have 10 signed cooperative agreements or contracts in place by 3/31/2010
2010	Develop premises-based sow-boar slaughter serology surveillance database, with slaughter plant-based data entry (web and/or MIM) and NAHLN HL-7 messaging	1/1/2010	12/31/2010	CADIA IT, PRV CCB	Functioning database capable of receiving serology results (HL-7) and animal premises data from slaughter facilities.
2010	Develop premises-based market swine slaughter serology surveillance database, with slaughter plant-based data entry (web and/or MIM) and NAHLN HL-7 messaging	1/1/2010	12/31/2010	CADIA IT, PRV CCB	Functioning database capable of receiving serology results (HL-7) and animal premises data from slaughter facilities.