

Comprehensive surveillance plan for Pseudorabies in the United States

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Abstract

In 2005, all States in the United States reached Stage V – Free status in the national Pseudorabies (PRV) eradication campaign. As a result, the USDA's National Surveillance Unit (NSU) developed a comprehensive surveillance plan for PRV in the US. This objectives based plan covers the rapid detection of PRV introduction into commercial swine, surveillance of risk factors related to this introduction, surveillance to assess the progress in PRV education programs, and surveillance to document disease freedom to facilitate trade. The introduction of PRV into commercial swine may occur through recrudescence of the virus or reintroduction. A pathways risk assessment was conducted to determine the mechanisms by which reintroduction was most likely to occur and in which populations. Surveillance programs for rapid detection were designed accordingly and are presented in this paper. Also presented are design specifications for surveillance programs developed to monitor the magnitude of risk factors for reintroduction. The efficient development and integration of animal health surveillance programs requires a comprehensive surveillance plan that can be to prioritize and coordinate surveillance activities.

Introduction

The pig is the only natural host for Pseudorabies Virus (PRV), a contagious herpesvirus causing reproductive problems such as abortions, stillbirths, mummies, and infertility. Death loss, especially in suckling pigs, can be extremely high. Pigs that survive develop a permanent latent infection. PRV infection may be lethal in other species as well including cattle, sheep, goats, raccoons, rats, cats, and dogs.

The State/Federal/Industry PRV eradication program culminated with the declaration by the PRV Control Board at the 2004 USAHA meeting that all States had achieved Stage V – Free status. In light of this achievement, they recognized the need for United States Department of Agriculture (USDA) to conduct a complete overhaul of PRV surveillance. As a result, the National Surveillance Unit (NSU) was charged with developing a comprehensive surveillance plan for PRV.

The objectives of PRV surveillance covered in this comprehensive plan include the following:

- Objective I: Surveillance for rapid detection of PRV in US commercial swine.
- Objective II: Monitor the risk of introduction of PRV into US commercial swine.
- Objective III: Surveillance of international PRV status.
- Objective IV: Surveillance to assess progress in PRV educational campaigns

This paper discusses the reasons for conducting PRV surveillance. Each of the four objectives will be briefly described in this paper, including the rationale for these objectives.

Surveillance for rapid detection of PRV in US commercial swine

The first objective of the PRV surveillance plan is to conduct surveillance for rapid detection of PRV in US commercial swine. PRV is a newcomer to the list of foreign animal diseases and has a very peculiar feature – it is foreign to a specific segment of the swine population, i.e. commercial swine production while still being present in other segments, i.e. feral swine and transitional herds.

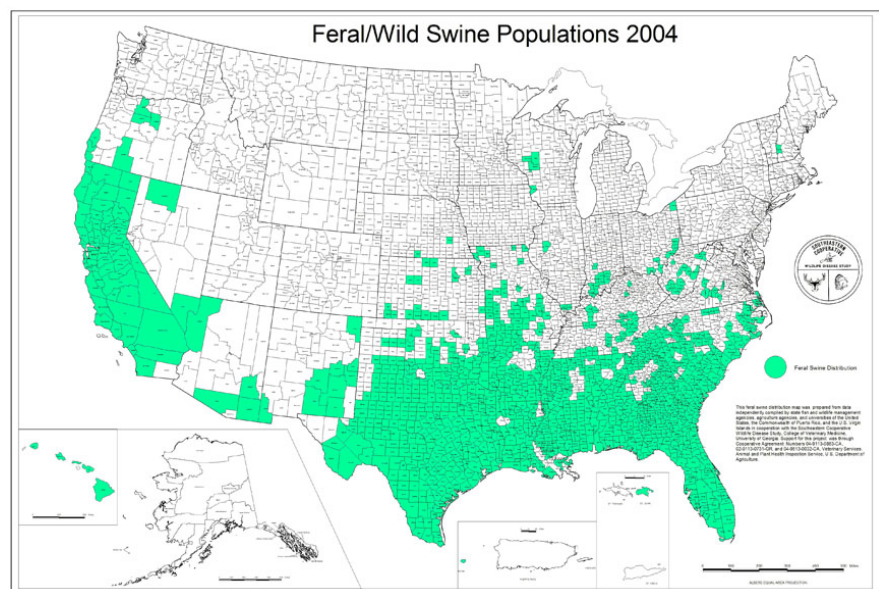
In 2005, CEAH's Trade Risk team conducted an "Assessment of the Risk on a State-by-State Basis for Re-exposure of Commercial Production Swine Herds to PRV in the US." Dr Tom Kasari lead this pathways risk assessment and presented his findings to the NSU in June, 2005. The two primary means by which PRV may reappear in US commercial swine is via reactivation in an old sow or reintroduction by exposure to feral swine.

Cases where reactivation is a clinical event (recrudescence) will be identified through laboratory-based surveillance of submissions which feature high mortality in pigs, central nervous system (CNS) symptoms in suckling pigs, abortions, and other signs of reproductive failure. Where suspicion of PRV is high, the case may be reported to animal health officials for further investigation. The most efficient surveillance mechanism to detect reactivation without overt clinical symptoms will be random testing of cull sows at slaughter for PRV exposure.

Reintroduction of PRV into commercial swine would most likely occur either via direct exposure to free-roaming feral hogs but could also occur via in-direct exposure to wild boar hunting clubs. The majority of feral swine are found in the southern most states. Southern states that have the preponderance of feral swine also have mostly small scale farms. In these states, the surveillance population will be defined by those swine moving through livestock markets and monitored via market-based surveillance for PRV exposure. For all other states that have relatively few counties with feral swine, the surveillance population will be defined by all outdoor farms in these counties. Surveillance will be conducted via on-farm testing on a routine basis and in response to passively reported "direct exposure" events between feral swine and commercial swine. The case definition for a "direct exposure" event would be physical contact (feral swine which have gained access to the swine facilities or pens) or fence line contact (feral swine spotted along the fence) with feral swine.

Monitor the risk of introduction of PRV into US commercial swine

Adequate preparation for disease emergencies involves more than just the rapid identification of a foreign animal disease (FAD) but also entails monitoring the associated risks so that preventive steps can be taken and the introduction of a FAD possibly averted. Therefore, objective II of the PRV surveillance plan is to monitor the risk of introduction of PRV into US commercial swine. The greatest risk of introduction of PRV into commercial swine comes from exposure to feral pigs. Since PRV remains endemic in feral swine, the distribution of the feral swine population is important to monitor. Feral swine moving into new areas poses increase risk of introduction into commercial swine. The risk is also elevated if the PRV prevalence in feral swine increases. Another aspect of the risk of introduction that will be monitored is the size of the population at risk of exposure, i.e. outdoor production sites. These risks have an impact on the likelihood of successful transmission of PRV from feral swine to commercial swine via direct exposure events.



Surveillance of international PRV status

A specific instance of objective II is the surveillance of PRV status of other countries (Objective III). The PRV status of neighboring countries and trading partners is particularly important and will be summarized on a regular basis through various sources. Specialized software for data mining of electronic information sources will be used to rapidly identify and analyze information related to PRV outbreaks. Identification of portals of entry of particularly high risk for disease introduction can be useful in meeting this objective, e.g. surveillance of sentinel herds in proximity to the Mexican border.

Surveillance to assess progress in PRV educational campaigns

A common application of surveillance data is to assess progress made in national disease control programs. Most commonly this is applied to national eradication campaigns but the principal can and should be applied more generally to other control programs including educational campaigns designed to change behavior. Therefore, objective IV is to conduct surveillance to assess progress in PRV educational campaigns. Education is needed on several fronts. One is for State Agriculture Departments to incorporate a standardized definition of “at risk” herds. An “at risk” herd is a swine production site that has some portion of production outdoors and is located in an area known to have feral swine where there is potential for contact.

A second educational need is for a PRV awareness campaign directed towards producers and practitioners to aid in passive reporting of suspicious PRV cases akin to other foreign animal diseases. A third is the need to educate producers on the risks associated with feral swine, what biosecurity measures can be taken to prevent disease transmission from feral swine and the how to report direct exposure events.

Surveillance to document freedom of PRV in US commercial swine

A final objective in a comprehensive surveillance plan for PRV would be surveillance to document freedom of PRV in US commercial swine. The PRV planning team believes at this time that if the suite of surveillance programs for objective I are fully implemented, that no additional surveillance will be necessary to document disease freedom.

Conclusion

The comprehensive surveillance plan for PRV described in this paper is an example of objectives-based surveillance developed according to the standard guidelines of USDA’s National Surveillance Unit. Comprehensive surveillance goes beyond running diagnostic tests but includes monitoring other indicators over time that are related to risks, hazards, and exposures of PRV.