

SWINE HEALTH INFORMATION CENTER

FINAL RESEARCH GRANT REPORT

Development of a Transboundary Swine Disease Information Resource (15-181 SHIC)

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Industry Summary: Transboundary diseases are defined as those that are highly contagious, spread quickly, cross national borders, and cause serious impact to the economy and animal health. Porcine epidemic diarrhea (PED) is a transboundary disease that entered the United States in 2013. As PED spread throughout the country, causing high death rates in newborn pigs, it became clear that the swine industry could better prepare for future transboundary disease outbreaks.

Many transboundary diseases affecting pigs are not well understood. The Center for Food Security and Public Health (CFSPH) developed factsheets that describe 24 diseases of concern for the swine industry. These factsheets contain information on the viruses themselves, cleaning and disinfection, current locations where the viruses are found, animals that the viruses are found in, ways that the viruses are spread, signs of infection in pigs, methods of diagnosis in pigs, vaccines, and ways to prevent/control disease. The CFSPH also designed a quick reference guide that lists diagnostic tests that have been described for each virus.

The viruses that were researched include the following: encephalomyocarditis virus, filoviruses: African (e.g., Ebola) and Reston species, Getah virus, hepatitis E virus, influenza C and D viruses, Japanese encephalitis virus, Menangle virus, Nipah virus, porcine adenovirus, porcine astrovirus, porcine cytomegalovirus, porcine kobuvirus, porcine rubulavirus ("blue eye", porcine sapelovirus, porcine sapovirus, porcine teschovirus, porcine torovirus, pseudorabies virus, Sendai virus, Seneca Valley virus (also known as *Senecavirus A*), swine papillomavirus, swine pox virus, vesicular exanthema of swine virus, and vesicular stomatitis virus.

The materials developed by CFSPH will serve as an information source for veterinarians, swine producers, and other industry groups. The factsheets are available on the Swine Health Information Center (SHIC) website at: <http://swinehealth.org/fact-sheets/>.

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Scientific Abstract: Recognizing the likelihood of future transboundary disease outbreaks, an information resource was created by the Center for Food Security and Public Health (CFSPH) for the Swine Health Information Center (SHIC). Focusing on 24 poorly understood transboundary production diseases, this resource will help guide industry decisions related to

priorities for preparedness. A literature review was conducted for each of the 24 diseases covering etiology; cleaning and disinfection; epidemiology; transmission; pathogenesis, clinical signs, and postmortem lesions associated with infection in swine; diagnostic tests; immunity; prevention and control; and gaps in preparedness. A one-to-two page summary for each disease was also prepared, providing producers, veterinarians, and industry personnel an abbreviated version of each review. These resources have been published on the SHIC website at <http://swinehealth.org/fact-sheets/>. In addition, a quick reference guide was prepared detailing diagnostic testing information described in the literature, covering each of the viruses listed below.

- Encephalomyocarditis virus (EMCV)
- Filoviruses: African (e.g., Ebola) and Reston species
- Getah virus (GETV)
- Hepatitis E virus (HEV)
- Influenza C (IVC) and D (IVD) viruses
- Japanese encephalitis virus (JEV)
- Menangle virus (MenPV)
- Nipah virus (NiV)
- Porcine adenovirus (PAdV)
- Porcine astrovirus (PAstV)
- Porcine cytomegalovirus (PCMV)
- Porcine kobuvirus (PKoV)
- Porcine rubulavirus ("blue eye", PoRV)
- Porcine sapelovirus (PSV)
- Porcine sapovirus (PSaV)
- Porcine teschovirus (PTV)
- Porcine torovirus (ToV)
- Pseudorabies virus (PRV)
- Sendai virus (SeV)
- Seneca Valley virus (SVV, also known as *Senecavirus A*)
- Swine papillomavirus (SPV)
- Swine pox virus (SwPV)
- Vesicular exanthema of swine virus (VESV)
- Vesicular stomatitis virus (VSV)

Introduction: The emergence of production diseases that are newly recognized, poorly characterized, and/or not currently found in the United States is a major concern for the swine industry. In particular, transboundary diseases—defined as those that are highly contagious, spread quickly, cross national borders, and cause serious impact to the economy and animal health—have the potential to negatively affect swine operations. The 2013 emergence of porcine epidemic diarrhea (PED), and its subsequent spread throughout the country, demonstrated that preparedness for emerging transboundary diseases should be improved. The Swine Health Information Center (SHIC) has identified 24 poorly understood transboundary production diseases, and funded a new information resource that aims to improve industry readiness and response should these diseases emerge in the United States.

Objectives:

1. Perform a literature review for each of the disease listed—encephalomyocarditis virus (EMCV), filoviruses: African (e.g., Ebola) and Reston species, Getah virus (GETV), hepatitis E virus (HEV), influenza C (IVC) and D (IVD) viruses, Japanese encephalitis virus (JEV), Menangle virus (MenPV), Nipah virus (NiV), porcine adenovirus (PAdV), porcine astrovirus (PAstV), porcine cytomegalovirus (PCMV), porcine kobuvirus (PKoV), porcine rubulavirus

("blue eye", PoRV), porcine sapelovirus (PSV), porcine sapovirus (PSaV), porcine teschovirus (PTV), porcine torovirus (ToV), pseudorabies virus (PRV), Sendai virus (SeV), Seneca Valley virus (SVV, also known as *Senecavirus A*), swine papillomavirus (SPV), swine pox virus (SwPV), vesicular exanthema of swine virus (VESV), and vesicular stomatitis virus (VSV). The acquired information will be used to complete the remaining objectives.

2. Develop a document, including a summary matrix, with information on available diagnostic tests for each of the transboundary production diseases listed in objective 1, as well as gaps in diagnostic preparedness.
3. Develop a white paper for each of the transboundary production diseases listed in objective 1 using the specified outline (etiology; cleaning and disinfection; epidemiology; transmission; pathogenesis, clinical signs, and postmortem lesions associated with infection in swine; diagnostic tests; immunity; prevention and control; and gaps in preparedness).
4. Develop a one-to-two page overview for each of the diseases listed in objective 1.

Materials & Methods:

Objectives 1, 3, and 4: For each of the 24 identified diseases, a literature search was performed using search engines such as PubMed and GoogleScholar. Scientific papers were collected and reviewed; a white paper was then composed for each transboundary disease according to the format specified in objective 3. A shorter summary document was included as part of each white paper.

Objective 2: An in-depth search was conducted for each of the 24 diseases to identify diagnostic testing methods that have been described. First, the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2015 was consulted; however, if the Manual did not yield data on the testing methods approved by the OIE for a specified disease, then diagnostic test catalogs for laboratories (e.g., NAHLN, university laboratories, private laboratories, etc.) were searched. Once laboratory catalogs were exhausted, a detailed literature search, using search engines such as PubMed and GoogleScholar was conducted. Results were recorded in two formats: 1) a disease diagnostic matrix; 2) a matrix supplement. The matrix is comprised of a table format listing the disease, test options, and a "yes" or "no" indicating if the testing method was described for that particular disease. Clarification of the diagnostic methods described was recorded in the matrix supplement. Tests that had been described in research were specified in the supplement as a validated or non-validated method.

Results: Information collected from the scientific literature was formatted and presented as described above.

Discussion: The purpose of this project was to develop an information source for veterinarians, swine producers, and other industry groups. This information should be used by the industry to enhance preparedness and response capabilities for transboundary diseases. Increased awareness of these diseases, by swine producers, veterinarians, and industry personnel, can also aid in the rapid detection and diagnosis of transboundary diseases, should they emerge in the United States.