



Swine Health Information Center

# Swine Health Information Center 2021 Progress Report

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## Executive Summary

### Swine Health Information Center

#### Swine Health Information Center Organization (additional information on page 14)

The Swine Health Information Center (SHIC) began operation as a 501(c)(3) corporation on July 4, 2015. The mission of SHIC is to protect and enhance the health of the United States swine herd through coordinated global disease monitoring, targeted research investments that minimize the impact of future disease threats and analysis of swine health data.

The National Pork Board (NPB), National Pork Producers Council (NPPC) and the American Association of Swine Veterinarians (AASV) have each appointed two representatives to the SHIC Board of Directors. Three at-large producer representatives are also members of the Board. The Board approved a 2021 operating budget, a 2021 Plan of Work and a plan for FDIC insured investments, that is modeled after that of the National Pork Board.

A Monitoring and Analysis Working Group and a Preparedness and Response Working Group have been formed to provide program oversight and decision-making. Each are actively meeting via conference calls to fulfill their respective objectives.

When the Swine Health Information Center was formed July 1, 2015, by a grant of Checkoff funds from the National Pork Board, it was with the understanding it was a five-year project. The proposal language surrounding the Center's formation stated, "Funding of the Center past its five-year life will depend on it being able to demonstrate a sufficient return on the investment to justify keeping it running." During 2021, the National Pork Board's Board of Directors voted to provide \$15M to continue to fund SHIC's work through 2027.

#### Swine Health Information Center 2021 Outreach (page 15)

There has been personal outreach to pork producers, veterinarians, academics and researchers, allied industry and state and federal animal health officials to foster collaboration, develop projects, increase understanding of SHIC and its mission and inform them about the research and programs. Their feedback has helped focus and refine SHIC responsibilities, research and programs. Presence and participation in international meetings and with international organizations have helped to monitor swine diseases and issues around the world.

## Progress on the Swine Health Information Center 2021 Plan of Work

### Preparedness

#### Study Validated US Pork Industry Biosecurity Measures and Pathway Awareness

A study to identify US pork industry gaps in biosecurity defenses against foreign animal diseases, funded by the Pork Checkoff and SHIC, found no major areas have been overlooked in efforts to prevent the introduction of African swine fever (ASF) to the United States. The study reinforced the importance of continued on-farm biosecurity diligence for known pathways and identified feed and

feed ingredient imports risks as a priority area of focus and critical opportunity to bolster defenses against ASF. (page 18)

#### **Canadian ASF preparedness webinar**

Canada's Swine Innovation Porc hosted a webinar titled, "African Swine Fever: How Is Canada Getting Prepared?" in January 2021. SHIC presented US-focused preparedness efforts, and emphasized the US-Canada collaborative nature of several projects. (page 18)

#### **SHIC-Funded Quantitative Risk Assessment Modeled US Risk of ASF Introduction in Feed**

Researchers developed a quantitative risk assessment model to estimate the probability that one or more corn or soybean meal ocean vessels contaminated with ASFv would be imported into the US annually. This model can be used to evaluate risk mitigation strategies and critical control points for inactivating ASFv during feed ingredient processing, storage, and transport, and contribute to the design and implementation of biosecurity measures to prevent the introduction of ASFv into the US and other ASFv-free countries. (page 18)

#### **Investigation of Feed Manufacturing Facility Decontamination Processes**

Research is needed to determine optimal methods for decontaminating feed manufacturing facilities, especially equipment that is not designed to be disinfected. SHIC has funded a study to evaluate methods of decontaminating feed manufacturing equipment, using Senecavirus A, PEDv, and PRRSv contamination as domestic surrogates for foreign animal diseases. (page 18)

#### **SHIC-Funded Research Helps Compare Pathogen Detection Methods in Feed**

The genetic extraction step for PCRs is validated for animal tissues but not for plant products like feed ingredients. Researchers at Cornell University focused on comparing the performance of three commercially available nucleic acid extraction kits (CORE, IndiMag, MVP II) on feed ingredients. Results show the CORE extraction kit outperformed the other two kits evaluated. (page 19)

#### **SHIC-Funded Study Evaluated Soy Importation Data**

Understanding the sources and intended uses of products being imported to the US is vital to determining the risk of FAD disease introduction. The goal of the research was to determine which products are being imported in the highest quantities and observe potential trends in imports from FAD-positive countries. A total of 78 different countries exported soy products to the US in 2019 and 2020 with the top contributors being Canada, India, and Argentina (India and Argentina are FAD-positive countries). Soy oilcake was imported in the largest quantities. (page 19)

#### **New Study Explored the Risk and Mitigation of Foot-and-Mouth Disease Virus in Feed**

A new study, funded by SHIC, the National Pork Board and USDA-ARS, was published in July 2021, evaluating the potential risk of incursion of foot and mouth disease virus (FMDv) into naïve pig herds through contamination of feed. The goal of the project was the assessment of the viability of FMDv in commercial whole pig feed and pig feed ingredients and determining the dose required to infect pigs through natural feeding behavior. ". . . this is the first comprehensive evaluation of the risk of FMDv

infection of pigs through ingestion of contaminated feed under controlled experimental conditions,” wrote the authors. (page 19)

### **SVA Half-life in Feed and Infection Following Consumption Are Results of SHIC-Funded Study**

In a study at Cornell University researchers determined the rate of decay of Senecavirus A (SVA) in swine feed ingredients as a function of time and temperature and established half-life estimates for the virus. Feed matrices can extend the survival of SVA, protecting the virus from decay and consumption of contaminated feed leading to productive SVA infection was demonstrated. (page 20)

### **Validating laboratory-based viral survival in feed**

This project evaluated virus survival (PRRSV 174, PEDv and SVA) over long distances under conditions experienced during a commercial transport event across the continental US. We now have for the first time, evidence of viral survival in representative volumes of feed and feed ingredients during an actual long-distance commercial transport event across the continental US. (page 20)

### **SHIC Funded PRV Oral Fluid PCR and ELISA for Diagnosis and Surveillance**

The final report on a study conducted at Iowa State University to evaluate the detection of pseudorabies virus (PRV) in swine oral fluid, providing additional testing resources using real-time PCR assays, has been posted. Following exposure to a gene-deleted modified live vaccine and/or a wild-type virus, PRV DNA was detected in oral fluid specimens in a pattern similar to that of nasal swabs, which adds support to the use of this specimen in PRV diagnosis and surveillance. (page 20)

### **SHIC Funds Porcine Sapelovirus Genetic Characterization and Diagnostic Tool Development**

SHIC funded a project for genetic characterization and diagnostic tool development for a potentially emerging porcine sapelovirus (PSV) that was isolated in a diagnostic specimen from a US swine farm. (page 21)

### **SHIC Diagnostic Assay Catalog**

Diagnostic tests developed in response to Swine Viral Disease Matrix detection and epidemiological needs are available to all veterinary diagnostic laboratories that want to use them through the SHIC Diagnostic Assay Catalog. During 2021, SHIC did a systematic review of the Diagnostic Assay Catalog, contacting the researchers responsible for the upkeep and access to the tests in it to make sure the catalog continues to be up to date and accurate. (page 21)

### **SHIC Funds Porcine Sapelovirus Genetic Characterization and Diagnostic Tool Development**

SHIC funded a project for genetic characterization and diagnostic tool development for porcine sapelovirus (PSV). PSV infection is commonly asymptomatic, but clinical disease of respiratory failure, diarrhea, reproductive disorder, and polioencephalomyelitis have been reported in swine farms from many countries. (page 21)

### **Veterinary Diagnostic Laboratory Lessons Learned from COVID-19 Testing Assistance**

The veterinary diagnostic laboratories were enlisted to help with COVID-19 testing laboratory capacity to meet public health demand. Lessons learned from the COVID-19 experiences were analyzed with the intent to be better prepared to benefit swine health through effective response to foreign animal

or emerging diseases. (page 22)

## **Monitor and Mitigate Risk to Swine Health**

### **Global Swine Disease Monitoring Reports**

The SHIC Global Swine Disease Monitoring Report provides near real-time information on swine diseases and is communicated to the US pork industry through SHIC's monthly e-newsletter and posting online on the SHIC website. The project created and now maintains a public, private, academic partnership for its reporting. The project has been successful in collecting, organizing, critically reviewing, and communicating the expansion of ASF through Asia, Europe and Hispaniola. (page 22)

### **SHIC Requested Information about a "Mystery Swine Disease" in the Dominican Republic**

In late June reports of a mystery swine disease in the Dominican Republic were noticed by SHIC, with the help of the National Pork Producers Council and the US Animal Health Association. SHIC reached out to USDA Animal and Plant Health Inspection Service (APHIS) for more information, concerned about a novel swine disease and its potential impact on the US herd. APHIS reported they would continue to follow the situation until a firm diagnosis is achieved. (USDA confirmed ASF in the Dominican Republic on July 27.) (page 22)

### **Reminder to International Travelers: Report Lack of Secondary Screening If Needed**

SHIC offered a reminder for continued reporting of traveler experiences while going through customs entering the US, especially when coming from FAD-endemic countries. A Customs and Border Protection contact responded saying, "...flights from that area of the world should be a tactical focus and there will be follow up with the agents at that airport." (page 23)

### **Movement of Dogs from China May Pose Risk to North American Livestock Production**

Dueling animal health priorities converged as US-based rescue groups worked to save dogs from the meat trade in China, bringing them to the US and Canada for re-homing.

On August 4, 2021, USDA's Animal and Plant Health Inspection Service (APHIS) issued a Federal Order establishing additional requirements for dogs imported into the US for resale from countries where ASF exists. (page 23)

### **SHIC-Funded ASF Molecular Epidemiology Project Identified Prevention and Control Gaps**

A project to summarize current knowledge and remaining gaps regarding the molecular epidemiology of African swine fever (ASF) conducted a systematic review of current literature including, but not restricted to, genetic diversity of strains, the association between sequence data, and epidemiological or pathogenic features, and development and performance of molecular diagnostic tools. (page 23)

### **SHIC Issued Call for Research Funding Proposals: Bioexclusion and Biocontainment**

SHIC solicited proposals to investigate cost-effective, innovative technologies, protocols, or ideas to implement biocontainment in the face of an emerging disease outbreak on swine farms. The main goal of a funded proposal is to help in the decision-making process to prevent the spread of infectious bioaerosols capable of causing disease outbreaks with significant economic consequences.

SHIC also solicited proposals to investigate cost-effective, innovative technologies, protocols, or ideas to implement bioexclusion to prevent an emerging disease outbreak on swine farms. The primary objective of the selected study is to evaluate the efficacy of temperature and time for inactivating PRRSv and PEDv on experimentally contaminated surfaces commonly found at supply entry rooms in swine farms. (page 23)

#### **SHIC-Funded MSHMP and NCSU Project Models PRRS Dissemination Dynamics**

A team led by North Carolina State University researchers in collaboration with the Morrison Swine Health Monitoring Project developed and calibrated a mathematical model for transmission of PRRSv. It provides strong evidence to support the need for cautious, measured PRRSv control strategies for transportation vehicles and, to some degree, feed by-products. (page 24)

#### **SHIC/AASV Influenza Webinar Addresses Management Strategies for Seasonal Challenges**

A webinar on swine influenza management strategies that was offered by SHIC along with the American Association of Swine Veterinarians and hosted by the Iowa State University Swine Medicine Education Center had 125 people in 21 countries attending. Experts in swine influenza and related research and a practitioner with hands-on swine influenza experience presented new information about swine influenza management strategies. (page 24)

### **Improve Swine Health Information**

#### **SHIC-Funded Swine Disease Reporting System Expanded Near Real-Time Disease Information**

The SHIC-funded Swine Disease Reporting System initiative has completed another successful year. An aggregated database with diagnostic data from the Iowa State, Kansas State, University of Minnesota, South Dakota State, and Ohio State (beginning in October 2021) veterinary diagnostic labs is regularly updated and now includes more than 950,000 distinct VDL submissions tested by PCR for five US endemic swine pathogens. (page 25)

#### **Ohio Animal Disease Diagnostic Laboratory Added to the Swine Disease Reporting System Network**

Ohio's Animal Disease Diagnostic Laboratory will now be contributing data to the Swine Disease Reporting System to further enhance capabilities as a surveillance tool and for early detection of pathogens of economic consequence to US livestock production. (page 25)

#### **SHIC Reports USDA Adds Blood Swabs and Spots as Official ASF Testing Tissues**

The USDA has approved blood swabs and spots as samples for official African swine fever (ASF) testing during foreign animal disease (FAD) investigations. The full list of approved samples now includes whole blood, tonsil, spleen, lymph node, spleen swabs, blood swabs and blood spots. (page 25)

#### **SHIC: Newly Discovered Low Virulent, Genotype 1, ASF China Virus Causing Chronic Infections**

A 2021 research paper described the detection of a second ASFv strain present in two Chinese provinces. The ASF viruses described are genotype 1 viruses, distinct from the currently circulating genotype 2 virus Georgia-07 and its derivatives. Given their reduced virulence and transmissibility characteristics, it is reasonable to assume these viruses also may be present in other regions of China and Southeast Asia and may add to US risk. (page 25)

**SHIC Offers Context on Chinese ASF Outbreaks and Vaccines**

Illegal African swine fever (ASF) vaccine use in China continues, creating concern in the US swine industry. Per a January 21, 2021, report by Reuters, “A new form of African swine fever identified in Chinese pig farms is most likely caused by illicit vaccines, industry insiders say...”.

When asked by SHIC, USDA said based on their information, they fully expect available ASF PCR tests deployed in the US to be able to detect both vaccine strains. (page 26)

**Rock Offered SHIC a Review of Reported ASFv Variants Emerging in China**

A China Harbin Laboratory paper describing their analysis of African swine fever virus (ASFv) variants emerging in China as well as media and on-the-ground reports of non-approved vaccine use causing pathology, chronic infection and vaccine virus shedding raised concern. SHIC asked Dr. Dan Rock, University of Illinois, to help give some interpretation and context to the Harbin Laboratory paper and attenuating mutations of the ASFv genome such as those that could be used in unapproved vaccines and reported the results. (page 26)

**SHIC Closely Observing ASF Outbreak in Germany - Report**

Confirmation of African swine fever (ASF) on three farms in eastern Germany, where restriction zones already exist, was widely reported in industry press the week of July 12, 2021. These were the first cases of ASF in domestic pigs in Germany, however, it has been prevalent in wild boar in the nation and in neighboring Poland. SHIC continued to monitor the situation and provided detailed information in the August Global Swine Disease Monitoring Report published in the Center’s newsletter on August 4, 2021. (page 26)

**Morrison Swine Health Monitoring Project**

With more than 50% of the nation’s sow herd represented, the Morrison Swine Health Monitoring Project (MSHMP) supports monitoring swine disease incidence as a national system for emerging pathogen detection, a key element of SHIC’s mission. Progress in 2021 included emerging pathogen tool finetuning, platform building for project information sharing and successfully building a system that allows the MSHMP team to quickly understand whether a PRRSv sequence they receive for review has been seen elsewhere. (page 27)

***Strep. zoo* Added to Swine Bacterial Disease Matrix and New Fact Sheet Developed**

*Strep equi spp zooepidemicus* (*S. zoo*) was added to SHIC Swine Bacterial Disease Matrix in February 2021 and a fact sheet focused on *S. zoo* has been added to the SHIC Fact Sheet Library. (page 27)

**SHIC Developed New *Salmonella* 1,4,[5],12:i:- Fact Sheet per Industry Input**

*Salmonella* 1,4,[5],12:i:-, a serotype that can be found in swine, has become one of the most identified serotypes in pigs, pork, and humans worldwide. It captured the attention of an American Association of Swine Veterinarians member who recommended SHIC develop a fact sheet on this bacterium for the benefit of the US pork industry. (page 27)

**SHIC Swine Disease Fact Sheet Library Gets Detailed Updates**

The SHIC Swine Disease Fact Sheet Library provides information, guidance and resources for producers, practitioners, and diagnosticians who are on the front lines of swine health concerns. 2021 updated



fact sheets on Getah virus, kobuvirus, porcine sapelovirus, porcine teschovirus, Japanese encephalitis virus, high path porcine reproductive and respiratory virus (HP-PRRSV), Ebola virus, Nipah virus, porcine rubulavirus, porcine circovirus 3 (PCV3), atypical porcine pestivirus, and influenza viruses C and D have been posted on the SHIC website, [www.swinehealth.org](http://www.swinehealth.org). (pages 27 – 29)

## **Surveillance and Discovery of Emerging Disease**

### **Development of environment sampling methods for disease freedom of the barn based on spatially balanced sampling**

Currently APHIS's restocking guidance requires a minimum of 40 days downtime after active cleaning and disinfection following an ASF outbreak. This project will develop environment sampling methodologies based on spatially balanced sampling to demonstrate freedom from disease with specific high confidence to help decrease the downtime before restocking after cleaning and disinfection. (page 29)

### **SHIC/CEID Partnership Examining Swine Bacterial Pathogens Risk**

SHIC also takes seriously the potential for bacteria to cause emerging disease. To provide needed information on bacteria, SHIC executed a Memorandum of Understanding with the University of Georgia Research Foundation to become a member of the Global Infectious Disease Intelligence Consortium and work with the Foundation's Center for the Ecology of Infectious Diseases (CEID). The result will be better intelligence on possible emerging bacteria to go along with the current information on potential emerging viruses. (page 30)

### **SHIC Diagnostic Fee Support Program Provided Additional Resources**

SHIC received a call when vesicles were observed in the snout area of pigs on multiple farms in Iowa and Minnesota from January to April 2021. A total of 133 swine vesicular cases with pig ages of three to 6.5 months from Iowa farms were received by veterinary diagnostic labs. When standard diagnostic protocols did not reveal satisfying information about the cause, a request for diagnostic fee support was reviewed and approved by SHIC. The investigation is on-going. (page 30)

Early fall of 2021 three farms were showing satisfactory stability from a previous PRRS outbreak, with several weeks of all negative processing fluids and baseline numbers of abortions. Then the number of abortions on the farms spiked to twice baseline and continued to move to four to five times baseline. A request for further diagnostic support was reviewed and approved by SHIC. The investigation is on-going.

### **Study on Canine Parvovirus 2 Spillover to Swine**

A dead pig was submitted to the South Dakota State University Animal Disease Research and Diagnostic Laboratory (SDSU-ADRDL) for diagnostic testing. Unexpectedly, canine parvovirus 2 was identified. This finding led SDSU-ADRDL staff to ask for support to study spillover of the virus from the canine species to swine and the investigation has begun. (page 30)

**SHIC-Funded Research on *S. zooepidemicus* Provided New Information and Diagnostic Resources**

The emergence of *S. zoo* associated with mortalities at a level not previously seen in the US prompted SHIC to fund an investigation conducted at Iowa State University and the USDA National Veterinary Services Laboratory. The result was the first study to experimentally infect and reproduce the disease in weaned pigs with a hypervirulent swine *S. zoo* strain, to describe pathogenicity differences between genetically different swine strains, and to develop a new multiplex PCR that provides an accurate and timely assay for detecting and monitoring *S. zoo* in swine herds. (page 30)

**SHIC Acted on Diagnosis of Novel Morbillivirus in Pigs**

After extensive testing for known pathogens in 22 porcine fetuses originating in Mexico, metagenomics sequencing identified a new virus in the genus of *Morbillivirus* (PoMV). SHIC reviewed and approved a funding request to develop isolation techniques of PoMV in the laboratory and determine presence/incidence of the virus in the US swine population. (page 31)

**SHIC Pursued Information on Novel Rotavirus to Determine Risk to US Swine Herd**

Acting on media reports, SHIC queried experts regarding a novel rotavirus affecting foals in Kentucky during the spring of 2021. After consideration, those experts from the University of Kentucky (UK) Gluck Equine Research Center, the University of Minnesota, South Dakota State University, and Iowa State University advised there was no need for action as the virus was not a threat to pork production. (page 31)

**SHIC-Funded Research Identified Potential Role of PPV2 in PRDC Development**

A recently completed SHIC-funded research project on porcine parvovirus 2 (PPV2) confirmed the high prevalence of PPV2 in diseased pigs and provided insight into its significance in porcine respiratory disease complex of weanlings to finishers. (page 31)

**PCV3 Case Definition and On-farm Epidemiology Needed**

Individual case definitions have been proposed for porcine circovirus 3 (PCV3)-associated reproductive disease and systemic disease to standardize diagnostic criteria. With SHIC support, US veterinary diagnostic labs are collecting clinical signalment from practitioners who have a PCV3 diagnosis in their clients' herds and are combining it with diagnostic test results to assess a definition that might fit US pork industry needs. (page 31)

**Responding to Emerging Disease****SHIC Rapid Response Corps Investigations Exercises Rapid Response Teams**

Rapid Response Teams were invited on farms to investigate likely failures of biosecurity that resulted in PRRS 1-4-4 Lineage 1C entry onto the farms. Results were presented during a SHIC PRRS 1-4-4 Lineage 1C webinar.

In addition, a localized PED outbreak on high biosecurity sites in south-central US offered another opportunity to exercise the Rapid Response Corps. Rapid Response Teams were deployed upon the invitation of the outbreak farms and conducted an investigation. (page 32)

**Rapid Response Team Investigation Form Refined to be Used as an Industry Standard**

The SHIC Rapid Response Corp approach, methodology, forms, and reports for investigating endemic, transboundary and emerging diseases have been developed. A working group has been formed to create an industry-standard form and reporting instrument that will help assure that the most relevant information is being gathered and enable the logging of data from the investigations in a database that can be analyzed quickly for associations and patterns. (page 32)

**F18-associated Gut Edema Disease Successes, Challenges and Analyses Offered During a SHIC-AASV Webinar**

Reports of difficult cases of colibacillosis that have been associated with the F-18 fimbrial antigen and leading to gut edema disease with up to 100% morbidity and 20% mortality on some sites increased. SHIC and the American Association of Swine Veterinarians responded with a webinar, conducted by the Iowa State University Swine Medicine Education Center, to hear directly from practitioners and a diagnostician involved in these outbreaks. The webinar was attended by 139 participants from Austria, Canada, the Czech Republic, Germany, the Netherlands, Spain and the United States. (page 32)

**PRRS 1-4-4 Lineage 1C Webinars**

Midwest veterinary diagnostic labs began diagnosing PRRS 1-4-4, Lineage 1C, in late 2020 when practitioners and producers reported dramatic PRRS-like clinical signs on farms. Reacting quickly to this new PRRS line, SHIC, with co-sponsor American Association of Swine Veterinarians, offered a webinar on PRRSV 1-4-4 Lineage 1C on February 4, 2021.

Because of an unexpected second wave of outbreaks in April and May 2021 in a wider geographic distribution, a second webinar took place in July, featuring updates and discussion on SHIC Rapid Response Teams' investigations into possible pathways of entry of the virus. (page 33)

**Vietnam ASF Research**

*All projects were made possible by a USDA Foreign Ag Service grant obtained by SHIC in September of 2019 with the help of the National Pork Producers Council.*

***Projects with Final Reports*****Potential of Rodents to be a Vector in the Transmission of African Swine Fever in Two Commercial Farms in Vietnam with Differing Biosecurity Levels**

A research project examined the potential for rodents to serve as vectors of the virus. Work conducted by researchers from South Dakota State University and the Vietnam National University of Agriculture (VNUA) on Vietnamese farms with differing biosecurity levels provided information that suggests rodents are not a high risk of being ASF vectors. (page 33)

**Using Standard Laboratory PCR Testing, and Comparing Available POC Technology, to Assess the Validity of Current ASF Test and Remove Practices in Commercial Swine Farms within Vietnam.**

This project examined an ASFv control measure involving a tooth extraction, or test-and-remove, protocol. The results of this study suggest tooth extraction test-and-remove is not a reliable way to eliminate ASF from a pig farm. The project also is comparing the sensitivity and specificity of

commercially available “point of care (POC)” or pen side antigen detection tests. Results are being analyzed and are expected to be available by the spring of 2022. (page 33)

### **SHIC Grant-Funded ASF Research Projects in Vietnam Examining the Use of Serum and Oral Fluid ELISAs**

Two separate research projects being conducted in Vietnam on ELISAs continued and provided a final and a preliminary report in 2021. Goals of the first study are to generate a panel of 2000 pig serum samples with known ASF infection status, determine the diagnostic sensitivity and specificity of the ELISAs in the study using the panel, and finally to perform an inter-laboratory evaluation of the assays in the USA and Canada.

Another ELISA-based study evaluated the performance of ASF serum and/or oral fluid ELISAs for use in the surveillance and monitoring of ASF outbreaks in commercial farms in Vietnam. This study shows there is no single best diagnostic approach for ASFv surveillance and demonstrates that the combined use of PCR and indirect ELISA tests and serum/oral fluid sampling increase efficiency of ASF disease surveillance. (page 34)

### **Determining the Pathways for ASF Introduction into Boar Studs and Risk of ASF Transmission via Semen Movements During an ASF Outbreak**

A completed study modeled the risk of introducing ASF to a sow farm as a result of semen movement from apparently healthy boar studs located in an ASF disease control area. Results indicated the risk is negligible to low given study parameters, however, several factors with the potential to impact these results were acknowledged. (page 34)

### ***Projects Still in Process***

#### **Field Evaluation of Oral Fluids as a Convenient, Aggregate Sample for Early Detection of African Swine Fever**

The initial agreement between CFIA and Vietnam National University for Agriculture (VNUA) has been signed to initiate the project. Plans have been placed to selecting a suitable farm with the early stage of ongoing ASF infection to collect oral fluids. However, due to the ongoing COVID-19 outbreaks there have been unexpected delays in access to farms and international travel for VNUA laboratory support. (page 34)

#### **Supporting the Control of African Swine Fever in Vietnam**

The primary objective of the program is to enhance the capabilities of the Vietnamese veterinary workforce to prevent and mitigate the impact of ASF. It's been decided to present and discuss the design of research projects in workshop #1 and results, implementation, and significance for Vietnam in workshop #2, to compensate for the delays due to the COVID-19 emergency. (page 35)

#### **Evaluate the Diagnostic Performance of Pen-side Tests for ASF Detection**

Objectives of this project are to determine the time from infection to the earliest detection of the pen-side tests and to determine the sensitivity and specificity of the pen-side tests for detection of ASF in the field. Because of the barriers with commercial shipping, a different PCR kit commercially available in Vietnam is being used. (page 35)

### **Identifying Pathways of Entry of ASF Virus onto Farms to Enhance Information for Improving Biosecurity in Vietnam**

Objectives of the project include to use the rapid response investigation form currently used by the US Rapid Response Teams to investigate ASF pathways onto the farms; to utilize the investigation form in an electronic format which can compile the data and provide answers as soon as the data sheet is populated; and to make recommendations on how to mitigate the identified gaps in Vietnamese farm biosecurity. The project is scheduled to be completed in the spring of 2022. (page 35)

### **Time and Temperature Required for Complete Inactivation of African Swine Fever Virus**

The objective of this project is to determine the optimal baking time and temperature required to completely inactivate ASFv in aluminum surface contaminated swine feces. One major limitation of this study is that virus isolation was used as the means to evaluate virus inactivation. Pig bioassays have been started to confirm time by temperature needed for inactivation. (page 36)

## **Swine Health Information Center Communications**

To broadly disseminate SHIC information to stakeholders, a variety of communications tools are employed including the SHIC website, e-newsletter, articles prepared for partners, news releases, interviews, social media, a new SHIC Talk podcast, and webinar series. SHIC also participates in industry events – virtually in 2021 – to provide access to information essential to protection of the US swine herd. Google Analytics of SHIC website traffic are used to measure impact of media efforts.

### **1) Activity on [www.swinehealth.org](http://www.swinehealth.org) (page 36)**

Google Analytics of the SHIC website traffic are used to measure impact of communications efforts. (NOTE: these totals reflect a period when statistics for the site were disabled due to a WordPress update which disconnected Google Analytics. Consequently, overall totals are lower than previous years' reports.)

- All e-newsletters, postings, and media releases communicate to the desired SHIC audiences, providing timely and relevant information, as well as activities of the center. Top pages on SHIC website (June 1 – November 22, 2021) with (number of visits):
  - Global Disease Monitoring Reports (2,129)
  - Domestic Disease Monitoring Reports (1,197)
  - Seneca Valley Virus Summary (1,061)
  - African Swine Fever (983)
  - There were over 14,700 individual SHIC website sessions during 2021. Most visitors were from the US, Germany, Canada, and the UK with a total of 25,663 page views.

### **2) Press releases (page 37)**

- In addition to contributing to press releases issues jointly by US pork industry organizations, three SHIC-specific press releases were issued in 2021. Emails were sent to 250 ag news outlets for each press release. Farm broadcasters continued as a very important media outreach for SHIC with follow-up interviews requested after each press release was deployed. Individual emails are sent to the top five pork media editors as well as five farm broadcasters with each press release. Nearly 100% of the press releases were picked up by

these national editors and farm broadcasters covering the US pork industry, resulting in 64 one-on-one interviews with the executive director.

**3) Articles for Partners (AASV) (page 38)**

- As of December 10, 2021, 68 articles have been provided for the AASV weekly e-letter and other partners. Additionally, organizations like the US Animal Health Association (USAHA) are using SHIC information gleaned from media and the e-newsletter to share with their audiences. With USAHA, this means distribution to state animal health officials as well as key federal animal health officials.

**4) SHIC e-newsletter (page 40)**

- A monthly SHIC e-newsletter publication schedule continued in 2021. Just under 3,000 subscribers are in the distribution database. “Percent opens” for the e-newsletter was 27.3% (Constant Contact benchmark is 17.0%).

**5) SHIC Talk Podcast (page 41)**

- In 2021, SHIC Talk continued. The podcast is hosted by Barb Determan and features guests on “industry chatter” topics as well as comments by SHIC’s executive director. Five episodes have been produced. SHIC Talk is available on the SHIC website as well as Apple Podcasts, Google Podcasts, Spotify, Pandora, Amazon Music/Audible, TuneIn/Alexa, and iHeart Radio. 2021 Episodes included “ASF Research in Vietnam”, “PRRS 1-4-4 Lineage 1C”, “SHIC Progress”, “SHIC Fact Sheets” and “Morbillivirus”.

**6) Webinars (page 42)**

- SHIC offered a series of webinars with co-sponsor the American Association of Swine Veterinarians in 2021. The quarterly webinars respond to “industry chatter” about current swine health issues. The webinars are conducted by Iowa State University Swine Medicine Education Center staff. Webinar topics were F18-Associated Gut Edema Management, PRRS 1-4-4 Incidence and Response, PRRS Strain 1-4-4 Outbreaks, and Swine Influenza Management Strategies.

## Swine Health Information Center 2021 Progress Report

### Swine Health Information Center Organization

- 1) The Swine Health Information Center is a 501(c)(3) corporation governed by a Board of Directors. The producer members of the Board of Directors are active pork producers or representatives of pork producing companies or allied industry that have an interest in the mission of the Center and that serve as champions for the Center's objectives and goals.

In January, Dr. Russ Nugent, pork producer from Arkansas was named to the SHIC Board of Directors representing the National Pork Board.

Currently there are nine members of the Board of Directors:

- a. Two named by the National Pork Board
    - i. Gene Noem, Director, Genus PLC, and pork producer, Iowa
    - ii. Dr. Russ Nugent, pork producer, Arkansas
  - b. Two named by the National Pork Producers Council
    - i. Dr. Howard Hill, NPPC past-president and pork producer, Iowa
    - ii. Dr. Jeremy Pittman, Smithfield Hog Production, North Carolina
  - c. Two named by the American Association of Swine Veterinarians
    - i. Dr. Matt Anderson, Suidae Health and Production and AASV past-president, Iowa
    - ii. Dr. Daryl Olsen, AMVC and AASV past-president, Iowa
  - d. Three at-large producer members
    - i. Mark Schwartz, pork producer, Minnesota
    - ii. Dr. Matthew Turner, JBS USA, Colorado
    - iii. Mark Greenwood, Compeer Financial, Minnesota
- 2) A 2021 operating budget and investment portfolio was developed.

The SHIC Board of Directors approved an operating budget for 2021 and has reviewed and modified the budget during the year to best meet the SHIC mission. The approved operating budget addressing the 2021 Plan of Work was \$2,125,000.

Extra funds not needed for the operating budget were invested in securities with Wells Fargo Bank and modeled after NPB's investment plan. The investments are a series of FDIC insured Certificates of Deposit, laddered to provide on-going operating funds as the certificates reach maturity.

- 3) SHIC Working Groups have been formed to provide input and oversight as the Center fulfills its mission.

The Working Groups give the opportunity to provide program oversight and decision-making, supplemented and informed by subject matter expertise. To complete the SHIC Plan of Work, two working groups have been formed.

The Monitoring and Analysis Working Group is charged with assessing foreign, transboundary production disease risk using information from a variety of sources. The outcome of this assessment is the on-going prioritization of the Swine Viral Disease Matrix and Swine Bacterial Disease Matrix. It is also responsible for improving the health of the nation's swine herd through the development and oversight of on-going projects. These include monitoring for domestic diseases affecting swine health and analyzing health and other data to support on-farm and prospective producer decision making. The Working Group reviews and selects research and program activities that address its Plan of Work.

The Preparedness and Response Working Group is responsible for oversight of the swine viral and bacterial disease matrices research. It is responsible for funding decisions to fulfill other matrices-related research objectives. It also provides advice and oversight of SHIC's role in the emerging swine diseases response plan. That includes the appropriate SHIC response to an emerging swine disease and for the information and analysis necessary to support the proportional pork producer and pork industry response to these emerging diseases. The Working Group reviews and selects research and program activities that address its Plan of Work.

4) A contract with the National Pork Board has extended Pork Checkoff funding of SHIC through 2027.

When the Swine Health Information Center (SHIC) was formed July 1, 2015, by a grant from the National Pork Board, it was with the understanding it was a five-year project. The proposal language surrounding the Center's formation stated, "Funding of the Center past its five-year life will depend on it being able to demonstrate a sufficient return on the investment to justify keeping it running." In December 2021, National Pork Board announced an additional \$15 million investment of Pork Checkoff funds in the Swine Health Information Center, extending funding for the center through 2027.

### **Swine Health Information Center 2021 Outreach**

There has been personal outreach to pork producers, veterinarians, academics and researchers, allied industry and state and federal animal health officials to foster collaboration, develop projects, increase understanding of SHIC and its mission and inform them about the research and programs. The feedback has helped to focus and refine SHIC responsibilities, research, and programs. Following is a list of organizations and meetings where SHIC's research and programs were presented or discussed.

#### **a. Pork producers**

- i. AMVC Swine Health Services; Breneman Pork, Carthage Veterinary Service; Christensen Farms; JBS; The Maschoff's; Iowa Select Farms; Pipestone; Pork Veterinary Solutions, Prestage Farms; Schwartz Farms; Seaboard Foods; Smithfield Foods, Hog Production Division; Suidae Health and Production; Swine Vet Center; 21<sup>st</sup> Century Strategic Forums, 21<sup>st</sup> Century Pork Club
- ii. NPB's Board of Directors, ASF Crisis Team, ASF Working Group, Surveillance Research Working Group
- iii. NPB/AASV Depopulation Working Group
- iv. National Pork Producers Council's Animal Health and Food Security Committee
- v. National Swine Disease Council



- vi. UMN Allen D. Leman Swine Conference
- b. Allied industry
  - i. Advanced Animal Diagnostics
  - ii. American Feed Industry Association
  - iii. Antitox Corporation
  - iv. APC Swine Advisory Group
  - v. Aptimunne Biologics
  - vi. Boehringer Ingelheim Vetmedica
  - vii. IDEXX
  - viii. Institute for Feed Education and Research
  - ix. Kemin Industries
  - x. Merck Animal Health
  - xi. National Association of Farm Broadcasters
  - xii. National Coalition for Food and Agriculture Research
  - xiii. National Grain and Feed Association
  - xiv. Tetracore, Inc.
  - xv. Thermo Fisher Scientific
  - xvi. United Soybean Board
  - xvii. Zoetis
- c. Veterinarians
  - i. 2021 AASV annual meeting
  - ii. AASV Board of Directors meetings
  - iii. Swine Medicine Education Center, Iowa State University
- d. US Animal Health Association, including allied industry, USDA and State Animal Health Officials
  - i. Swine Health Committee
  - ii. Global Animal Health and Trade Committee
- e. Veterinary Diagnostic Laboratories, Colleges of Veterinary Medicine, and Academics
  - i. Kansas State University Veterinary Diagnostic Laboratory
  - ii. Iowa State University Veterinary Diagnostic and Production Animal Medicine
  - iii. South Dakota State University Veterinary Diagnostic Laboratory
  - iv. Texas A&M University Institute for Infectious Animal Diseases
  - v. University of Arizona College of Veterinary Medicine
  - vi. University of Minnesota Veterinary Diagnostic Laboratory
  - vii. University of Saskatchewan
- f. Federal agencies
  - i. USDA Ag Research Services
  - ii. USDA Ag Research Services Virus Prion Research Unit
  - iii. USDA Animal and Plant Health Inspection Service (APHIS), Administrator
  - iv. USDA APHIS, Deputy Administrator, Veterinary Services
  - v. USDA APHIS, Veterinary Services Leadership Team and Veterinary Services staff
  - vi. USDA Center for Epidemiology and Animal Health
  - vii. USDA Center for Veterinary Biologics
  - viii. USDA National Animal Health Laboratory Network
  - ix. USDA National Import Export Services

- x. USDA National Wildlife Services
- xi. USDA National Veterinary Services Laboratory, Foreign Animal Disease Diagnostic Laboratory
- xii. USDA-APHIS ASF Technical Working Group
- xiii. USDA-APHIS ASF Packing Plant Technical Working Group
- xiv. United States Agency for International Development (USAID)
- g. Department of Homeland Security
  - i. Customs and Border Protection
- h. Food and Drug Administration
  - i. Center for Veterinary Medicine
- i. International
  - i. Animal Nutrition Association of Canada
  - ii. Canadian Food Inspection Agency
  - iii. Canadian Innovation Pork
  - iv. Canadian Pork Producers Association
  - v. Canadian West Swine Health Intelligence Network
  - vi. OIE, International Organization for Animal Health
  - vii. Ontario Animal Health Network
  - viii. National Service of Agrifood Health, Safety and Quality (SENASICA), Mexico

## Progress on the Swine Health Information Center 2021 Plan of Work

### Preparedness

#### **Study Validated US Pork Industry Biosecurity Measures and Pathway Awareness**

A new year-long study to identify US pork industry gaps in biosecurity defenses against foreign animal diseases, funded by the Pork Checkoff and SHIC, found no major areas have been overlooked in efforts to prevent the introduction of African swine fever (ASF) to the United States. With ASF confirmed in the Dominican Republic, the first time it has been in the western hemisphere in 40 years, this work provides reassurance the US pork industry and government agencies have identified the major routes of potential domestic introduction. The study, conducted by EpiX Analytics, LLC, reinforced the importance of continued on-farm biosecurity diligence for known pathways and identified feed and feed ingredient imports risks as a priority area of focus and critical opportunity to bolster defenses against ASF.

#### **Canadian ASF preparedness webinar**

Canada's Swine Innovation Porc hosted a webinar titled, "African Swine Fever: How Is Canada Getting Prepared?" in January 2021 and invited SHIC Executive Director Dr. Paul Sundberg to participate. While Dr. Sundberg presented US-focused efforts, he emphasized the collaborative nature of several projects, saying it is a North American swine industry in many respects. Other presenters shared information on Canadian African swine fever (ASF) research priorities, actions, diagnostics, risk mitigation, and emergency euthanasia. These experts represent key Canadian pork-related agencies, businesses, and councils.

#### **SHIC-Funded Quantitative Risk Assessment Modeled US Risk of ASF Introduction in Feed**

Evidence suggests African swine fever virus (ASFv) can survive under conditions similar to those observed in transoceanic transport models. In a SHIC-funded study, researchers developed a quantitative risk assessment model to estimate the probability that one or more corn or soybean meal ocean vessels contaminated with ASFv would be imported into the US annually. Ultimately, this model can be used to evaluate risk mitigation strategies and critical control points for inactivating ASFv during feed ingredient processing, storage, and transport, and contribute to the design and implementation of biosecurity measures to prevent the introduction of ASFv into the US and other ASFv-free countries. Study authors are Rachel A. Schambow, Fernando Sampedro, Pedro E. Urriola, Jennifer L. G. van de Ligt, Andres Perez, and Gerald C. Shurson.

#### **Investigation of Feed Manufacturing Facility Decontamination Processes**

Research is needed to determine optimal methods for decontaminating feed manufacturing facilities, especially equipment that is not designed to be disinfected. SHIC has funded a study, proposed by a group of co-investigators including Dr. Chad Paulk of Kansas State University, to evaluate methods of decontaminating feed manufacturing equipment, using Senecavirus A (SVA), porcine epidemic diarrhea virus (PEDv), and porcine reproductive and respiratory syndrome virus (PRRSv) contamination as domestic, pathogenic surrogates for foreign animal diseases. There is field and/or experimental

evidence that feed and/or ingredients may be potential vectors of African swine fever virus (ASFv) or foot-and-mouth disease virus (FMDv) introduction and introduction of ASFv or FMDv in a domestic feed manufacturing facility has the potential to unknowingly and widely disseminate those viruses.

### **SHIC-Funded Research Helps Compare Pathogen Detection Methods in Feed**

Recent experimental evidence confirmed African swine fever virus (ASFv), PEDv, Senecavirus A (SVA), and foot-and-mouth disease virus (FMDv) can be transmitted through contaminated feed, providing an avenue for introduction to susceptible pigs via ingestion. One way of reducing the risk of pathogen transmission through feed is to test feed ingredients and feed before they are introduced onto farms and fed to pigs. This would only be possible if sampling and nucleic acid extraction methods would allow efficient detection of pathogens in feed. The genetic extraction step for PCRs is validated for animal tissues but not for plant products. In a study funded by SHIC, principal investigator Dr. Diego Diel, Cornell University, and colleagues focused on comparing the performance of three commercially available nucleic acid extraction kits (CORE, IndiMag, MVP II). Results show the CORE extraction kit outperformed the other two kits evaluated.

### **SHIC-Funded Study Evaluated Soy Importation Data**

Understanding the sources and intended uses of products being imported to the US is vital to determining the risk of FAD disease introduction. The viable risk to US swine herds prompted a SHIC-funded project designed to evaluate sources of US soy imports. The goal of the research, led by Allison Blomme, Dr. Chad Paulk, and the Feed Safety Team at Kansas State University, was to determine which products are being imported in the highest quantities and observe potential trends in imports from FAD-positive countries.

Quantities of imports were determined, with a breakdown of different soy product types being imported into the US from 2015 to 2020. A total of 78 different countries exported soy products to the US in 2019 and 2020 with top contributors being Canada, India, and Argentina. Soy oilcake was imported in the largest quantities, followed by organic soybeans and soy oil for 2020. Of the 78 countries, 46 had cases of FAD reported through the World Organization for Animal Health (OIE). Top exporters of soy products to the US from FAD-positive countries in 2019 and 2020 were India, Argentina, and Ukraine.

### **New Study Explored the Risk and Mitigation of Foot-and-Mouth Disease Virus in Feed**

Introducing important work examining the role of contaminated feed as a vector for transmission of foot-and-mouth disease virus (FMDv), a new study, funded by SHIC, the National Pork Board and USDA-ARS, was published in July 2021. Specifically, the study performed by researchers from USDA-ARS at Plum Island, evaluated the potential risk of incursion of FMDv into naïve pig herds through contamination of feed. Per the study report, the goal of the project was the assessment of the infectiousness (viability) of FMDv in commercial whole pig feed and pig feed ingredients. Additionally, the researchers, led by Drs. Stenfeldt and Arzt, determined the dose required to infect pigs through natural feeding behavior. Finally, the project looked at the ability of select feed additives to reduce infectivity of contaminated feed. “While comparable research investigating the potential biosecurity risks of imported feed exists for other viral pig pathogens, this is the first comprehensive evaluation of

the risk of FMDv infection of pigs through ingestion of contaminated feed under controlled experimental conditions,” wrote the authors.

### **SVA Half-life in Feed and Infection Following Consumption Are Results of SHIC-Funded Study**

The survival of several viruses in feed and feed ingredients for prolonged periods has been demonstrated. Feed and feed ingredients have also been investigated as sources of pathogen introduction to farms and as a potential source of infection to animals, post consumption of contaminated feed. In a study led by Leonardo C. Caserta, Cornell University, and funded by SHIC, researchers determined the rate of decay of Senecavirus A (SVA) in swine feed ingredients as a function of time and temperature and established half-life estimates for the virus. Study findings demonstrate that feed matrices can extend the survival of SVA, protecting the virus from decay. Additionally, it was demonstrated that consumption of contaminated feed can lead to productive SVA infection.

### **Validating laboratory-based viral survival in feed**

This project was the first attempt to evaluate virus survival (PRRS 174, PEDv and SVA) over long distances under conditions experienced during a commercial transport event across the continental US. It used an experimental design that incorporated real world elements, such as the use of a commercial transport vehicle, a route of transit that crossed multiple regions of the US, a standardized method of bulk feed sampling, and an evaluation of viral genome, viability, and transmission. Based on the results of this study, feed and feed ingredients can serve as vehicles for the transport and transmission of three significant viral pathogens of veterinary significance under real world conditions. We now have for the first time, evidence of viral survival in representative volumes of feed and feed ingredients during an actual long-distance commercial transport event across the continental US.

### **SHIC Funded PRV Oral Fluid PCR and ELISA for Diagnosis and Surveillance**

The final report on a SHIC-funded study conducted at Iowa State University to evaluate the detection of PRV in swine oral fluid, providing additional testing resources using real-time PCR assays, has been posted. Pseudorabies virus (PRV) is ranked fourth in SHIC Swine Disease Matrix in large part due to the potential for the introduction of highly pathogenic PRV into the US from Asia - an event which would have a highly negative impact on pork exports. In addition, while PRV was officially eliminated from US domestic swine in 2004, it is occasionally introduced into "transitional" herds via contact with feral swine.

In this study, the detection of PRV DNA in nasal swab and oral fluid samples collected over time from experimentally PRV vaccinated and/or PRV inoculated pigs was comparatively evaluated by real-time PCR. Serum samples were also tested by PRV ELISAs to monitor PRV status over time. Following exposure to a gene-deleted modified live vaccine and/or a wild-type virus, PRV DNA was detected in oral fluid specimens in a pattern similar to that of nasal swabs. The results demonstrated the detection of PRV DNA in swine oral fluid which adds support to the use of this specimen in PRV diagnosis and surveillance.

**SHIC Funds Porcine Sapelovirus Genetic Characterization and Diagnostic Tool Development**

SHIC maintains a priority on diagnostics of swine diseases as part of its mission to protect and enhance the health of the US swine herd. Consequently, SHIC funded a project for genetic characterization and diagnostic tool development for a potentially emerging porcine sapelovirus (PSV). This virus was isolated in a diagnostic specimen from a US swine farm.

In work done at the University of Illinois, a full-length genome sequence was obtained through next-generation sequencing. Phylogenetic analysis showed that the virus is more closely related to two Japanese strains but is distantly related to two known US strains. PSV specific diagnostic tools were developed, including the monoclonal antibodies against PSV antigens, and a PSV antigen-based indirect ELISA. Using this assay, PSV antibody response was investigated in a group of post-weaned pigs that were naturally exposed with PSV. The availability of the PSV isolate and the specific diagnostic reagents and assays provide important tools for potential PSV control and prevention.

Additional pathogenesis studies are required for in-depth characterization of different PSV strains, especially the newly emerging strains. The virus isolate, diagnostic reagents and assays generated in this study will be important tools in aid of future pathogenesis studies as well as development of vaccines and therapeutics against PSV infection.

**SHIC Diagnostic Assay Catalog**

SHIC has used the Swine Viral Disease Matrix as a guide to research and enhancing swine disease diagnostic capabilities with the goal of early detection of emerging diseases. One objective is to ensure that the developed diagnostic tests are available to all veterinary diagnostic laboratories that want to use them. That means that there needs to be awareness as well as availability. The SHIC Diagnostic Assay Catalog is one way to accomplish that. Thirty-three Swine Viral Disease Matrix pathogens have new or updated PCRs from USDA support or SHIC-funded research since 2016. Five pathogens have ELISAs finished and were added to the SHIC Diagnostic Assay Catalog. During 2021, SHIC did a systematic review of the Diagnostic Assay Catalog, contacting the researchers responsible for the upkeep and access to the tests in it to make sure that it is up to date and accurate.

**SHIC Funds Porcine Sapelovirus Genetic Characterization and Diagnostic Tool Development**

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This potentially emerging virus was isolated in a diagnostic specimen from a US swine farm and designated as PSV KS18-01. In work done at Kansas State University and the University of Illinois, a full-length genome sequence was obtained through next-generation sequencing. PSV specific diagnostic tools were developed, including the monoclonal antibodies against PSV antigens VP1 and VP2, and a VP1-VP2 antigen-based indirect ELISA. Using this assay, the PSV antibody response was investigated in a group of post-weaned pigs that were naturally exposed with PSV. The availability of the PSV isolate (KS18-01) and the specific diagnostic reagents and assays provide important tools for PSV control and prevention.

### **Veterinary Diagnostic Laboratory Lessons Learned from COVID-19 Testing Assistance**

The veterinary diagnostic laboratories (VDL) were enlisted to help with COVID-19 laboratory capacity to meet public health demand. Learn lessons from the COVID-19 diagnostic laboratory experiences were analyzed with the intent to be better prepared to benefit swine health through effective response to foreign animal or emerging diseases. First, it was critical to find people with laboratory experience for additional staffing needs. And simplifying and partitioning the processes helped to expedite training. Second, it was important to identify the person or institution that can focus on the supply chain for equipment and supplies and stockpiling. Third, the VDLs were proficient in responding to needs with creativity and science. High throughput tests were critical to meeting the capacity of demands. Fourth, regular and frequent communications were needed in the dynamic environments.

## **Monitor and Mitigate Risk to Swine Health**

### **Global Swine Disease Monitoring Reports**

The SHIC Global Swine Disease Monitoring Report has provided near real-time information on swine diseases regularly since November 2017 and is communicated to the US pork industry through SHIC's monthly e-newsletter, posting online on the SHIC website, and being published using channels available to authors at the University of Minnesota Department of Veterinary Population Medicine. The project created and now maintains a public, private, academic partnership for its reporting.

This reporting system identifies hazards and subsequently scores them using a step-wise procedure of screening for issues that potentially represent a risk for the US. A combination of unofficial and official data is actively and passively collected and organized. Following successive screening steps in which data and information are modified, edited, corrected, and expanded in collaboration with USDA-APHIS-CEAH and selected stakeholders, a report describing the outputs has been routinely available to the public. In addition to the three USDA-classified tier 1 reportable foreign animal diseases of swine – ASF, classical swine fever, and foot-and-mouth disease – which represent the main content, reports of significant changes in the epidemiological situation of production diseases such as PRRS or PRV have been included.

The project has been successful in finding and communicating a number of potential threats to the US pork industry. In particular, the project has collaborated with relevant stakeholders in collecting, organizing, critically reviewing, and communicating the expansion of ASF through Asia, Europe and now Hispaniola.

### **SHIC Requested Information about a “Mystery Swine Disease” in the Dominican Republic**

In late June this year reports of a mystery swine disease in the Dominican Republic were noticed by SHIC, with the help of the National Pork Producers Council and the US Animal Health Association. Found in local press from the island nation, the description painted a severe picture of unique swine illness. SHIC reached out to USDA Animal and Plant Health Inspection Service (APHIS) for more information, concerned about a novel swine disease and its potential impact on the US herd. APHIS in turn contacted international resources for more information. APHIS reported back that the initial press report was exaggerated. However, APHIS also reported they would continue to follow the situation until a firm diagnosis is achieved. APHIS confirmed ASF in the Dominican Republic on July 27.

**Reminder to International Travelers: Report Lack of Secondary Screening If Needed**

SHIC offered a reminder for continued reporting of traveler experiences while going through customs entering the US. In response to a report from international travelers not being diverted to Customs and Border Protection (CBP) agriculture specialists after they indicated on their Customs form that they had had animal contact at their ASF and FMD endemic destination that information was sent to CBP. After getting this report, a CBP contact immediately responded saying, "...flights from that area of the world should be a tactical focus and there will be follow up with the agents at that airport."

SHIC continued to remind all international travelers of the expected protocol when returning to the US after visiting a farm or being in contact with animals in a country (or countries) with ASF, or any other foreign animal disease. These persons should declare this information to US CBP via written form, airport kiosk, or verbally. SHIC, along with the American Association of Swine Veterinarians, National Pork Board, and National Pork Producers Council, continue to ask international travelers to report if they were not diverted for secondary screening upon arrival in the US.

**Movement of Dogs from China May Pose Risk to North American Livestock Production**

Dueling animal health priorities converged as US-based rescue groups worked to save dogs from the meat trade in China, bringing them to the US and Canada for re-homing. North American pork industry stakeholders worried about the threat of foreign animal disease transmission posed by these pets, particularly African swine fever (ASF) which continues to be a concern in Asia. The supplies used in shipment, such as kennels and bedding materials, are of special concern because of their potential to act as vectors for disease transmission.

On August 4, 2021, USDA's Animal and Plant Health Inspection Service (APHIS) issued a Federal Order establishing additional requirements for dogs imported into the US for resale from countries where ASF exists. The new requirements took effect immediately. Per the USDA, the number of dogs being imported for resale from ASF-affected countries is growing, and APHIS took this action to continue its efforts to protect the domestic swine industry against this devastating disease.

**SHIC-Funded ASF Molecular Epidemiology Project Identified Prevention and Control Gaps**

A project to summarize current knowledge and remaining gaps regarding the molecular epidemiology of African swine fever (ASF) was funded by SHIC. The unprecedented expansion of ASF during the last five years produced a 218% increase in the volume of scientific publications on the subject compared to the previous five years (2010 to 2014). Due to this volume, a critical need to synthesize available scientific evidence to support and offer the new evidence into updates for regulations and policy framework, and management recommendations for the industry, was apparent. Staff at the Center for Animal Health and Food Safety (CAHFS) at the University of Minnesota College of Veterinary Medicine conducted a systematic review of current literature including, but not restricted to, genetic diversity of strains, the association between sequence data, and epidemiological or pathogenic features, and development and performance of molecular diagnostic tools.

**SHIC Issued Call for Research Funding Proposals: Bioexclusion and Biocontainment**

The SHIC 2021 Plan of Work included the investigation of biosecurity – biocontainment and bioexclusion – as tools to help prevent or control an emerging swine disease outbreak on farms. To



achieve this objective, SHIC solicited proposals to investigate cost-effective, innovative technologies, protocols, or ideas to implement biocontainment in the face of an emerging disease outbreak on swine farms.

The main goal of a funded biocontainment proposal is to help in the decision-making process to prevent the spread of infectious bioaerosols capable of causing disease outbreaks with significant economic consequences. An extensive literature search on known technologies directed at removing airborne particles from the air found fibrous filtration, ionization, bipolar ionization, ultraviolet light type C, ultraviolet light type A, electrostatic precipitation, microwave, photo electrochemical oxidation, non-thermal plasmas, and air filters coated with antimicrobial property materials as possible to use. Also, a core group of individuals who will assist with the selection and evaluation of the technologies and measures for their application to swine has been identified.

SHIC also solicited proposals to investigate cost-effective, innovative technologies, protocols, or ideas to implement bioexclusion to prevent or control an emerging disease outbreak on swine farms. The decontamination of fomites (e.g., supplies and equipment) coming into sow farms using foggers at supply entry rooms is commonly used to mitigate associated risks. Despite being considered a relatively low risk event compared to others; the high frequency of supply entry rooms use increases the probability of failure. The primary objective of the selected study will be to evaluate the efficacy of temperature and time for inactivating porcine reproductive and respiratory syndrome virus (PRRSv) and porcine epidemic diarrhea virus (PEDv) on experimentally contaminated surfaces commonly found at supply entry rooms in swine farms.

#### **SHIC-Funded MSHMP and NCSU Project Models PRRS Dissemination Dynamics**

A team led by North Carolina State University researchers and funded by the Fats and Proteins Research Foundation, in collaboration with the University of Minnesota Morrison Swine Health Monitoring Project (MSHMP), that is funded by SHIC, developed and calibrated a mathematical model for transmission of porcine reproductive and respiratory syndrome virus (PRRSv). Their recently published work demonstrated the contribution of multiple unmeasured routes of PRRSv dissemination, including for the first time the role of animal by-products delivered via feed meals, and multiple transportation vehicle networks. It also provides strong evidence to support the need for cautious, measured PRRSv control strategies for transportation vehicles and, to some degree, feed by-products.

#### **SHIC/AASV Influenza Webinar Addresses Management Strategies for Seasonal Challenges**

A webinar on swine influenza management strategies was offered by SHIC along with the American Association of Swine Veterinarians and hosted by the Iowa State University Swine Medicine Education Center and attended by 125 people in 21 countries. Experts in swine influenza and related research and a practitioner with hands-on swine influenza experience presented information. The influenza researchers presented background on influenza A virus in swine as well as surveillance and tools to monitor virus diversity and evolution; diagnostic methods to detect influenza in swine, including timing of sample collection, sample types, tests available, and interpretations including expected outcomes of sequencing and virus isolation based on concentration of swine influenza A in the sample. The practitioner related experience with the Prime and Boost influenza vaccination protocol that involves

choosing two vaccines that are genetically different, giving a priming dose and then following up two to four weeks later with a booster dose to improve immune response.

## Improve Swine Health Information

### **SHIC-Funded Swine Disease Reporting System Expanded Near Real-Time Disease Information**

The SHIC-funded Swine Disease Reporting System (SDRS) initiative has completed another successful year. An aggregated database with diagnostic data from the Iowa State, Kansas State, University of Minnesota, South Dakota State, and Ohio State (beginning in October 2021) veterinary diagnostic labs (VDLs) is regularly updated, with monthly reports and podcasts to SHIC. The database now includes more than 950,000 distinct VDL submissions tested by PCR for the five US porcine endemic agents: porcine reproductive and respiratory syndrome virus (PRRSv), porcine epidemic diarrhea (PEDv), porcine deltacoronavirus (PDCoV), transmissible gastroenteritis (TGE), and *Mycoplasma hyopneumoniae*. Monthly etiologic summaries of digestive, respiratory, and neurologic diagnostics from the Iowa State VDL are also reported. Interactive online dashboards with filtering capabilities for age category, specimen, geographic region, are kept updated and are available on the project website (<https://www.fieldepi.org/sdrs>).

### **Ohio Animal Disease Diagnostic Laboratory Added to the Swine Disease Reporting System Network**

Ohio's Animal Disease Diagnostic Laboratory (ADDL) will now be contributing data to the Swine Disease Reporting System (SDRS) to further enhance capabilities as a surveillance tool and for early detection of pathogens of economic consequence to US livestock production. ADDL provides regulatory testing support for disease control programs and full diagnostic laboratory services for veterinarians, livestock producers and agribusinesses within and beyond Ohio. The SDRS provides data used for disease prevention and biosecurity, disease monitoring, disease management, and disease forecasting. SHIC conceptualized and funded systems for near real-time domestic and global swine disease monitoring to enable better, faster, and more effective response to endemic or foreign infectious diseases. As a result, SHIC helps the industry toward better swine health information to positively impact the long-term sustainability of pork production with the Domestic Swine Disease Monitoring Report.

### **SHIC Reports USDA Adds Blood Swabs and Spots as Official ASF Testing Tissues**

The USDA has approved blood swabs and spots as samples for official African swine fever (ASF) testing during foreign animal disease investigations. These are important additions to antemortem samples approved since August 2018. The full list of approved samples includes whole blood, tonsil, spleen, lymph node, spleen swabs, blood swabs and blood spots. While important additions, more work needs to be done to fully integrate blood swabs and blood spots into the ASF/CSF active surveillance program as well as the ASF Red Book. The process is ongoing. SHIC will continue to monitor developments and share progress with stakeholders interested in ASF testing protocols.

### **SHIC: Newly Discovered Low Virulent, Genotype I, ASF China Virus Causing Chronic Infections**

Low or moderately virulent strains of African swine fever virus (ASFv) increase the likelihood of spread before detection. Recently, Sun et al. (2021) described in "*Genotype I African swine fever viruses emerged in domestic pigs in China and caused chronic infection*" the detection of a second ASFv strain in two Chinese provinces. The ASF viruses described are genotype 1 viruses, distinct from the currently

circulating genotype 2, Georgia-07, virus and its derivatives. These virus isolates (hemadsorption negative) are lower virulence, characterized by a more chronic disease including necrotic skin lesions and joint swelling. Data presented suggest the viruses are readily transmissible to contact animals. Notably, pigs infected with these viruses could easily be missed early in a disease outbreak due to their reduced virulence. However, current diagnostic PCR (p72-based) or serologic (ELISA-based) tools should be adequate for detection of infected animals. Given their reduced virulence and transmissibility characteristics, it is reasonable to assume these viruses also may be present in other regions of China and Southeast Asia.

### **SHIC Offers Context on Chinese ASF Outbreaks and Vaccines**

Illegal African swine fever (ASF) vaccine use in China continues, creating concern for the US swine industry. Per a January 21, 2021 report by Reuters, “A new form of African swine fever identified in Chinese pig farms is most likely caused by illicit vaccines, industry insiders say...”. “Two new strains of African swine fever have infected more than 1,000 sows on several farms owned by New Hope Liuhe, China’s fourth-largest producer, as well as pigs being fattened for the firm by contract farmers, said Yan Zhichun, the company’s chief science officer.” USDA Animal and Plant Health Inspection Service (APHIS) said there is information about at least two ASF vaccines being used in China, a situation they continue to monitor and acknowledge may change. One of these vaccines circulating in China at this stage has a deletion of only the CD2 gene and the other with deletions of the CD2 and the MGF genes. Based on this information, APHIS fully expects available ASF PCR tests deployed in the US to be able to detect either new vaccine strain.

### **Rock Offered SHIC a Review of Reported ASFv Variants Emerging in China**

A China Harbin Laboratory paper describing their analysis of African swine fever virus (ASFv) variants emerging in China as well as media and on-the-ground reports of non-approved vaccine use causing pathology, chronic infection and vaccine virus shedding raised concern. SHIC asked Dr. Dan Rock, University of Illinois, to help give some interpretation and context to the Harbin Laboratory paper and attenuating mutations of the ASFv genome such as those that could be used in unapproved vaccines and reported the results. Dr. Rock has extensive research experience focused on exotic viral diseases of high consequence and the molecular mechanisms that underlie viral virulence.

### **SHIC Closely Observing ASF Outbreak in Germany - Report**

Confirmation of African swine fever (ASF) on three farms in eastern Germany, where restriction zones already exist, was widely reported in industry press the week of July 12, 2021. The Friedrich-Loeffler-Institut (FLI) confirmed the diagnoses. All three affected farms are near the border with Poland. SHIC continued to monitor the situation and provided detailed information in the August Global Swine Disease Monitoring Report published in the Center’s newsletter on August 4, 2021.

Per press reports, the largest farm had 200 pigs and all were culled after the diagnosis. This was an organic farm and sows were able to be outdoors, therefore assumed to be at greater risk of contracting ASF due to the virus’s prevalence in wild boar. The second and third locations had two pigs and four pigs respectively.

These were the first cases of ASF in domestic pigs in Germany, however, it has been prevalent in wild boar in the nation and in neighboring Poland. German agricultural officials have responded to the outbreak with pleas for continued strict biosecurity and diligence.

### **Morrison Swine Health Monitoring Project**

The Morrison Swine Health Monitoring Project (MSHMP) helps identify industry needs via input from the project's participants, representing more than 50% of the nation's sow herd, and other sources. MSHMP supports monitoring swine disease incidence as a national system in place for emerging pathogen detection, a key element of SHIC's mission. Pig farm population growth, emerging pathogen tool finetuning, transport data usability and platform building for project information sharing are all key areas of action.

Progress in 2021 included successfully building a system that allows the MSHMP team to quickly understand whether a porcine reproductive and respiratory virus (PRRSv) sequence they receive for review has been seen elsewhere. Another example of progress is the development of PRRS strain analysis or regional heat maps that will enable timely visualization of disease movement or evolution. When cases like a recent concerning PRRS sequence, 1-4-4 Lineage 1C, arise, participants are willing and interested in sharing information, feedback and continue to add more epidemiological information. The project is also working to develop the capability for adding more pathogens to its database.

### ***Strep. zoo* Added to Swine Bacterial Disease Matrix and New Fact Sheet Developed**

*Strep equi spp zooepidemicus* (*S. zoo*) was added to SHIC Swine Bacterial Disease Matrix in February 2021 and a fact sheet focused on *S. zoo* has been added to the SHIC Fact Sheet Library. Drs. Raghavendra Amachawadi, Kansas State University, Maria Clavijo, Iowa State University (ISU), Rachel Derscheid, ISU, Connie Gebhart, University of Minnesota, Angela Pillatzki, South Dakota State University, and Nubia Resende-De-Macedo, ISU, convened to review the Bacterial Matrix list, score *S. zoo* for its position on the Matrix and review the new fact sheet.

### **SHIC Developed New *Salmonella* 1,4,[5],12:i:- Fact Sheet per Industry Input**

*Salmonella* 1,4,[5],12:i:-, a serotype that can be found in swine, has become one of the most identified serotypes in pigs, pork, and humans worldwide. It captured the attention of an American Association of Swine Veterinarians member who recommended SHIC develop a fact sheet on this bacterium for the benefit of the US pork industry. As a result, the new *S. 1,4,[5],12:i:-* fact sheet has been posted and contains valuable information on the serotype.

### **SHIC Updated Getah Virus Fact Sheet and Revised Its Fact Sheet Template**

SHIC has updated its fact sheet on Getah virus (GETv). The updated GETv fact sheet contains details about this viral disease gleaned from a comprehensive literature review of the latest research. In the improved literature review portion of the fact sheet, in addition to sections on etiology, cleaning and disinfection, epidemiology, transmission, pathogenesis, diagnosis immunity, prevention, and gaps in preparedness, new sections on importance, public health, infection in swine, treatment, and history in swine have been added.

**SHIC Porcine Kobuvirus Fact Sheet Received Detailed Update**

A major update of the SHIC's porcine kobuvirus (PKV) fact sheet has been posted. PKV, originally detected in baby pigs in Hungary in 2008, is an enteric picornavirus found nearly worldwide in both in healthy pigs and pigs with diarrhea. It was first diagnosed in the US in 2013. The significantly revised PKV fact sheet includes refreshed taxonomy, epidemiology, and diagnostics sections as well as new information on experimental infection. To date, the importance of PKV as a swine pathogen remains unclear.

**Updated SHIC Sapelovirus Fact Sheet Addresses Prevalence and Diagnostics**

An updated SHIC fact sheet on porcine sapelovirus (PSV) has been posted and includes new information on prevalence and diagnostics, as well a description of an outbreak of PSV-associated polioencephalomyelitis in the US. PSV, an enteric picornavirus of swine, has been detected in healthy pigs as well as pigs with diarrhea, neurological, reproductive, and respiratory disease. An outbreak of polioencephalomyelitis occurred in US swine in 2016, with reported morbidity and case fatality rates of 20% and 30%, respectively. The role of PSV as a pathogen, and more specifically as a cause of polioencephalomyelitis, is unclear.

**SHIC Added to Preparedness with Updated PTV and JEV Fact Sheets**

Updated fact sheets on porcine teschovirus (PTV) and Japanese encephalitis virus (JEV) have been added to the SHIC Swine Disease Fact Sheet Library. PTV is an enteric picornavirus of swine. Most infections are subclinical, but some strains cause severe central nervous system disease (polioencephalomyelitis) with high mortality. Why some PTVs cause polioencephalomyelitis and others circulate inapparently is not known. In the United States, diagnostic laboratory submissions with a history of posterior paresis seem to be increasing in pigs from a wide age range. Additionally, in other countries, sporadic outbreaks of severe polioencephalomyelitis continue to occur. Swine, including wild boar, are the only known hosts for PTV.

JEV is a zoonotic arbovirus that is endemic in much of Asia and the western Pacific region. Pigs are an amplifying host of JEV while most other susceptible species are dead-end hosts. The virus produces neurological disease in pigs and horses as well as reproductive failure in pigs.

Japanese encephalitis is currently a foreign animal disease, but its emergence in the United States is a concern due to the presence of competent mosquito vectors and susceptible hosts.

**SHIC HP-PRRSV and Ebola Virus Fact Sheets Updated for US Swine Industry Benefit**

The SHIC Swine Disease Fact Sheet Library provides guidance and resources for producers, practitioners, and diagnosticians who are on the front lines of swine health concerns. Updated fact sheets on high path porcine reproductive and respiratory virus (HP-PRRSV) and Ebola virus have been posted on the SHIC website. While each fact sheet was thoroughly updated, taxonomy and epidemiology sections for both viruses saw the greatest change.

**SHIC Updated Nipah and Rubulavirus Fact Sheets to Aid US Swine Industry**

Updated fact sheets on Nipah virus (NiV) and porcine rubulavirus (PoRV) were posted. The NiV fact sheet is a major revision of the original document. Updates on diagnostics and vaccine development, in

addition to epidemiology, were all incorporated. Its literature review is as current as possible, even including publications from as recent as May 2021.

PoRV is endemic in Mexico. It is a paramyxovirus of swine that causes CNS signs and high mortality in piglets, respiratory disease in pigs over 30 days-of-age, reproductive disease in sows and boars, and corneal opacity (“blue eye”) in pigs of all ages.

### **SHIC Updated the PCV3 Fact Sheet**

An updated fact sheet on porcine circovirus 3 (PCV3) has been posted on the SHIC website containing the latest information available. PCV3 is a newly detected pathogen of swine. Although most cases have been detected subclinically, PCV3 is also associated with clinical signs similar to those caused by porcine circovirus 2.

### **SHIC Updated APPV Fact Sheet Noting Need for Further Research**

The atypical porcine pestivirus (APPV) fact sheet has been updated in the SHIC Swine Disease Fact Sheet Library. APPV was identified in the US in 2015 and is genetically distinct from other pestiviruses. APPV is widely found, but its clinical relevance is poorly understood. To date, APPV has been associated with congenital tremors (CT) in newborn pigs. In addition to muscle spasms, posterior paresis and splay leg can be seen. Litters from gilts are most commonly affected. In litters with CT, morbidity ranges from 0–100%.

### **Influenza Virus Fact Sheet Updated in SHIC Library**

The SHIC fact sheet on influenza viruses C and D has been updated. New information in the fact sheet on epidemiology, including host range, geographic distribution, and prevalence, as well as pathogenicity, is provided. Influenza C virus (ICV) and influenza D virus (IDV) are potential emerging pathogens of pigs, although swine are not the primary host for either virus species. Swine can be naturally and experimentally infected with both ICV and IDV, but clinical illness occurs rarely. Currently, influenza A virus (IAV) is the only species of routine clinical significance in swine.

## **Surveillance and Discovery of Emerging Disease**

### **Development of environment sampling methods for disease freedom of the barn based on spatially balanced sampling**

Currently APHIS’s restocking guidance requires a minimum of 40 days downtime after active cleaning and disinfection following an ASF outbreak. Previous studies have found that disease distribution within barns is not uniform. There exist “clusters” of disease pathogens with samples located in hot spots that are positive, others are negative. Thus, traditional sampling recommendations based on independent and identical distributions will no longer apply. This project is developing environment sampling methodologies based on spatially balanced sampling that includes sample sizes and optimal sample locations to substantiate freedom from disease with specific high confidence. This could help the industry to decrease the downtime before restocking since cleaning and disinfection.

**SHIC/CEID Partnership Examining Swine Bacterial Pathogens Risk**

The SHIC 2021 Plan of Work included the commitment to join with other organizations to help to fill gaps in research and information needed to prevent, prepare, and respond to foreign animal or emerging diseases. SHIC has focused on viral pathogens/diseases of swine because of the risk they present to the US swine herd by virtue of their ability to travel and transmit. SHIC also takes seriously the potential for bacteria, which can also be pathogens, to cause emerging disease. To provide needed information on bacteria, SHIC executed a Memorandum of Understanding with the University of Georgia Research Foundation to become a member of the Global Infectious Disease Intelligence Consortium and work with the Foundation's Center for the Ecology of Infectious Diseases (CEID). The objective is to add another source of relevant information about existing and emerging infectious diseases. The result will be better intelligence on possible emerging bacteria to go along with the current information on potential emerging viruses.

**SHIC Diagnostic Fee Support Program Provided Additional Resources**

SHIC received a call when vesicles were observed in the snout area of pigs on multiple farms in Iowa and Minnesota from January to April 2021. A total of 133 swine vesicular cases with pig ages of three to 6.5 months from Iowa farms were submitted to the veterinary diagnostic lab. All were foot-and-mouth disease virus PCR negative, but they were also negative for Senecavirus A and other known vesicular viral pathogens, leaving the causative agent(s) unidentified. When standard diagnostic protocols did not reveal satisfying information about the cause, a request for diagnostic fee support was reviewed and approved by SHIC. The investigation is on-going.

Early fall of 2021 three farms were showing satisfactory stability from a previous PRRS outbreak, with several weeks of all negative processing fluids and baseline numbers of abortions. Then the number of abortions on the farms spiked to twice baseline and moved to four to five times baseline. Weak born and non-viable pigs also increased in the herds. Subsequent PRRS testing and other diagnostics were negative. The potential for an emerging disease is supported by the lack of clarity in the evidence explaining the causes of abortion so a request for further diagnostic support was reviewed and approved by SHIC. The investigation is on-going.

**Study on Canine Parvovirus 2 Spillover to Swine**

A dead pig was submitted to the South Dakota State University Animal Disease Research and Diagnostic Laboratory (SDSU-ADRDL) in October 2020 for diagnostic testing. Moderate enteritis, hepatitis, and visceral edema along with hemolytic *E. Coli* were discovered as well as porcine circovirus type 2. Later, viral metagenomic sequencing was performed on archived lung tissue for an unrelated research project. Unexpectedly, canine parvovirus 2 (CPV2) was also identified. This finding led SDSU-ADRDL staff to ask for 2021 support from SHIC to study spillover of the virus from the canine species to swine and the investigation has begun. The specific goal of this project is to investigate the epidemiology of CPV2 in pigs and evaluate its pathogenesis in a colostrum deprived pig model.

**SHIC-Funded Research on *S. zooepidemicus* Provided New Information and Diagnostic Resources**

During 2019, outbreaks of *S. zoo* septicemia were reported in Ohio and Tennessee with mortality of up to 50%. Then, in January 2021, a breeding herd in Indiana experienced very high mortalities related to *S. zoo*. The emergence of *S. zoo* associated with mortalities at a level not previously seen in the US

prompted SHIC to fund a project conducted at Iowa State University and the USDA National Veterinary Services Laboratory to meet the urgent need for information. The result was the first study to experimentally infect and reproduce the disease in weaned pigs with a hypervirulent swine *S. zoo* strain. Furthermore, pathogenicity differences between genetically different swine strains were described. And a newly developed multiplex PCR provides an accurate and timely assay for detecting and monitoring *S. zoo* in swine herds.

#### **SHIC Acted on Diagnosis of Novel Morbillivirus in Pigs**

The Iowa State University Veterinary Diagnostic Lab (ISU VDL) received 22 porcine fetuses from six litters from a site in Mexico in the spring of 2020. After extensive testing for known pathogens, metagenomics sequencing identified a new virus in the genus of *Morbillivirus*. ISU VDL staff named it porcine morbillivirus (PoMV) and conducted an initial study providing some insight into the outbreak. Subsequently, these researchers sought 2021 funds to isolate PoMV and determine presence/incidence of the virus in the US swine population. SHIC reviewed and approved the ISU VDL funding request for further study on PoMV as part of its ongoing mission to protect and enhance US swine herd health with a focus on emerging and transboundary swine disease prevention, preparedness, and response.

#### **SHIC Pursued Information on Novel Rotavirus to Determine Risk to US Swine Herd**

SHIC monitors emerging swine disease threats, engaging experts on preparedness, response, and possible actions needed on behalf of the US pork industry. SHIC queried experts regarding a novel rotavirus affecting foals in Kentucky during the spring of 2021. After consideration, those experts, Drs. Feng Li, University of Kentucky (UK) Gluck Equine Research Center, along with swine experts Albert Rovira, University of Minnesota, Ben Hause, South Dakota State University, and Eric Burrough, Iowa State University, advised there was no need for action as the virus was not a threat to pork production.

#### **SHIC-Funded Research Identified Potential Role of PPV2 in PRDC Development**

Discovered in 2001, porcine parvovirus 2 (PPV2) is prevalent in swine worldwide. A recently completed SHIC-funded research project on PPV2 confirmed the high prevalence of PPV2 in diseased pigs and provided insight into its significance in porcine respiratory disease complex (PRDC). Results supported PPV2 as one of the primary viral pathogens in the natural development of PRDC, particularly in weaned to finishing pigs.

#### **PCV3 Case Definition and On-farm Epidemiology Needed**

Individual case definitions have been proposed for PCV3-associated reproductive disease and systemic disease to standardize diagnostic criteria. US veterinary diagnostic labs are collecting clinical signalment from practitioners who have a PCV3 diagnosis in their clients' herds and are combining it with diagnostic test result qualifications. When this first step is finished in 2021, SHIC will then move on to research priorities and needs. Research will further characterize the clinical and economic outcomes of a PCV3 diagnosis.



## **Responding to Emerging Disease**

### **SHIC Rapid Response Corps Investigations Exercises Rapid Response Teams**

PRRS 1-4-4 Lineage 1C spread quickly in the upper Midwest. And outbreaks were nondiscriminatory, occurring on some high biosecurity sites. Rapid Response Teams were invited on farms to investigate likely lapses of biosecurity that resulted in PRRS 1-4-4 Lineage 1C entry onto the farms. Using the standardized SHIC Rapid Response Teams investigation form, different Rapid Response Teams investigated separate farms to maximize the training and exercise opportunities. Likely pathways of entry included the loadout process where washing, disinfecting, and allowing the room to fully dry before personnel come into the loadout room was a recommended improvement. In addition, a better understanding of how the cull sow trailer sanitation and animal transportation is needed to rule out/in this process as a potential hazard related to this event.

A localized PED outbreak on high biosecurity sites in the south-central US offered another opportunity to exercise the Rapid Response Corps. Rapid Response Teams were deployed upon the invitation of the outbreak farms and conducted an investigation. The results suggested that the most likely pathways of entry included carcass removal, employee entry, repairs done inside the barn and wean pig removal. A single employee hauled dead pigs to a single compost for all the farms involved and also helps out with loading and unloading. Also, maintenance staff did repairs in the nursery and sow farm and there was evidence that they were transferring parts between farms.

### **Rapid Response Team Investigation Form Refined to be Used as an Industry Standard**

The SHIC Rapid Response Corp is composed of a nationwide network of veterinarians, state animal health officials or representatives, epidemiologists, and, when appropriate, federal animal health officials who are trained, prepared, and committed to conduct epidemiological investigations when a new transboundary or emerging disease threat occurs. The approach, methodology, forms, and reports for investigating endemic (like PRRS and PED), transboundary and emerging diseases have been developed.

An important next step is to garner input on the approach, investigation form, and reporting instrument developed for use by Rapid Response Teams on farms. With input from the pork industry, the form and reporting instrument could be improved and promoted as an industry standard. A working group has been formed to create an industry-standard form and reporting instrument that will help assure that the most relevant information is being gathered and enable the logging of data from the investigations in a database that can be analyzed quickly for associations and patterns. The objective is for that analysis to be used for identification of industry-wide biosecurity deficiencies that need improvement to increase the health of the nation's swine herds.

### **F18-associated Gut Edema Disease Successes, Challenges and Analyses Offered During a SHIC-AASV Webinar**

Reports of difficult cases of colibacillosis that have been associated with the F-18 fimbrial antigen and leading to gut edema disease, with up to 100% morbidity and 20% mortality on some sites, had been increasing. SHIC and the American Association of Swine Veterinarians responded with a webinar, conducted by the Iowa State University Swine Medicine Education Center, on September 28 to hear

directly from practitioners and a diagnostician involved in these outbreaks. In addition to the clinical signalment of the disease, the webinar included outbreak videos, postmortem findings, diagnostic workups, management successes and challenges, and ISU Veterinary Diagnostic Laboratory historical data analyses. The webinar was attended by 139 participants from Austria, Canada, the Czech Republic, Germany, the Netherlands, Spain, and the United States.

### **PRRS 1-4-4 Lineage 1C Webinars**

Midwest veterinary diagnostic labs began diagnosing porcine reproductive and respiratory syndrome virus (PRRSv) 1-4-4, Lineage 1C, in late 2020 with practitioners and producers reporting dramatic PRRS-like clinical signs on farms. Reacting quickly to this new PRRS strain, the Swine Health Information Center, with co-sponsor American Association of Swine Veterinarians, offered a webinar on PRRSV 1-4-4 Lineage 1C on February 4, 2021. Expert presenters on the webinar provided context from the practitioner, diagnostician, and monitoring perspectives. While 1-4-4 is not a new strain, on-farm experience with this new Lineage 1C variant has shown it had resulted in higher farrow to finish mortality, abortions, mummies, and slower growth in finishing pigs compared to other PRRSV strains.

An unexpected second wave of outbreaks in upper Midwest states during April and May 2021 in a wider geographic distribution kept this virus at the forefront of current swine health issues. A second webinar, PRRS 1-4-4 Lineage 1C Incidence and Response, took place July 20, 2021, featuring discussion on SHIC Rapid Response Teams' investigations into possible pathways of entry of the virus plus updates on incidence and geographic distribution.

## **Vietnam ASF Research**

*All projects were made possible by a USDA Foreign Ag Service grant obtained by SHIC in September of 2019 with the help of the National Pork Producers Council.*

### ***Projects with Final Reports***

#### **Potential of Rodents to be a Vector in the Transmission of African Swine Fever in Two Commercial Farms in Vietnam with Differing Biosecurity Levels**

A research project examined the potential for rodents to serve as vectors of the virus. Rodent vectors are a possible transmission route long-established for other swine diseases, but uncharacterized for ASF. Work conducted by researchers from South Dakota State University and the Vietnam National University of Agriculture (VNUA) on Vietnamese farms with differing biosecurity levels provided information that suggests rodents are not a high risk of being ASF vectors.

#### **Using Standard Laboratory PCR Testing, and Comparing Available POC Technology, to Assess the Validity of Current ASF Test and Remove Practices in Commercial Swine Farms within Vietnam.**

This project examined an ASFv control measure involving a tooth extraction, or test-and-remove, protocol. Commonly, a tooth extraction protocol for a sow farm involves removing any sow exhibiting clinical signs compatible with ASF along with the two sows in stalls on each side of the index animal. The results of this study suggest tooth extraction test-and-remove is not a reliable way to eliminate ASF from a pig farm.

The project also is comparing the sensitivity and specificity of commercially available “point of care (POC)” or pen side antigen detection tests. Results are being analyzed and are expected to be available by the spring of 2022.

### **SHIC Grant-Funded ASF Research Projects in Vietnam Examining the Use of Serum and Oral Fluid ELISAs**

Two separate research projects being conducted in Vietnam on ELISAs continued and provided a final and a preliminary report in 2021. The first project is being done by Biostone Animal Health, in collaboration with the Canadian Food Inspection Agency’s (CFIA’s) National Centre for Foreign Animal Disease (NCFAD). Goals of the study are to generate a panel of 2000 pig serum samples with known ASF infection status, determine the diagnostic sensitivity and specificity of the ELISAs in the study using the panel, and finally to perform an inter-laboratory evaluation of the assays in the USA and Canada.

Another ELISA-based study evaluated the performance of ASF serum and/or oral fluid ELISAs for use in the surveillance and monitoring of ASF outbreaks in commercial farms in Vietnam and in preparation for the virus becoming endemic in the US. This study shows there is no single best diagnostic approach for ASFv surveillance and demonstrates that the combined use of the Tetracore qPCR and indirect ELISA tests and serum/oral fluid sampling increase efficiency of ASF disease surveillance.

### **Determining the Pathways for ASF Introduction into Boar Studs and Risk of ASF Transmission via Semen Movements During an ASF Outbreak**

A completed study modeled the risk of introducing ASF to a sow farm as a result of semen movement from apparently healthy boar studs located in an ASF disease control area. Results indicated the risk is negligible to low given study parameters, however, several factors with the potential to impact these results were acknowledged. If the Incident Command System is activated by USDA in response to an ASF outbreak, Incident Command staff can get valuable information from the risk assessment to assess industry requests for movement of liquid, cooled boar semen from a boar stud in a control area.

The study included a proactive risk assessment (RA) that looked at the potential risk of semen movements during an outbreak. Researchers, led by staff at the University of Minnesota, established the ASF Boar Semen RA workgroup. Together with researchers at the University of Hanoi, experts determined 10 potential entry pathways for ASF into boar studs as people, feed, water, geographic and/or aerosol transmission, fomites (such as tools, equipment, vehicles), mortality management, domestic animals (such as dogs, cats, replacement boars), biological materials (such as medicines and vaccines), insects/ticks, and wildlife. They further evaluated these pathways on this scale: Extremely High, High, Moderate, Low, Negligible.

### ***Projects Still in Process***

#### **Field Evaluation of Oral Fluids as a Convenient, Aggregate Sample for Early Detection of African Swine Fever**

The initial agreement between CFIA and Vietnam National University for Agriculture (VNUA) has been signed to initiate the project. Plans have been placed to selecting a suitable farm with the early stage of ongoing ASF infection to collect oral fluids. Materials for sample collection such as rope kits have been ordered. Rope kits, primers and probes will soon be shipped to Vietnam. However, due to the

ongoing COVID-19 outbreaks there have been unexpected delays in access to farms and international travel for VNUA laboratory support.

### **Supporting the Control of African Swine Fever in Vietnam**

The primary objective of the program is to enhance the capabilities of the Vietnamese veterinary workforce to prevent and mitigate the impact of ASF. A series of meetings took place with relevant stakeholders in Vietnam, including swine companies and the Vietnamese Department of Animal Health (DAH) to identify priorities for training and develop the instructional strategy. As a result of those meetings, areas of emphasis for the training were identified. It has also been decided that the instructional strategy that would best fit the objectives of the problem is to deliver contents at an initial workshop, deliver training materials in the form of e-books in Vietnamese language for participants to consult at and after that initial workshop (WS #1), and finally wrap up the activities and discuss conclusions in a second workshop (WS #2).

Due to the COVID-19 emergency, there have been some delays in the implementation of the project. It's been decided to present and discuss the design of research projects in WS #1 and results, implementation, and significance for Vietnam in WS #2, to compensate for the delays due to the COVID-19 emergency and mitigate the impact of the emergency on the project. The project has been extended through the spring of 2022.

### **Evaluate the Diagnostic Performance of Pen-side Tests for ASF Detection**

Objectives of this project are to determine the time from infection to the earliest detection of the pen-side tests and to determine the sensitivity and specificity of the pen-side tests for detection of ASF in the field. Initially, the plan was to hand-carry these tests to Vietnam. Due to the pandemic, travel to Vietnam has not been possible. Thus, arrangements have been made for the shipments of test kits and reagents through commercial couriers. This took a significant amount of time to obtain appropriate permits.

Because of the barriers with commercial shipping, the US National Animal Health Laboratory Network ASF PCR test has had to be replaced a different PCR kit that commercially available in Vietnam and is approved by OIE and is validated by the European Union Reference Laboratory for ASFv. The project has been extended into the summer of 2022.

### **Identifying Pathways of Entry of ASF Virus onto Farms to Enhance Information for Improving Biosecurity in Vietnam**

Objectives of the project include to use the Rapid Response investigation form currently used by the US Rapid Response Teams to investigate ASF pathways onto the farms; to utilize the Rapid Response investigation form in an electronic format which can compile the data and provide answers as soon as the data sheet is populated; and to make recommendations on how to mitigate the identified gaps in Vietnamese farm biosecurity and improve the situation on the respective farm(s).

Collaboration with Iowa State University, the Rapid Response Corps management center, has been established. A Non-Disclosure Agreement has been signed with swine farms in Vietnam that have agreed to participate in the project. A set of questions on biosecurity specific for ASF for the swine

farms has been developed and is being used in the investigations. The investigation form is being moved into a website format. A collaboration relationship on biosecurity for sow farms in Vietnam has been formed with a team of veterinarians. The project is scheduled to be completed in the spring of 2022.

### **Time and Temperature Required for Complete Inactivation of African Swine Fever Virus**

The objective of this project is to determine the optimal baking time and temperature required to completely inactivate ASFv in aluminum surface contaminated swine feces. Specifically, to test the effectiveness of the use of thermal-assisted drying and decontamination (TADD) which commonly operates at the temperature between 63°C and 71°C. Three cleaning protocols are being used: baking contaminated trays without additional cleaning, power washing the tray surface with water at room temperature prior to baking, and power washing the tray surface with water followed by applying a disinfectant prior to baking.

The highly virulent ASFv strain currently circulating in Vietnam was inactivated at 54°C within 5 min. However, heat treatment did not eliminate the viral genomic DNA as the swabs were still positive by PCR. One major limitation of this study is that virus isolation was used as the means to evaluate virus inactivation. Passing the samples through a filter prior to inoculating cells may increase the limit of detection of the virus isolation method and thus, it might not be sensitive enough to detect virus from samples that have low level of infectious virus. Pig bioassays have been started to confirm time by temperature needed for inactivation. The bioassay work has extended the project to the summer of 2022.

## **Communications**

Many communications tools are employed to disseminate information to stakeholders, including the SHIC website, e-newsletter, articles prepared for partners, news releases, interviews with Dr. Paul Sundberg, social media, SHIC Talk podcast, and webinar series. SHIC also participates in industry events to provide access to information essential to protection of US swine herd health. Google Analytics of SHIC website traffic are used to measure impact of media efforts.

### **1. Activity on [www.swinehealth.org](http://www.swinehealth.org)**

NOTE: these totals reflect a period when statistics for the site were disabled due to a WordPress update which disconnected Google Analytics. Consequently, overall totals are lower than previous years' reports.

- a. Top pages on SHIC website (June 1-November 22, 2021) with (number of visits):
  - i) Homepage (5,666)
  - ii) Global Disease Monitoring Reports (2,129)
  - iii) Domestic Disease Monitoring Reports (1,197)
  - iv) Seneca Valley Virus Summary (1,061)
  - v) African Swine Fever (983)
  - vi) Research Results (630)
  - vii) Fact Sheets (625)
  - viii) About (562)

- ix) Swine Bacterial Disease Matrix (520)
- b. Continuous WordPress and plugin updates completed
- c. Website content updated with relevant content
  - i) Posted press releases and articles
  - ii) Posted monthly newsletters
  - iii) Posted Research Results
- d. Website impact (January 1 – November 22, 2021)
  - i) Over 14,775 individual sessions
    - o 12.1% returning visitors
    - o 87.9% new visitors
  - ii) Posted press releases and articles
  - iii) 11,952 separate users
  - iv) 25,663 total page views
  - v) Average of 1.41 pages per session
  - vi) Average session duration of 1:23
  - vii) 5,682 users were from the USA
  - viii) 611 users were from Germany
  - ix) 456 users were from Canada
  - x) 375 users were from United Kingdom
  - xi) 284 users were from the Philippines
  - xii) 263 users were from the Netherlands
  - xiii) 194 users were from China

## 2. Press releases

In addition to contributing to press releases issued jointly by US pork industry organizations, three SHIC-specific press releases were issued in 2021:

- o SHIC 2020 Progress Report Details Efforts to Protect US Swine Herd Health
- o Nugent Joins SHIC Board of Directors
- o SHIC Receives Pork Checkoff Funding for Program Extension to 2027

Key media remain engaged by direct contact plus receive the SHIC e-newsletter and monitor social media posts. Several articles from the e-newsletter drove interviews and prompted follow-up by media. So far this year, 64 interviews with Dr. Sundberg have taken place.

### a. Press release impact

Emails were sent to 250 ag news outlets for each press release. Farm broadcasters continued as a very important media outreach for SHIC with follow-up interviews requested after each press release was deployed.

Individual emails are sent to the top five pork media editors as well as five farm broadcasters with each press release. Press releases were picked up by these national editors and farm broadcasters covering

the US pork industry, many times resulting in one-on-one interviews with the executive director. Publications, radio networks, and stations receiving personalized emails include:

- Farm Journal's PORK
- National Hog Farmer/Farm Progress Publications - 3 editors
- Agri-Pulse - 3 editors
- Feedstuffs
- Successful Farming and associated daily e-newsletter
- Brownfield Network
- Rural Radio Network
- WHO Radio – Des Moines, Iowa
- WMT Radio – Cedar Rapids, Iowa
- KWMT Radio – Fort Dodge, Iowa
- KGLO Radio – Mason City, Iowa
- Market Talk Ag – National
- Red River Farm Network

b. Event Interview Opportunities

Multiple media interviews were given throughout the year. Participation in the National Association of Farm Broadcasters annual meeting and its virtual Trade Talk, American Association of Swine Veterinarians (AASV) Annual Meeting as well as other industry events always have good results.

### 3. Articles Prepared for Partners (AASV)

As of December 10, 2021, content was provided for 68 articles for the AASV weekly e-letter and other partners, including:

- 1) SHIC 2020 Progress Report Details Efforts to Protect US Swine Herd Health
- 2) SHIC Shares US ASF Research Update During Canadian ASF Preparedness Efforts Webinar
- 3) CBP Canine Alerts to Prohibited Pork Sausage Arriving at Newark Airport
- 4) Nugent Joins SHIC Board of Directors
- 5) February 4 Webinar Addresses PRRS Strain 1-4-4 Outbreaks
- 6) SHIC Provides Context on Chinese ASF Outbreaks and Vaccines
- 7) SHIC Diagnostic Fee Assistance Fills a Gap When an Answer Is Needed
- 8) SHIC-Funded Study Finds Better Approach for Disease Surveillance
- 9) SHIC-Funded MSHMP Offered New Deliverables in 2020
- 10) SHIC 2021 Plan of Work Builds on Progress and Adds New Emphases
- 11) SHIC-Funded *S. zooepidemicus* Research Continues to Provide Resources
- 12) SHIC/AASV PRRS 1-4-4 Lineage 1c Webinar Provides Information on Recent Outbreaks
- 13) SHIC-Funded Study Evaluates TADD to Inactivate ASF Virus in Transport Trailers
- 14) CBP Seizes 194 Pounds of Prohibited Bologna
- 15) SHIC-Funded Study Advances PRRS Biosecurity Screening Tool
- 16) SHIC Offers Resources on PRRS 1-4-4 lineage 1c Outbreaks
- 17) SHIC Releases Program Review Detailing Return on Producer Investment
- 18) SHIC Addresses *Strep. zoo* with Addition to Matrix and New Fact Sheet
- 19) Rock Offers Review of Reported ASFV Variants Emerging in China for SHIC
- 20) SHIC Funds PRV Oral Fluid PCR and ELISA for Diagnosis and Surveillance

- 21) Movement of Dogs from China May Pose Risk to North American Livestock Production
- 22) SHIC-Funded Research on *S. zooepidemicus* Provides New Information and Resources
- 23) SHIC Updates Getah Virus Fact Sheet and Revises Template
- 24) SHIC Grant-Funded Study in Vietnam Indicates Rodents May Be Low Risk ASF Vector
- 25) SHIC/CEID Partnership Examines Swine Bacterial Pathogens Risk
- 26) SHIC-Funded ASF Molecular Epidemiology Project Identifies Prevention and Control Gaps
- 27) SHIC Issues Call for Research Funding Proposals: Bioexclusion and Biocontainment
- 28) SHIC's USDA FAS Grant-Funded ASF Seminars in Vietnam Begin
- 29) SHIC Swine Disease Fact Sheet Updates Offer Current Research on Chikungunya, Menangle, and Sapovirus
- 30) SHIC Develops New *Salmonella* 1,4,[5],12:i:- Fact Sheet per Industry Input
- 31) SHIC Updates Nipah and Rubulavirus Fact Sheets to Aid US Swine Industry
- 32) SHIC Board of Directors Extends SDRS Program and Takes Other Actions
- 33) SHIC Acts on Diagnosis of Novel Morbillivirus in Pigs
- 34) SHIC Pursues Information on Novel Rotavirus to Determine Risk to US Swine Herd
- 35) USDA Adds Blood Swabs and Spots as Official ASF Testing Tissues
- 36) SHIC Porcine Kobuvirus Fact Sheet Receives Detailed Update
- 37) SHIC-Funded Research Identifies Potential Role of PPV2 in PRDC Development
- 38) See Something? Say Something! SHIC Version (mystery disease in Dominican Republic – pre-ASF diagnosis)
- 39) Updated SHIC Sapelovirus Fact Sheet Addresses Prevalence and Diagnostics
- 40) SHIC-Funded ASF Study on Test-and-Remove Protocol in Vietnam Finds it Unreliable
- 41) SHIC HP-PRRSV and Ebola Virus Fact Sheets Updated for US Swine Industry Benefit
- 42) SHIC Closely Observing ASF Outbreak in Germany
- 43) SHIC-AASV Webinar Delves into PRRS 1-4-4 1C Incidence and Possible Pathways of Entry
- 44) SHIC Adds to Preparedness with Updated PTV and JEV Fact Sheets
- 45) New Study Explores the Risk and Mitigation of Foot-and-Mouth Disease Virus in Feed
- 46) SHIC Grant-Funded ASF Research Project in Vietnam Examines ELISAs
- 47) SHIC Joins Swine Industry Partners to Applaud USDA Action on Dog Importation Restrictions
- 48) SHIC Updates PCV3 Fact Sheet - Case Definition and On-farm Epidemiology Needed
- 49) SHIC Continues on Emerging Disease Mission with Study on Canine Parvovirus 2 Spillover to Swine
- 50) Reminder to International Travelers: Report Lack of Secondary Screening If Needed
- 51) International Travelers Reporting Lack of Secondary Screening
- 52) September 28 SHIC/AASV Webinar Will Address F18-Associated Gut Edema Management
- 53) SHIC Updates APPV Fact Sheet Noting Need for Further Research
- 54) F18-associated Gut Edema Disease Successes, Challenges and Analyses Offered During a SHIC-AASV Webinar
- 55) Ohio Animal Disease Diagnostic Laboratory Expands the Swine Disease Reporting System Network
- 56) Influenza Virus Fact Sheet Updated in SHIC Library
- 57) SHIC Funding Investigation of Feed Manufacturing Facility Decontamination Processes
- 58) SVA Half-life in Feed and Infection Following Consumption Are Results of SHIC-Funded Study
- 59) SHIC-Funded Research Helps Compare Pathogen Detection Methods in Feed



- 60) SHIC-Funded Swine Disease Reporting System Expands Near Real-Time Disease Information
- 61) SHIC Diagnostic Fee Support Program Provides Additional Resources
- 62) SHIC-Funded Quantitative Risk Assessment Models US Risk of ASF Introduction in Feed
- 63) SHIC-Funded MSHMP and NCSU Project Models PRRS Dissemination Dynamics
- 64) SHIC: Newly Discovered Low Virulent, Genotype I, ASF Virus Causing Chronic Infections in China
- 65) More SHIC-Funded Vietnam ASF Research Results Reported
- 66) SHIC Funds Porcine Sapelovirus Genetic Characterization and Diagnostic Tool Development
- 67) SHIC-Funded Study Evaluated Soy Importation Data
- 68) SHIC/AASV Influenza Management Strategies Webinar

**4. SHIC e-newsletters**

A monthly SHIC e-newsletter publication schedule continued in 2021. The distribution list has just under 3,000 subscribers and is consistently updated.

The following chart details SHIC e-newsletter acceptance and impact.

Edition	Number	Date Sent	# Sent	Opens	Opens %	Unsubs	Clicks*	Click %*
January 2021 newsletter	107-47	1/6/2021	3004	775	26.7%	5	135	17.4%
February 2021 newsletter	107-48	2/3/2021	3008	823	28.7%	2	276	20.7%
March 2021 newsletter	107-49	3/3/2021	3007	865	29.9%	3	405	22.5%
April 2021 newsletter	107-50	4/7/2021	3031	932	32.1%	3	950	33.7%
May 2021 newsletter	107-51	5/5/2021	3026	741	25.6%	2	259	19.2%
June 2021 newsletter	107-52	6/3/2021	3021	626	21.8%	1	276	19.5%
July 2021 newsletter	107-53	7/7/2021	3035	685	23.8%	2	219	19.3%
PRRS 1-4-4 Webinar #2 eblast	111	7/12/2021	3031	771	26.9%	0	204	22.2%
August 2021 newsletter	107-54	8/4/2021	3040	843	29.4%	1	388	28.2%
September 2021 newsletter	107-55	9/3/2021	3056	674	23.0%	2	347	21.0%
F18 Gut Edema Webinar eblast	111	9/20/2021	3054	761	26.5%	4	193	18.0%
October 2021 newsletter	107-56	10/6/2021	3065	750	26.2%	1	348	21.9%
November 2021 newsletter	107-57	11/3/2021	3077	861	30.0%	1	442	
December 2021 newsletter	107-58	12/3/2021	3095	899	31.2%	1	226	
<b>Averages</b>				<b>786</b>	<b>27.3%</b>		<b>333</b>	<b>NA</b>

Benchmarks\*\*

17.0%

9.0%

\* Clicks = following a link to the SHIC website. Email platform changed click percentage calculation in October 2021, rendering report incomparable to previous.

\*\* Benchmarks are industry standard averages per Constant Contact, the email distribution platform used for the newsletter.

**5. SHIC Talk Podcast**

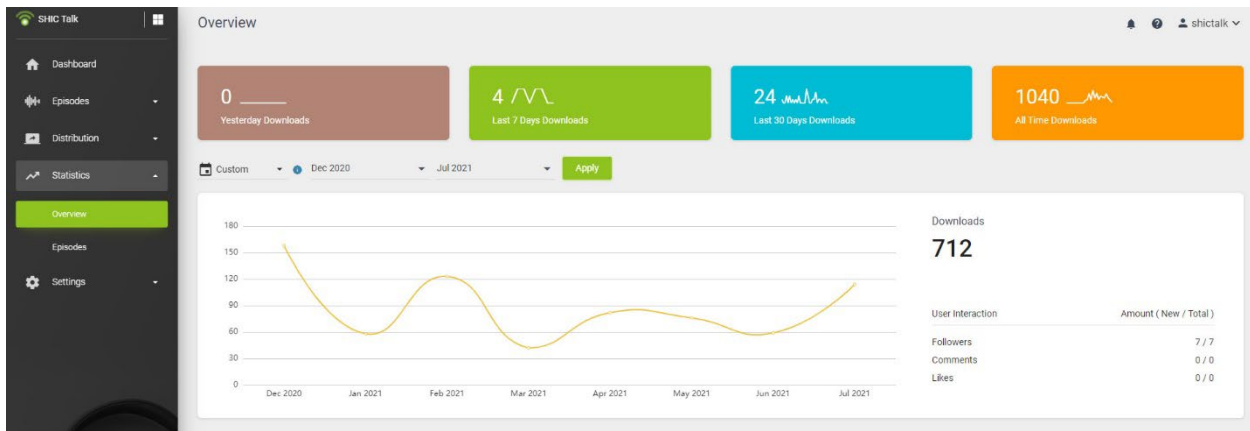
In 2021, SHIC Talk episodes continued to be produced. The podcast is hosted by Barb Determan and features guests on “industry chatter” topics as well as comments by Dr. Paul Sundberg. Five episodes have been produced from December 2020 to July 2021. SHIC Talk is available on the SHIC website as

well as Apple Podcasts, Google Podcasts, Spotify, Amazon Music/Audible, TuneIn/Alexa, and iHeart Radio.

Episodes (as of October 2021)

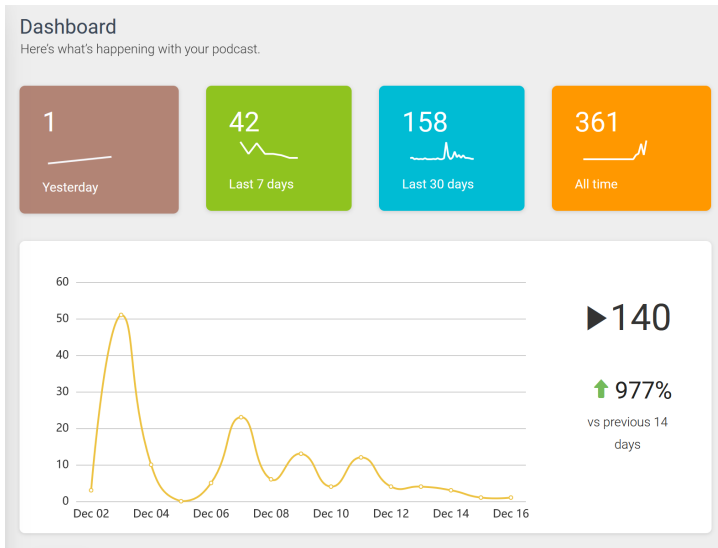
- ASF Research in Vietnam with Drs. Sundberg, Wagstrom, and Pyburn (December 2020)
- PRRS 1-4-4-1c with Drs. Yeske and Linhares (February 2021)
- SHIC Progress with Drs. Connor and Olsen (April 2021)
- SHIC Fact Sheets (May 2021)
- Morbillivirus with Drs Arruda and Li (July 2021)

Podcast Listenership



Episode List

Title	Author	Status	Type	When	Downloads(All time)
SHIC Talk Ep 8 Morbillivirus Drs Arruda and Li	shictalk	Published	Public	Jul 14, 2021	108
SHIC Fact Sheets	shictalk	Published	Public	May 26, 2021	76
SHIC Talk Ep 6 - SHIC Progress - Drs Connor and Olsen	shictalk	Published	Public	Apr 20, 2021	95
SHIC Talk Ep 5 - PRRS 1-4-4-1c - Drs Yeske and Linhares	shictalk	Published	Public	Feb 15, 2021	167
SHIC Talk Ep 4 - ASF Research in Vietnam - Drs Sundberg, Wagstrom, and Pyburn	shictalk	Published	Public	Dec 02, 2020	200



## 6. Webinars

SHIC offered a series of webinars with co-sponsor the American Association of Swine Veterinarians in 2021. The quarterly webinars respond to “industry chatter” about current swine health issues. The webinars are conducted by Iowa State University Swine Medicine Education Center staff. Webinars as of December 15, 2021:

- F18-Associated Gut Edema Management Webinar
  - Presenters: Dr. Drew Magstadt, Iowa State University, Dr. Deb Murray, New Fashion Pork, and Dr. Kurt Kuecker, Hanor Companies
- PRRS 1-4-4 Incidence and Response
  - Presenters: Dr. Mariana Kikuti, University of Minnesota, Dr. Giovanni Trevisan, Iowa State University, Dr. Derald Holtkamp, Iowa State University College, Dr. Paul Yeske, Swine Vet Center
- PRRS Strain 1-4-4 Outbreaks
  - Presenters: Dr. Mariana Kikuti, University of Minnesota, Dr. Giovanni Trevisan, Iowa State University, Dr. Stephanie Rossow, University of Minnesota
- Swine Influenza Management Strategies
  - Presenters: Dr. Amy Vincent, USDA-ARS National Animal Disease Center, Dr. Philip Gauger, Iowa State University, and Dr. Dyneah Classen, Carthage Veterinary Service

Quarterly webinars will continue with subject matter and presenters to be determined.