SHIC
Swine Health Information Center

Newsletter
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OUR LATEST INFORMATION ON PROTECTION OF US SWINE HERD HEALTH

SHIC Receives Pork Checkoff Funding for Program Extension to 2027

TThe National Pork Board announced an additional $15 million investment of Pork Checkoff funds in the Swine Health Information Center (SHIC), extending funding for the Center through 2027. Launched with Checkoff funds in 2015, SHIC works 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.

"SHIC provides value to the entire pork industry through targeted disease research programs," says Gene Noem, National Pork Board president and SHIC board member. "Specifically, SHIC is able to conduct and source research for emerging health issues from a network of academia, veterinary service and diagnostic labs and researchers across the globe."

Several essential programs to keeping the US swine heard safe from emerging global diseases have been developed by SHIC, including:

- Near real-time domestic and global swine disease reports
- Viral and bacterial swine disease matrices, providing a prioritized list of endemic and foreign swine pathogens
- Diagnostic fee assistance to help identify newly introduced or emerging diseases
- Rapid Response Program to investigate transboundary or newly emerging swine diseases with the Rapid Response Corps, a team of experts to analyze the patterns, causes and effects of health and disease conditions in affected herds

"In the very short time we've been in existence, we have come to play such a vital role in helping defend the health of our industry. Since receiving initial funding from the National Pork Board, we have filled a void and been very successful. We're committed to protecting the US pig population," remarked Daryl Olsen, DVM, AMVC, Audubon, Iowa, SHIC board chair.

SHIC has also been involved in foreign animal disease (FAD) work, including a Biosecurity Risk Assessment. Released in September 2021 and conducted by EpiX Analytics, LLC, this report looked at eight potential pathways, and found no major areas have been overlooked to prevent the introduction of African swine fever (ASF) to the US. Other vulnerabilities, such as feed ingredients being imported from ASF-positive countries and illegal or out-of-regulatory-compliance garbage feeding, were also identified by the study as areas for the pork industry to continue working to address.

For feed risk to be approached with sound science, SHIC has pursued a breadth of research and

information. These projects include viral survivability in feed ingredient research, half-life estimates for ASF and foot-and-mouth disease (FMD) leading to holding time information, supporting laboratory extraction research for PCRs, documenting sources and quantities of imported feed ingredients, and continuing to gather information that can help fill gaps in risk assessments.

SHIC is governed by a Board of Directors and functions with two Working Groups. These swine disease experts include practitioners, diagnosticians, academicians, producers, and other industry experts. SHIC Executive Director Paul Sundberg, DVM, PhD, DACVPM, guides the Center's work, which is informed by an annual Plan of Work. SHIC is focused on domestic and global emerging swine disease. Due to the Center's organization, it can move quickly on needed research, diagnostics, and response.

SHIC Invites Applications for Associate Director

The Swine Health Information Center (SHIC) is responsible for developing and maintaining a global swine disease information network for the purpose of protecting and enhancing the health of the United States swine herd. This includes coordinated global disease monitoring, targeted research investments that minimize the impact of future disease threats, and analysis of swine health data. SHIC is inviting applications for the position of Associate Director. A job description and application information are available here.

The Associate Director will help the Executive Director to lead SHIC. The Associate Director will assist in directing overall expectations and accountability and ensuring quality programs and services. Responsibilities and essential job functions include working with the Executive Director to provide oversight and implementation of the Center's budget, long range planning, and strategic initiatives. The Associate Director will interact closely with the pork community, assisting efforts to build awareness of the Center, to build and maintain excellent working relationships, and to successfully meet the Center's mission.

To reply, please provide to Dr. Paul Sundberg, SHIC Executive Director, at psundberg@swinehealth.org a CV with a cover letter describing professional goals and why you are uniquely qualified to fill this position. The position will remain open until the successful candidate is identified. If you have questions, contact Dr. Sundberg at that email address or call him at (515) 451-6652.

SHIC/AASV Influenza Webinar Addresses Management Strategies for Seasonal Challenges

A webinar on swine influenza management strategies was offered by the Swine Health Information Center (SHIC) along with the American Association of Swine Veterinarians (AASV) and hosted by the Iowa State University Swine Medicine Education Center (ISU SMEC) on December 14, 2021. Dr. Amy Vincent, USDA-ARS National Animal Disease Center, and Dr. Phil Gauger, Iowa State University, experts in swine influenza and related research, along with Dr. Dyneah Classen, Carthage Veterinary Service, a practitioner with hands-on swine influenza experience presented information. A recording of the webinar is available here.

Dr. Vincent provided background on influenza A virus (IAV) in swine as well as discussed surveillance and tools to monitor virus diversity and evolution. She covered the impact of genetic evolution on antigenic diversity of HA and NA influenza strains and their sequences. Her presentation included information regarding limitations on vaccines in the real world along with vaccine research and immune responses to sequential vaccination or exposure.

Dr. Vincent cautioned the audience to remember IAV in swine changes rapidly due to genetic mutation and antigenic drift. The emergence of new genetic lineages by migration or interspecies transmission and adaptation impacts IAV detection and response. Dr. Vincent said, "Robust surveillance and HA/NA sequencing are necessary for improved vaccines." Immune responses to infection and vaccination are impacted by many factors, according to Dr. Vincent. The sequence of exposure or vaccination can impact subsequent antibody responses.

Dr. Gauger presented 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.

Per Dr. Gauger, IAV diagnostic testing goals address postmortem and antemortem diagnostic testing. In postmortem testing, the goal is diagnosing the cause of clinical respiratory disease. Antemortem diagnostic testing has broader implications. "Most IAV diagnostic testing involves monitoring or surveillance purposes," Dr. Gauger remarked. The process identifies the presumptive diagnosis of clinical respiratory disease in a population, surveillance to establish IAV status at the farm or population level, monitoring the frequency of IAV infection/detection to develop control measures, success of intervention strategies, and genetic diversity of circulating strains in the production system. The process also assists selection of an appropriate sampling strategy, sample types, and type of test to use based on the submitters diagnostic question.

There are a diversity of sample types for IAV diagnostic testing to address ease of collection, population or group sample types, improved detection of IAV as well as increasing compliance of sample collection per routine monitoring protocols per Dr. Gauger. He also shared IAV sampling strategies saying sample collection at the litter or pen level is best for detection. Research has shown improved detection in this format compared to individual sample types (Garrido-Mantilla et al., 2019). The individual sample type is best to obtain isolates, however, per the same research. Dr. Gauger emphasized that sample size should be based on expected prevalence and clinical impressions.

Dr. Classen said IAV can circulate among swine throughout the year, but most outbreaks occur during the late fall and winter months. Clinical signs in swine can start out similar to other diseases with animals off feed, showing lethargy, high fevers (rectal temperatures of 104 F and above), increased mortality, and in pregnant sows, abortions. Other clinical signs seen as the disease progresses are nasal discharge and a deep, barking cough.

Dr. Classen shared her experience with the Prime and Boost influenza vaccination protocol. The strategy involves choosing two vaccines that are genetically different, or heterologous, and giving a priming dose and following up two to four weeks later with a booster dose. The supposition is the two different vaccinations will boost the immune response.

In the last two years, 55% of sow herds in Dr. Classen's systems have had a new Influenza outbreak and 11% were breaking with two strains during the same flu season. She said the utilization of oral fluids has increased passive surveillance of finishing herds and found non-clinical herds positive for influenza.

Dr. Classen shared an influenza endemic herd elimination program. This process begins with identification of the endemic strain or multiple strains identified through testing and uses an autogenous vaccine with 3% or less heterology (97% homology). "This can be a multivalent vaccine or can be made specifically for the endemic strains," Dr. Classen explained.

SHIC/AASV sponsored webinars bring together subject matter experts to discuss current issues facing US pork producers and practitioners. Previous webinars are posted online for convenient access here.

Do you have a recommendation for a topic to be addressed in this format? SHIC and AASV would like your input! Reach out to SHIC Executive Director Dr. Paul Sundberg at psundberg@swinehealth.org or AASV Director of Public Health and Communications Dr. Abbey Canon at canon@aasv.org with your webinar recommendations.

SHIC-Funded Infectious Aerosols Biocontainment Project Provides Initial Results

A project designed to help prevent the spread of infectious bioaerosols capable of causing swine disease outbreaks with significant economic consequences is underway. Funded by the Swine Health Information Center (SHIC) and being conducted by University of Minnesota staff, work on objective one began in October 2021 and has provided initial insights. This portion of the project is identifying existing and emerging aerosol technologies and procedures, then reviewing them to assess their ability to contain bioaerosols in the face of disease outbreaks in swine.

As part of the literature review being conducted during the first objective, researchers have identified more than 80 references on different technologies. Those identified so far include 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. The literature search is being conducted mostly through the Web of Science, PubMed, Google Scholar, and Scopus databases. Researchers expect to finalize the review of the technologies from the public database by February.

Experts at the College of Veterinary Medicine and the College of Science and Engineering at the University of Minnesota have been assembled to conduct the extensive literature search on known technologies directed at removing airborne particles from the air. Individuals have also identified who has experience in handling disease outbreaks in the swine and poultry industries, handling outbreaks from a regulatory point of view, as well as others with experience handling human and animal disease outbreaks. An additional group who will assist with the selection and evaluation of the technologies and measures for their application to swine have also been identified with plans to continue progress on the project in early 2022.

The breakdown of references and a description of the most prevalent technologies is as follows:

Fibrous Filtration (11 references): Filtration is the most well-established and widely applied approach for biocontainment. Its method of action is the indiscriminate removal of particles from flowing airstreams. There is a balance between the particle size dependent on removal efficiency for a filter, which should be as high as possible, and the pressure drop across the filter for a given flow rate, which is directly related to the energy costs of filter operation. Furthermore, filter loading increases pressure drop but also efficiency, and must be considered in filter application.

Ultraviolet light technologies (16 references): UV-C light at 254 nm is an established route towards pathogen inactivation in aerosols and on surfaces, as nucleic acid molecules readily absorb photons near this wavelength. UV-C (and potentially UV-A) sources can be incorporated in ducts to directly inactivate pathogens in aerosols, in conjunction with filters to inactivate collected pathogens and in upper room bulbs to inactivate larger spaces. However, the latter typically cannot be operated continuously, as UV-C can be mutagenic or carcinogenic at high enough exposure levels.

Electrostatic precipitation (10 references): Commonly used in the combustion industry, electrostatic precipitation is a process wherein particles are unipolarly ionized through interaction with gas phase ions, and ionized particles are exposed to DC electric fields, which lead to their deposition. Electrostatic precipitators (ESPs) are competitive technologies with filters, able to achieve similar-to-better collection efficiencies with minimal pressure drops. They still require periodic cleaning of particles from deposition electrodes, and their performance does change over time as particles deposit.

Other ionization, catalysis, and disinfection technologies: In addition to previously discussed established technologies, there are some more recently developed ionization schemes (16 references), photocatalytic approaches (nine references), and disinfection technologies (13 references) which are still at the developmental stage. These need to be 1) tested for efficacy at scales relevant to agricultural biocontainment and 2) tested for animal safety.

This work will be complementary to additional objectives of the project which will be addressed in 2022.

SHIC Diagnostic Assay Catalog Update Supports Emerging Disease Readiness

Since its inception in 2015, diagnostic preparedness and readiness for possible new or emerging production diseases has been a focus of the Swine Health Information Center (SHIC). The SHIC Diagnostic Assay Catalog, a tool for preparedness and readiness, was updated again in December 2021. Developed for swine diagnosticians, this updated catalog contains information for SHIC-funded diagnostic tests developed to support early identification and epidemiological investigations of possible emerging disease pathogens. SHIC actively updates emerging disease information, including this

catalog and swine disease fact sheets, regularly to equip the industry.

Early detection is critical to early response. This catalog provides diagnosticians at veterinary diagnostic labs pertinent information about the tests developed, including contact information for the experts, providing the opportunity for questions about availability and use. Additionally, the catalog summarizes research behind test development and covers technical background information including sample types and analytical and diagnostic sensitivity and specificity.

From evaluating risks via the SHIC Swine Disease Matrix and assessing our current diagnostic needs to be able to quickly identify these pathogens, to funding the development of tests, SHIC has led the pork industry to an additional level of readiness which puts the US industry on a different playing field than it was on prior to SHIC's inception.

SHIC-Funded MSHMP Year Seven Goals to Expand Participation and Capacity

The Morrison Swine Health Monitoring Project (MSHMP) is entering year seven with plans to build capacity. MSHMP will carry on monitoring swine disease incidence with a national system in place for emerging pathogen detection, a key element of the Swine Health Information Center's (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.

MSHMP maintains the following overarching objectives:

1. Monitor trends in pathogen incidence and prevalence.
2. Conduct prospective monitoring of PRRS virus sequence evolution and impact.
3. Develop capacity to capture and analyze movement data.
4. Expand participation of producers to allow for all the opportunity of access to timely detailed information on disease occurrence and streamline public access to information relevant to the industry.

As in previous years, MSHMP's commitment to the US swine industry will remain the collection, analysis and report generation and sharing of disease occurrence metrics. This ongoing process has allowed MSHMP to conduct complementary projects, share data with producers on a more granular level contributing to further understanding trends in the nation, but most importantly, stimulate cooperation among producers and practitioners. An example of this was the recent emergence of the new porcine reproductive and respiratory syndrome (PRRS) variant that rapidly evolved. Without the MSHMP platform metrics, the epidemiologic curve and maps could not have been generated and shared with the US industry.

In year seven, MSHMP is proposing several new projects within each overarching goal. All newly proposed projects have evolved from conversations with participants with the goal of making them applicable for a foreign animal disease emergency.

Goal 1:
- Begin exploring data pathways to quantify and characterize the occurrence of disease in the growing pig herd population.

Goal 2:
- Develop a methodology to identify new PRRSv strains circulating as part of a cluster through frequency and similarity.

Goal 3:
- Create and characterize the dissemination network patterns through pig movement of the newly emerged PRRSv lineage 1-4-4 1C in a production system and assess regional risk of these newly placed pigs.

Goal 4:
- Develop and launch the first publicly available MSHMP website to optimize project output dissemination within both the participant and industry communities.

The MSHMP team will continue to deliver practical knowledge in a timely fashion to help producers prevent and manage swine diseases. Through MSHMP, participation and sharing of diagnostic information in the interests of the producer and the industry is encouraged.

Aside from capacity building, MSHMP proposes to create value through conducting practical, short-term research on diseases important to the industry. This

will include monitoring the incidence and prevalence of PRRS virus, PEDV, and potentially other important pathogens. MSHMP will use the diagnostic results in conjunction with management information and interventions to publish ways for producers to limit the impact of important swine diseases. And by adding phylogenetic information to the data routinely collected by MSHMP, the project will contribute to producer capabilities to early identify, interpret, and react to PRRS outbreaks, new virus incursions, and changes in risk at both system and regional levels. This work will help answer one of the most important PRRS research questions related to virus evolution, emergence, and transmission at the regional and system levels, while at the same time preparing the basic tools needed for a rapid response in the face of an FAD.

This proposed project will create value in three ways. MSHMP encourages and entices producers to participate in a voluntary, producer-led disease control program. The project creates the infrastructure to monitor, detect and inform producers about emerging pathogens in the country, a SHIC mission priority.

SWINE DISEASE MONITORING REPORTS

As the world deals with the COVID-19 pandemic, SHIC continues to focus efforts on prevention, preparedness, and response to novel and emerging swine disease for the benefit of US swine health.

DOMESTIC

This month's Domestic Swine Disease Monitoring Report shows that a moderate increase in detection of porcine reproductive and respiratory syndrome virus (PRRSV) in breeding herds occurred in December and agreed with past reports that have highlighted that spike in grow-finish pigs (seen since September) usually is followed by increased activity in breeding herds. Detection of enteric coronavirus, i.e., porcine epidemic diarrhea virus (PEDV), porcine deltacorona virus (PDCoV), transmissible gastroenteritis (TGE), and *M. hyopneumoniae* by PCR are according to forecasted levels for this time of the year. The SDRS bonus page brings a 2021 SDRS retrospective. In the podcast, the SDRS hosts talk with Dr. Luc Dufresne, Director of Veterinary Services at Seaboard Foods, about his experiences in animal health management, disease management, control, and his vision for the swine industry to better handle animal health interventions for major agents.

VIEW REPORT

GLOBAL

In the January Global Swine Disease Monitoring Report, African swine fever (ASF) regionalization is discussed as France arrives at an agreement with China to carry on trade in case of an outbreak. In Germany, the number of ASF-infected wild boar goes over 3,000 before the end of 2021. Japanese authorities confirmed three new outbreaks of classical swine fever (CSF) in commercial farms - over 18,000 pigs were destroyed. In Taiwan, authorities are carrying out a plan using sentinel farms to end vaccination against CSF – targeting 2023. And in Canada, Manitoba closes the year with 30 porcine epidemic diarrhea (PED) outbreaks in less than three months - half reported in December.

VIEW REPORT