SHIC
Swine Health Information Center
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Newsletter
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OUR LATEST INFORMATION ON PROTECTION OF US SWINE HERD HEALTH

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SHIC Invites Input for 2025 Plan of Work

The Swine Health Information Center annually solicits input for its Plan of Work which guides its activities. Now being developed, SHIC is requesting ideas for its 2025 Plan. SHIC's five strategic priorities include 1) improving swine health information, 2) monitoring and mitigating risks to swine health, 3) responding to emerging disease, 4) surveillance and discovery of emerging disease, and 5) swine disease matrices. These priorities guide the Center's Plan of Work along with stakeholder input. Once developed, the 2025 Plan of Work will be implemented by Executive Director Dr. Megan Niederwerder and Associate Director Dr. Lisa Becton with input from the SHIC Board of Directors and SHIC Working Groups.

Stakeholder input for SHIC's 2025 Plan of work can be submitted here and is requested by November 8, 2024. All swine industry stakeholders are encouraged and welcomed to provide feedback. Input may include topic areas, research priorities, and/or identified industry needs that will focus SHIC's programmatic and research efforts in 2025, such as an emerging swine disease or an emerging swine health issue.

SHIC's activities are guided by the Plan of Work while the organization remains nimble and responsive to industry needs as they arise throughout the year. Stakeholder input and ideas are welcomed year-round to address newly identified needs which may necessitate adapting the Plan of Work to fulfill SHIC's mission on emerging diseases.

SHIC has recently funded nine new projects addressing research priorities and topics that were published in its 2024 Plan of Work. These nine projects were initiated in summer 2024 and are six to 12 months in duration. Research outcomes from SHIC's funded projects will provide critical information and resources to help pork producers as they face emerging disease challenges in their swine herds.

Newly funded projects addressing SHIC's research priorities include:

- disease spillover risks from wean-to-market pigs to sow herds
- whole genome sequencing as a forensic diagnostic tool
- pathogenesis and interpretation of test results for porcine circoviruses
- early disease outbreak warning signals
- population-based sample types for emerging disease testing

- domestic disease monitoring for bacterial pathogens
- clinical relevance of newly identified agents or syndromes from veterinary diagnostic lab submissions
- informing the swine disease matrices to prioritize pathogens for research and diagnostics

Funding timely research is an essential component of SHIC providing project outcomes that drive action for emerging disease prevention, preparedness, mitigation, and response for the US swine industry.

SHIC Wean-to-Harvest Biosecurity: New Projects Funded to Investigate Pathogen Contamination of Trailers at the Harvest Plant and Mortality Disposal Structures on Farm

The Swine Health Information Center's Wean-to-Harvest Biosecurity Research Program, funded in collaboration with the Foundation for Food & Agriculture Research and the Pork Checkoff, has recently funded two new projects to advance biosecurity of US swine farms. The newly funded projects include: 1) quantifying trailer contamination rates at the harvest plant interface led by Dr. Cesar Corzo at the University of Minnesota, and 2) assessing viral contamination of mortality disposal structures at wean-to-market farms led by Dr. Igor Paploski at the University of Minnesota. These awards bring the total number of projects to 20 that have been funded by the program for a comprehensive approach to enhancing biosecurity across the wean-to-harvest phases of swine production.

Priorities of the Wean-to-Harvest Biosecurity Research Program focus on site and transportation biosecurity in five targeted areas: 1) personnel biocontainment and bioexclusion, 2) mortality management, 3) truck wash efficiency, 4) alternatives to fixed truck wash, and 5) packing plant biocontainment. The research program reflects SHIC's responsiveness to an identified swine health vulnerability and collaborative efforts to leverage producer Checkoff funds to safeguard the health of the US swine herd. Proactively enhancing wean-to-harvest biosecurity will help control the next emerging disease in the US pork industry. All proposals submitted undergo a competitive review process by a task force of industry stakeholders with funding recommendations approved by the SHIC Board of Directors, FFAR, and Pork Checkoff. Projects are reviewed for their value to pork producers and their ability to provide cost-effective biosecurity solutions on the farm.

Novel tools, technologies and approaches are needed to augment current biosecurity practices in the US swine industry. Each of the two newly funded projects investigate unique routes for disease transmission through market transport and mortality management. First, a project led by Dr. Cesar Corzo at the University of Minnesota was awarded entitled "Quantification of the trailer contamination risk at the harvest plant: An assessment of current trailer positivity rate and associated factors." Developed in collaboration with the Meat Institute, this project seeks to gather and analyze key data on viral pathogen contamination rates of transport trailers throughout the year at the interface with the harvest facility, including PEDV, SVA, and PRRSV. The goal of the research is to understand potential epidemiological factors related to the trailer and unloading process that contribute to increased or decreased contamination risks.

Second, a project led by Dr. Igor Paploski at the University of Minnesota entitled "Assessing viral environmental contamination: An investigation of dead animal disposal structures in wean-to-market farms" was awarded. This project seeks to describe current biosecurity practices associated with dead animal disposal, assess viral environmental contamination around mortality disposal structures including composting bins and dead boxes, and test an environmental decontamination strategy. The goals of the research are to identify practices associated with viral contamination of mortality structures and develop actionable information for risk mitigation of disease transmission through mortality management.

The Wean-to-Harvest Biosecurity Program continues to accept research proposal submissions which address the five targeted priority areas until funds have been expended. Total project funds

available for the Program since its inception are $2.3 million. Real-time results of all projects will be shared as quickly as they become available for producers to implement knowledge gained on the farm.

SHIC-Funded Study Examines Piglet Postmortem Sampling for PRRS Detection

With a goal to provide welfare-friendly and cost-effective methods for active PRRSV surveillance, Drs. Cesar Corzo, Mariana Kikuti and colleagues from the University of Minnesota led a study to evaluate the accuracy of different postmortem specimens collected from piglets in breeding herds for disease detection. Funded by the Swine Health Information Center, the study focused on the sensitivity of PRRSV detection by PCR across six sample types, including nasal, oral, and rectal swabs, tongue-tip fluids, superficial inguinal lymph nodes, and intracardiac blood. Overall, investigators concluded that oral swabs and lymph nodes showed the best diagnostic performance. Tongue-tip fluids had high sensitivity (92.2%) but low specificity (53.9%) due to likely environmental contamination and may be a less suitable sample type for individual pig diagnosis. Published by mdpi.com, you can find the entire piglet postmortem sampling study here, including citations for content included in this summary.

In the US, PRRS continues to be the primary health challenge faced by swine herds. PRRS outbreaks afflict a significant portion of US breeding and growing herds, causing a major economic impact and production losses across the industry. The estimated weekly PRRS virus prevalence was 20%–40% between 2019 and 2023 in US breeding herds, according to the SHIC-funded Morrison Swine Health Monitoring Project.

Traditionally, PRRS surveillance efforts in breeding herds have heavily relied upon live animal sampling methods, including individual pig-level serum, oropharyngeal and nasal swabs, along with group-level oral fluids and environmental samples. Live animal specimens collected directly from individual pigs tend to have higher analytical sensitivity, the ability to detect a true positive sample, when compared to the group or environmental specimens. However, individual pig sampling poses labor and logistical challenges including concerns for staff safety and animal welfare.

Monitoring the dead piglet population through sampling tongue-tips for PRRS diagnosis has been proposed by European researchers (Baliellas et al., 2021) as an alternative to processing-fluids surveillance for PRRS and was quickly adopted in the US as a complementary specimen when monitoring breeding herds. In the study described herein, the aim was to determine the sensitivity of PRRSV detection across six postmortem sample types collected from dead piglets in US breeding herds.

Three Midwestern US farrow-to-wean farms undergoing PRRS elimination after an outbreak were utilized as the study population. Farms that utilized PRRS-modified live virus vaccination protocols for sows or piglets were excluded. Farm size ranged from 2500 to 5000 sows and all farms were representative of modern pig production and have year-round negative-pressure air-filtration systems.

For each farm, 30 and 60 samples were collected at eight and 20 weeks, respectively, after the PRRS outbreak. Postmortem samples included nasal swabs, oral swabs, rectal swabs, tongue-tip fluids, superficial inguinal lymph nodes, and intracardiac blood. All samples were tested for PRRSV RNA using RT-PCR. Intracardiac serum served as the gold standard for calculating the sensitivity, specificity, and predictive values of other post-mortem specimens.

To establish PRRS prevalence within each farm, blood samples were collected from live piglets via jugular venipuncture in the same rooms as the ones used for post-mortem sampling. Sera from live piglets were tested for PRRS by RT-PCR in pools of five; any sera from positive pools were then tested individually to estimate the within-herd PRRS prevalence. All specimens were submitted to the University of Minnesota Veterinary Diagnostic Laboratory for individual PRRS RT-PCR testing. PRRSV was detected in all specimen types and at all sampling points, except for two sampling points, where swabs (oral, nasal, rectal) and intracardiac sera did not detect the virus, respectively.

Oral swabs and lymph nodes showed the best overall diagnostic performance with sensitivity ranging from 94.6% to 100% and specificity ranging from 83.9% to 85.1%. Tongue-tip fluids had high sensitivity (92.2%) but low specificity (53.9%), indicating a potential for environmental contamination affecting results. Nasal swabs and rectal swabs had moderate sensitivity and specificity, indicating some diagnostic utility, but had less accuracy compared to oral swabs and lymph nodes. The agreement between each specimen and intracardiac sera, as well as agreement between tongue-tip fluids and oral swabs, were calculated. The agreement between postmortem specimens and intracardiac sera was highest for superficial inguinal lymph nodes (88.89%), followed by oral swabs (87.10%) and nasal swabs (85.48%).

Three specimens were selected to investigate the success rate in obtaining a PRRSV ORF5 sequence based on their routine use in the field (tongue-tip fluids), ease of collection (oral swabs), and lowest probability of environmental contamination (intracardiac serum). The ORF5 sequencing was successful in 29 out of the 31 tongue-tip samples, 23 out of the 28 oral swabs, and 21 out of the 23 serum samples. Even though the sequencing success rate was higher in tongue-tip fluids, all three specimens presented a good sequencing success rate (82.1% to 93.5%), indicating that sequencing was not a limitation for sample type tested.

While there were challenges in meeting sampling targets due to variable pre-weaning mortality, PRRS was detected in all postmortem specimens. Tongue tips are easy and inexpensive specimens to collect but require some manipulation of the piglets with sharps, which can result in longer personnel time requirements when compared to swabs. Swabs (whether oral, nasal, or rectal) are quick, safe, and easy to collect, requiring minimal training. However, the costs associated with investment in individual swabs are high. Oral and nasal swabs showed promising results for disease monitoring. Although tongue tip fluids had high sensitivity, they also had lower specificity, making them less suitable for individual pig diagnostics due to environmental contamination.

Overall, this study provides insight into postmortem sample types as a welfare-friendly alternative for disease monitoring in breeding herds.

Minimizing the Impact of Emerging Disease Threats in Swine Through Research Funding Partnerships

Webinar: October 22, 2024, 2:00 p.m. CT / 3:00 p.m. ET
Click here to register.

This webinar will discuss the benefits of collaborative approaches to protect the U.S. swine herd from emerging disease threats.

The Foundation for Food & Agriculture Research (FFAR) supports research that improves animal health and welfare. The Swine Health Information Center (SHIC), supported by Pork Checkoff funding, protects and enhances the health of the U.S. swine herd by minimizing the impact of emerging disease threats through preparedness, coordinated communications, global disease monitoring, analysis of swine health data and targeted research investments. FFAR's and SHIC's shared goals directly address pork producer concerns and have resulted in several collaborations that identify, prioritize and fund research on emerging disease threats in swine. FFAR collaborations with SHIC have included a comprehensive approach to enhancing Wean-to-Harvest Biosecurity, funded in partnership with the Pork Checkoff, and proactive investigations to prevent and prepare for a potential Japanese encephalitis virus incursion.

SHIC Tongue Tip Study Optimizes Sampling and Testing Protocols for Successful PRRS Viral Isolation

With the goal of improving the diagnostic value of tongue tips for PRRS surveillance, a study led by Dr. Onyekachukwu Henry Osemeke from Iowa State University aimed to optimize protocols to increase the likelihood of recovering live PRRSV isolates from tongue tip fluids. Successfully

isolating PRRS viruses from post-mortem tongue tips enhances their diagnostic value as a sample type for herd surveillance. Funded by the Swine Health Information Center, the study evaluated four different sample collection protocols across 597 tongue tips from stillborn and dead piglets. Samples with the lowest Ct values on PRRSV PCR testing were selected for virus isolation on two cell lines and primary alveolar macrophages. Overall, the highest rates of successful virus isolation were found in fluids extracted from fresh tongue tissues using PBS (22.6%) and on ZMAC cells (21%).

Find the industry summary of this study here.

Porcine reproductive and respiratory syndrome virus surveillance is particularly challenging in low-prevalence scenarios due to the cost of testing representative units and the complexities associated with PRRSV ecology (Muñoz-Zanzi et al., 2006). Recently, the post-mortem tongue tip or tongue tip fluids sample was demonstrated to be a cost-effective and population-sensitive approach for PRRSV surveillance in swine herds. Although the reverse transcription-quantitative polymerase chain reaction (RT-qPCR) detection of PRRSV RNA is the most requested test for PRRSV surveillance in the US (Trevisan et al., 2019), isolating the live virus remains crucial for confirming the presence of infectious PRRSV in a herd. There is currently no documented evidence of live PRRSV being isolated specifically from tongue tip samples.

Thus, the goal of the study described herein was to identify what protocols for collection, processing, and cell culture enhance the recovery of live PRRSV isolates from tongue tip fluids collected from perinatal mortalities. By optimizing collection techniques and testing procedures, this study aimed to improve the diagnostic value of tongue tips as a sample type for PRRSV surveillance. As a field application, this could offer swine practitioners a more herd-representative tool for formulating live vaccines.

To complete this study, samples were collected from 597 perinatal mortalities from a 5,000-head PRRSV-positive breeding herd over a four-day period. Tongue tissues were grouped into 20 batches (approximately 30 mortalities or tongues per batch). Each tongue was divided into four quarters, with each quarter randomly assigned to one of four collection protocols: 1) tongue fluids extraction from fresh tissues using phosphate buffered saline, 2) tongue fluids extraction from fresh tissues using virus transportation medium, 3) tongue fluids extraction in phosphate buffered saline after one freeze-thaw cycle, and 4) tongue tissue homogenate.

The result was 80 total samples (20 batches x 4 protocols) that were sent to a NAHLN-approved veterinary diagnostic laboratory for RT-qPCR testing. The RT-qPCR cycle threshold values were averaged across the four protocols in each of the 20 batches, and the 10 batches with the lowest mean Ct values were selected for virus isolation (VI). Two cell lines (ZMAC and MARC-145) and one batch of primary alveolar macrophages were tested for their ability to successfully isolate PRRSV.

All samples tested positive for PRRSV by RT-qPCR, with the average Ct values for the phosphate buffered saline, virus transportation medium, freeze-thaw, and homogenate groups being 21.9, 21.8, 22.6, and 24.8, respectively. PRRSV was isolated successfully from tongue tissues in all groups with variable success rates. The virus isolation success rate was 22.6% in the phosphate buffered saline group, 12.1% in the virus transportation medium group, and 2.8% in both the freeze-thaw and homogenate groups. The probability of successful viral isolation was 3.1% in MARC-145 cells, 21.0% in ZMAC cells, and 4.8% in primary alveolar macrophages cells. Mortality batches with only stillborn piglets had a 35.5% probability of successful PRRSV isolation, while batches with stillborn and dead piglets had a 1.0% probability.

Investigators concluded that live PRRSV can be isolated from postmortem tongue tip fluids. Extracting tongue tip fluids from fresh stillborn piglets using phosphate buffered saline or virus transportation medium increases the chances of successful virus isolation. The ZMAC cell line outperformed the MARC-145 cell line and primary alveolar macrophages cells in this study. Ensuring a cold chain from sample collection until arrival at the laboratory maintains the diagnostic quality of the samples. Isolating PRRSV from aggregate samples such as tongue tip fluids provides several surveillance and vaccine development benefits.

As virus isolation using aggregate samples allows for the efficient co-detection of multiple PRRSV strains within a herd, there are great advantages for surveillance and developing autogenous vaccines.

Because there is no predicting when or where the next emerging disease will appear, the critical evaluation of convenient sampling protocols for applicability and effectiveness for disease surveillance will help the industry monitor and detect diseases as they emerge. This study provides objective information about diagnostic testing applications and best practices for obtaining tongue tip fluids from perinatal mortalities.

SHIC Engages in Industry's North American African Swine Fever Forum

When African swine fever was diagnosed in China in August 2018, the North American swine industry immediately began actively monitoring its status and subsequent efforts to control the outbreak. Knowing the consequences of an ASF diagnosis in North America would be catastrophic, collaborative efforts among stakeholders in the US, Canada, and Mexico began immediately. The first North American African Swine Fever Forum took place in Ottawa, Canada, in 2019, and recently returned to Ottawa in September 2024 for the fourth Forum. The Swine Health Information Center was among many US participants with Executive Director Dr. Megan Niederwerder speaking during the Spotlight on Communications session.

Government agency representatives, pork industry leaders, international ASF experts, WOAH delegates, international animal health organizations, state and provincial chief veterinary officers, and other stakeholders all took part in the Forum. Their collective focus centered on the protection of the livelihoods of North American pork producers from a devastating foreign animal disease outbreak through the development of tools for prevention, risk mitigation strategies, and collaborative agreements for maintenance of business continuity and trade.

Despite global efforts and knowledge advancements, Forum organizers noted ASF continues to spread globally, negatively impacting economies and pork production in affected regions of the world. They wrote, "Since January 2022, 10 countries have reported ASF for the first time, while 14 countries have reported its spread to new areas. The disease has also re-emerged in regions that had effectively managed it for decades." They further noted the lack of treatment and commercial vaccines for ASF keeps stakeholders vigilant in their efforts to prevent, prepare for, and respond to this threat.

During the fourth ASF Forum, past successes were explored, current experiences shared, and ongoing challenges in ASF control identified. Across the various Forum sessions, participants addressed key topics including business continuity programs, management and surveillance of wild pigs, effective stakeholder communication needs, and the development and use of ASF vaccination as a control tool. A collaborative roadmap for ongoing management of the ASF threat as well as renewed partnerships for continued coordination and collaboration were established.

Key presentations from Germany, Denmark, the EU, the Dominican Republic, and Italy focused on the current status and management of ASF in their respective countries. The importance and development of regionalization and zoning agreements for response to ASF was another key topic for discussion and collaboration across the North American countries. The role of communications for informing stakeholder awareness was a topic discussed by the Forum participants. Dr. Niederwerder provided examples of US stakeholder communication channels for ASF, including the monthly SHIC Global Disease Monitoring Report as a readily accessible source of information on new ASFV outbreaks and introduction risks. She also highlighted the need for rapid and accurate information sharing for producers on ASF and emerging disease events. Forum participants engaged in joint discussion regarding the role and need for robust communications strategies to support backyard pork production in each country and provision of tools for small scale producers.

While the Forum's objective is to prevent entry and mitigate the impacts of ASF in the Americas, the collaborative work of the international participating

stakeholders represents significant investment of time, resources, and commitment to safeguarding the pork industries of North America on behalf of producers and all allied organizations.

SWINE DISEASE MONITORING REPORTS

DOMESTIC

This month's Domestic Swine Disease Monitoring Report includes a survey which asks for your input on the SDRS Strategic Plan. SDRS reports increased PRRSV activity in Iowa, Oklahoma, and South Dakota. The overall PEDV percent case positivity remains low at 4%. However, there is an increase in finishing sites' PEDV percent case positivity in Kansas above expected levels. For the third consecutive month, an increase in the percent positive case submissions for *Mycoplasma hyopneumoniae* in wean-to-finish sites was reported. *Mycoplasma hyopneumoniae* positivity remains steady from the previous month in sow farms, with 12% positive case submissions reported. An increase in case positivity for influenza A virus, mainly in the finishing sites, was noted with the advisory group highlighting that growing animals close to market were more affected. The podcast broadcasts a talk with Dr. Janice Zanella (Embrapa Swine and Poultry, Brazil) about the global scenario of the influenza A virus, the importance of influenza A virus in the swine industry and its public health issues, and finally, strategies for controlling IAV in the farms.

VIEW REPORT

GLOBAL

Read about African swine fever in Italy in the October Global Swine Disease Monitoring Report. Since ASF was first introduced there in 2022, the pig population in the most affected areas has dropped significantly, causing estimated losses of over USD $130 million. In September, the European Commission officially recognized Sardinia as free from ASF genotype I, which is different from genotype II currently circulating in continental Italy and across many European and Asian countries. The European Commission also officially recognized Sweden as free from ASF a year after the disease was first detected in wild boar. The first 10,000 ASF vaccine doses were administered on backyard farms in The Philippines. AVAC, a Vietnam-based company, is the vaccine provider. Detection of the first recombinant ASF virus (genotypes I and II) in domestic pigs in Russia is also highlighted in the report.

VIEW REPORT

The Swine Health Information Center, launched in 2015 with Pork Checkoff funding, protects and enhances the health of the US swine herd by minimizing the impact of emerging disease threats through preparedness, coordinated communications, global disease monitoring, analysis of swine health data, and targeted research investments. As a conduit of information and research, SHIC encourages sharing of its publications and research. Forward, reprint, and quote SHIC material freely. For more information, visit http://www.swinehealth.org or contact Dr. Megan Niederwerder at mniederwerder@swinehealth.org or Dr. Lisa Becton at lbecton@swinehealth.org.