

Swine Health Information Center

2023 Progress Report

December 19, 2023

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Executive Summary

1 Swine Health Information Center

2 **Swine Health Information Center Organization** (additional information on page 11)

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 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.

7

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.

10 Three at-large producer representatives are also members of the Board. The Board approved a 2023 11 operating budget, a 2023 Plan of Work and a plan for FDIC insured investments, that is modeled after 12 that of the National Pork Board.

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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.

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When SHIC 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.

24

Executive Director Paul Sundberg, DVM, PhD announced his retirement at the end of 2023. The SHIC Board of Directors selected the current SHIC Associate Director, Megan Niederwerder, DVM, PhD, to replace him as of January 1, 2024. The SHIC Board of Directors also selected Lisa Becton, DVM, MS, as the new Associate Director, affective that date. Most recently, Dr. Becton served as the National Pork Board's Director of Swine Health.

30

31 Swine Health Information Center 2023 Outreach (page 13)

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.

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40 Progress on the Swine Health Information Center 2023 Plan of Work

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42 **Preparedness**

43 Cleanup and Decontamination of Feed Mills to Decrease Disease Transmission Risk (page 17)

This project set forth to understand the best flushing, thermal processing, and decontamination techniques for a feed mill contaminated with porcine epidemic diarrhea virus (PEDV), porcine reproductive and respiratory syndrome virus (PRRSV), and Seneca Valley virus 1 (SVV1)

47

SHIC Wean-to-Harvest Biosecurity: SHIC Project Looks at New Technique for Evaluating Trailer Cleanliness (page 18)

- 50 The goals of this project were to determine the areas of the trailer with the greatest surface
- 51 contamination, the correlation between microbial counts and RLUs, and the number of locations that 52 are needed to accurately determine surface cleanliness.
- 53
- 54 SHIC Awarded \$650K Grant from USDA NIFA to Investigate ASFV Stability in Soybean Products (page 55 18)
- 56 SHIC continues a 4-year \$650,000 grant from the USDA National Institute of Food and Agriculture 57 Agriculture and Food Research Initiative Competitive Grants Program for research designed to reduce 58 the risk of imported feed ingredients, specifically soybeans, from spreading African swine fever virus in 59 the domestic swine herd.
- 60

National Bio and Agro-Defense Facility Tour Informs SHIC Board of Directors and Pork Industry Representatives (page 19)

- 63 National Bio and Agro-Defense Facility directors and research leaders invited SHIC Board of Directors
- 64 members and staff to tour the new facilities in Manhattan, Kansas. The team explored potential
- 65 collaboration to meet SHIC's objectives of minimizing the impact of emerging disease threats through
- 66 preparedness, and targeted research investments. In addition, insight into potential collaboration
- 67 opportunities to other pork industry representatives of AASV, NPB, NPPC, and SHIC, who share a
- 68 mission to protect US swine herd health, were offered by NBAF during a separate meeting .
- 69

70 SHIC Identifies JEV Research Gaps to Fuel Preparedness/Response Efforts (page 19)

- SHIC, along with industry partners, compiled a comprehensive list of research gaps to facilitate next steps in the ongoing efforts towards reducing the risk of JEV introduction and spread, understanding
- 73 JEV's impact on production, and investigating how on-farm factors influence JEV transmission.
- 74

SHIC Discusses JEV Domestic and International Collaboration Opportunities with FFAR and Australian Organizations (page 21)

Along with the Foundation for Food & Agriculture Research (FFAR), SHIC is continuing to investigate collaborative JEV opportunities and interests with the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO). The discussions include CSIRO scientists in Biosecurity, Disease Prevention & Detection, and Invasive Species & Diseases, with a goal of aligning biosecurity priorities for North America and Australia and to see if there are common research priorities.

82

During their August meeting, the SHIC Board of Directors accepted a proposed \$500,000 2023 budget
 modification to enable collaborative funding for the JEV Research Program.

85

86 Monitor and Mitigate Risk to Swine Health

- 87 SHIC Round 1 of Wean-to-Harvest Biosecurity Research Program (page 22)
- SHIC, along with the Foundation for Food and Agriculture Research and Pork Checkoff, joined together to fund and launch a two-year Wean-to-Harvest Biosecurity Research Program in the summer of 2022. In October 2022, a call for research proposals was announced with the goal of investigating costeffective, innovative technologies, protocols, or ideas to enhance biosecurity during the wean-toharvest phases of production. After review by a focused task force, 10 of the 41 proposals received were accepted for funding early in 2023.
- 94

95 SHIC Round 2 of Wean-to-Harvest Biosecurity Research Program (page 23)

- 96 During the spring of 2023, SHIC announced a second round of research proposal solicitation to
- 97 investigate cost-effective and innovative technologies, protocols, or ideas to enhance biosecurity
- 98 during the wean-to-harvest phase of pig production.99

SHIC Wean-to-Harvest Biosecurity: Investigating Manure Pumping Effects on Disease Interim Report (page 23)

- With funding from SHIC, the Foundation for Food & Agriculture Research, and Pork Checkoff, a team
 has provided a preliminary results report on their study examining manure pumping effects on disease
 onset in wean-to-finish pigs.
- 105

106 SHIC Leads Tongue Tip Diagnostic Sample Research (page 24)

- 107 Research proposals investigating tongue tips as a novel diagnostic sample type were solicited as part of 108 a SHIC released public call for research proposals. SHIC's research priority is to understand the 109 potential breadth of tongue tips as a sample type for monitoring emerging diseases.
- 110
- During their October meeting, the SHIC Board of Directors approved \$250,000 of modifications to the
 2023 SHIC budget so funds would be available for the tongue tip diagnostic research proposals.
- 113

114 **CBP Establishes Public Interdiction Reporting Dashboard** (page 25)

SHIC, along with the National Pork Board, National Pork Producers Council, and American Association of Swine Veterinarians, has been working with U.S. Customs and Border Protection on efforts to prevent entry of foreign animal disease vectors to the US through screening and awareness. As part of the ongoing process, CBP has recently launched a Public Interdiction Reporting Dashboard.

120 SHIC Funded MSHMP Reports on 2023 Results and Progress (page 25)

121 The Morrison Swine Health Monitoring Project (MSHMP), funded primarily by SHIC, helps identify

industry needs via input from the project's participants, representing more than 50% of the nation's
sow herd, and other sources. The 2023 report details the project's progress.

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125 Global Swine Disease Monitoring Reports (page 26)

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.

131

132 Improve Swine Health Information

133 SHIC and CEID Welcomed Ideas for a JEV Information Website (page 27)

134 In October 2022, the SHIC joined with the Center for the Ecology of Infectious Diseases, University of

135 Georgia to host a symposium entitled Japanese Encephalitis Virus: Emerging Global Threat to Humans

136 & Livestock. One of the initiatives that came from the symposium was an agreement between SHIC and

137 CEID to build and launch a JEV Information Sharing Network website, which is now live.

138

139 SHIC Applauded Ramped-Up USDA APHIS ASF Outreach (page 27)

Following detection of African swine fever in China in 2018 and the Caribbean in 2021, SHIC and the other pork industry associations have worked with USDA Animal and Plant Health Inspection Service to further increase efforts to protect US swine from the transboundary disease. As a result of that collaborative work, USDA APHIS outreach campaigns designed to increase awareness and to target international travelers as well as pork producers, veterinarians, and pig owners have been launched.

145

SHIC Organizes Session at Allen D. Leman Swine Conference on Emerging Diseases and Outbreak Investigations (page 28)

SHIC funded and served as a Session Chair at the 2023 Leman Swine Conference on September 18,
2023, in St. Paul, MN for the Session entitled "Disease Outbreak Investigations". SHIC also co-funded
and moderated an additional breakout session, "Discerning Emerging Diseases".

151

152 **2023 Travel Season Reminder: Report Lack of Secondary Screening** (page 28)

- 153 During June of 2023, as international travel increased, SHIC offered a reminder to report, while
- 154 entering the US and going through customs, traveler agricultural experiences.
- 155

156 SHIC Reports on African Swine Fever Vaccines Approved in Vietnam (page 29)

- 157 SHIC's Global Swine Disease Monitoring Report provided a detailed overview of the process and
- 158 expectations of two locally manufactured African swine fever vaccines the Vietnamese Ministry of
- 159 Agriculture and Rural Development have officially approved for domestic commercial use.

160 SHIC-Funded MSHMP Launches New Website (page 30)

161 The Morrison Swine Health Monitoring Project, funded primarily by SHIC, continues to monitor trends 162 in pathogen incidence and prevalence. In 2023 a new MSHMP website optimizes the project's 163 information sharing ability for both the participant and swine industry communities at 164 https://mshmp.umn.edu/.

165

166 SHIC-AASV Webinar Shares Perspectives on Emerging PRRS Virus Strains (page 30)

As PRRSV strains continued to affect pork production in the US and around the world, SHIC and AASV held a webinar on February 21, 2023, to provide the latest information on challenges caused by emerging strains of this virus. SHIC's mission includes sharing global disease risk and perspectives like these surrounding PRRSV in the effort to safeguard US swine herd health. Over 300 individuals

- registered for the webinar with 167 participants watching live from 18 countries and 20 US states.
- 172

173 Porcine Sapovirus Webinar Demonstrates Need for Diligence in Diagnostics (page 30)

174 SHIC and the American Association of Swine Veterinarians hosted a webinar on porcine sapovirus 175 (PSaV), a potentially emerging disease, on August 30 with 394 registrants from 22 countries.

176

177 Strep. zoo Experiences Provide Response Blueprint During SHIC/AASV Webinar (page31)

Recent US experiences and a series of severe *Streptococcus equi* subspecies *zooepidemicus* outbreaks
in Canada and globally since 2019 led to a Swine Health Information Center/American Association of
Swine Veterinarians webinar on November 29, 2023. Presentations from Canadian and US experts
provided 173 live participants from seven countries and 26 US states field experiences, background,
and what you need to know to take action during a *Strep. zoo* outbreak.

183

SHIC Programs Highlighted at AASV Annual Meeting Underscore Mutually Beneficial Relationship (page 32)

Consistent with SHIC's mission to protect and enhance the health of the United States swine herd, it strives to share information and resources with those on the front lines of the swine health battle. At the 2023 American Association of Swine Veterinarians Annual Meeting, SHIC-funded research and programs were shared to help practitioners serve their producer customers with the latest tools for swine disease prevention, preparedness, and response.

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192 SHIC Wean-to-Harvest Biosecurity Results Presented at NAPRRS/NC229 Conference (page 33)

North American PRRS/NC229 International Conference of Swine Viral Diseases brings together swine
 industry researchers, professionals, and field practitioners. Though inspired by PRRS-related concerns,

- the conference has expanded to include emerging and transboundary swine disease topics. During the
- 196 2023 NAPRRS/NC229 ICSVD, SHIC hosted a special session, "Biosecurity in the US Swine Industry." SHIC
- 197 invited four principal investigators in its Wean-to-Harvest Biosecurity Research Program, that is
- cooperatively funded with the Foundation for Food & Agriculture Research and Pork Checkoff, to speak
 about their bioexclusion, biocontainment and transport biosecurity research results.
- 200

201 SHIC Standardized Outbreak Investigation Program Web-Based Application (page 34)

SHIC's Standardized Outbreak Investigation Program (SOIP) was introduced in early 2023 with a
 downloadable standardized outbreak investigation Word-based form. Now, a web-based application to
 conduct outbreak investigations is available.

205

By employing the SOIP application, veterinarians have a standardized way to conduct a biosecurity hazard analysis and epidemiological investigation to identify and prioritize biosecurity hazards. It can

- 208 be used now for endemic disease prevention and outbreak investigations to identify and prioritize
- 209 biosecurity hazards so the production system can implement biosecurity control measures accordingly.
- 210 It also facilitates preparation for seasonal or epidemic disease challenges.
- 211

212 Surveillance and Discovery of Emerging Disease

213 SHIC's Domestic Swine Disease Monitoring Report Renewed for 2024 (page 34)

Currently, SDRS is the only publicly available source of swine health information from U.S. VDLs, and the only publicly available source of pathogen activity in all age groups, from boar studs to breeding herds to grow-finish pigs, including a wide variety of specimens, including biological, feed, and environmental samples.

218

219 USDA Grant Expands SHIC-Initiated Swine Disease Reporting System (page 35)

After pioneering a SHIC-funded system to improve swine health by reporting pathogen test results from public veterinary diagnostic laboratories across the Midwest, a team led by faculty from Iowa State University's College of Veterinary Medicine received a three-year, \$1 million grant from the USDA's National Institute of Food and Agriculture to expand how this data is utilized to inform disease trends and improve swine health.

226 SHIC Expands SDRS with Addition of Indiana ADDL Data (page 36)

Starting in September 2023, diagnostic data from the Indiana Animal Disease Diagnostic Laboratory
 (ADDL) at Purdue University has been included in the Swine Disease Reporting System. The Indiana
 Animal Disease Diagnostic Laboratory at Purdue is a Level 2 laboratory accredited by NAHLN.

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231 SHIC Diagnostic Fee Support Program Continues to Offer Additional Resources (page 36)

In cases of high or ongoing morbidity or mortality, where cause is either not identified or diagnosis is
questionable, SHIC offers help to pay for further diagnostic work.

SHIC-Funded Study Discovers First Association Between Astrovirus and Respiratory Pathology in Pigs (page 37)

A study funded by SHIC is the first to report astrovirus being associated with respiratory pathology in pigs.

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241 SHIC Helps Refine PCV3 Case Definition with VDL Study (page 37)

A SHIC-funded study provided valuable insights into the diagnosis and prevalence of PCV3 in reproductive failure and surveillance cases submitted to the ISU-VDL as well as the synergism of PCV3 with PRRSV and PCV2.

245

246 SHIC Pursues Diagnostic Test Capable of Detecting Multiple Swine Viruses Simultaneously from Field

- 247 Samples (page 33)
- 248 Researchers at the University of Minnesota developed a workflow called TELSVirus, or Target-Enriched
- 249 Long-Read 38 of Virus, that enables the real-time detection and genomic characterization of multiple
- viral pathogens from a single sample in a relatively short turnaround time (approximately 24 hours).
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252 **Responding to Emerging Disease**

253 SHIC-Funded JEV Risk Assessment Update in Progress (page 39)

Following the outbreak of Japanese encephalitis virus in Australia in early 2022, SHIC funded a study to reassess the risk of JEV introduction and establishment in the US. Kansas State University is leading the efforts to build on a 2018 qualitative risk assessment to estimate the risk of emergence of JEV into the US.

259 SHIC-Funded Systematic Literature Review Reveals JEV Knowledge Gaps (page 40)

Due to the ongoing risk of Japanese encephalitis virus emergence in the US, SHIC funded a systematic literature review intended to increase understanding of the virus's biology, components and dynamics of transmission, and environmental factors necessary for incursion and establishment. The recently completed systematic review is in addition to a separate JEV Risk Assessment funded by SHIC that is still in progress.

266 JEV Threat to US Swine Industry Prompts Continued Research Fueled by USDA NBAF Grant (page 40)

The potential for Japanese encephalitis virus transmission and spread in the US is the focus of a new investigation. With funding from and in collaboration with researchers from the United States Department of Agriculture, National Bio and Agro-Defense Facility, Foreign Arthropod-Borne Animal Diseases Research Unit, the team of researchers from Kansas State University and the University of Georgia commenced the multi-year grant on August 1, 2023.

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273 USDA APHIS Veterinary Services Addresses JEV Diagnostic Submission Process (page 41)

Due to producer communication efforts by SHIC, along with the other pork industry associations, the threat of JEV has prompted the USDA APHIS Veterinary Services division to issue a statement regarding related testing and preparedness. The statement also addresses the diagnostic submission process and USDA plans for further preparedness activities.

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281 SHIC Rapid Response Teams Stand Ready (page 41)

In response to events following the introduction of PED, SHIC funded Iowa State University to develop the Rapid Response Program. The program now includes a nationwide network of individuals called the Rapid Response Teams (RRT), who are trained, prepared, and committed to arriving within 72 hours of invitation from pork producers to conduct epidemiological investigations when a new transboundary or emerging disease threat occurs.

287 288 Rapid Response Team Investigation Form Refined to be Used as an Industry Standard (page 42)

289 SHIC has funded the development of a standardized outbreak investigation instrument for the Rapid 290 Response Team outbreak investigations. A working group of fourteen swine veterinarians was formed 291 to develop the standardized instrument and approach to conducting outbreak investigations.

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293 **Regional Disease Warning Tool Results from SHIC Funding** (page 43)

With funding provided by SHIC, the Morrison Swine Health Monitoring Project team at the University
 of Minnesota developed and tested a tool to enable timely communication of regional disease activity,
 The Early Regional Occurrence Warning project.

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298 Vietnam ASF Research (completed Vietnam ASF field projects page 44)

With the support of the National Pork Producers Council, in 2019 SHIC was awarded a grant from the USDA-Foreign Agricultural Service to support Vietnam in the prevention and control of ASF through the implementation of a project that builds the capacity of the country's pork production and veterinary workforce. The project officially closed in 2023 and the summary is included.

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304 Swine Health Information Center 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 Drs. Paul Sundberg and Megan Niederwerder, social media, SHIC Talk podcast, and webinar series. SHIC also participates in industry events to provide access to information to the protection of US swine herd health. Google Analytics data on SHIC website traffic are used to measure impact of media efforts.

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311 **Website impact** (January 1-March 31/April 1-December 19, 2023. For comparison, January 1-312 November 20, 2022, results are included in parentheses after each applicable line) (page 51)

- Over 8,156/40,046 individual sessions (30,276)
 5,796/12,767 separate users (20,666)
 15,967/74,932 total page views (58,199)
 Selected top countries

 2,924/7,102 = 10,026 users were from the USA (11,095)
 172/1,167 = 1,339 users were from China (257)
 278/652 = 795 users were from Canada (804)
- 320 546/197 = 743 users were from Germany (1,641)

321 322 \circ 167/394 = 561 users were from The Philippines (431)

323 **Press release impact** (page 52)

Eight SHIC-specific press releases were issued in 2023. Emails were sent to 260 ag news outlets for each press release. Individual emails are sent to the top five pork media editors as well as five farm broadcasters with each press release.

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Farm broadcasters continued as a very important media outreach for SHIC with follow-up interviews requested after each press release was deployed. So far this year, more than 80 interviews with Drs. Sundberg and Niederwerder have taken place.

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332 Articles Prepared for Partners (page 53)

SHIC communications efforts are amplified by stakeholders who share our articles in their publications
 including online newsletters, social media posts, and presentations. These stakeholders include
 National Hog Farmer, PORK, USAHA, NPPC, NPB, and others.

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As of December 19, 2023, content was provided for 55 articles for the AASV weekly e-letter and other partners. 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.

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342 SHIC e-newsletter (page 54)

In 2023, the monthly SHIC e-newsletter publication schedule continued. The distribution list has grown
to over 3,000 subscribers and is consistently updated. "Percent opens" for the e-newsletter was 36.1%
(2022 – 34.4%; Constant Contact benchmark - 34.5%).

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347 SHIC Talk Podcast (page 55)

In 2023, SHIC Talk episodes continued to be produced. Three episodes have been produced in 2023.
 SHIC Talk is available on the SHIC website as well as Apple Podcasts, Google Podcasts, Spotify, Amazon
 Music/Audible, TuneIn/Alexa, and iHeart Radio. All time downloads of all episodes total 2314 as of
 November 12, 2023, with 441 downloads occurring from November 2022 to November 2023.

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353 SDRS Communication Multiplication (page 55)

In addition to being distributed in the monthly SHIC newsletter and posted on the SHIC website, the Swine Disease Reporting System team at Iowa State University amplifies the reports' distribution. A total of 340 subscribers from 151 organizations receive the reports via email. Since the implementation of the podcast platforms (Spotify, Apple Podcast, Amazon Music, and Google podcast), the audio report has been listened to in 36 different countries

Swine Health Information Center 2023 Progress Report 360

Swine Health Information Center Organization 362

- 1) The Swine Health Information Center is a 501(c)(3) corporation governed by a Board of Directors. 363 The producer members of the Board of Directors are active pork producers or representatives of 364 pork producing companies or allied industry that have an interest in the mission of the Center and 365 that serve as champions for the Center's objectives and goals. 366
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SHIC welcomed two new board members during their meeting held on June 30, 2023. Joseph 368 369 Dykhuis, a Michigan pork producer representing the National Pork Producers Council on the SHIC 370 Board, and Pete Thomas, DVM, with Iowa Select Farms, in an at-large position, began their terms. Founding board members Howard Hill, DVM, retired industry veterinarian, pork producer, and 371 372 NPPC representative, and Matthew Turner, DVM, head of live pork division, JBS, at-large member, 373 concluded their service.

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While at the meeting, the SHIC Board of Directors held an election of officers. Russ Nugent, from 375 376 northwest Arkansas, will serve as President of the SHIC Board of Directors and represents the National Pork Board with his seat. Mark Schwartz, a pork producer from Minnesota and at-large 377 378 member, was tabbed as vice president for the organization and Kent Bang, an at-large member, will 379 continue to serve as secretary/treasurer.

- Currently there are nine members of the Board of Directors: 381 382 a. Two named by the National Pork Board i. Gene Noem, Director, Genus PLC, and pork producer, Iowa 383 384
 - ii. Dr. Russ Nugent, Co-owner of Dogwood Ag Services, LLC, Arkansas
 - b. Two named by the National Pork Producers Council
 - i. Joe Dykhuis, pork producer, Michigan
 - ii. Dr. Jeremy Pittman, Smithfield Hog Production, North Carolina
- 388 c. Two named by the American Association of Swine Veterinarians
 - i. Dr. Paul Ruen, Fairmont Veterinary Clinic and AASV past-president, Minnesota
 - ii. Dr. Daryl Olsen, AMVC and AASV past-president, Iowa
 - d. Three at-large producer members
 - i. Mark Schwartz, pork producer, Minnesota
 - ii. Dr. Pete Thomas, Iowa Select Farms, Iowa
 - iii. Kent Bang, Bang Ag Consulting/Compeer Financial-retired, Nebraska
- 394 395 396

397 2) A 2023 projected budget and investment portfolio was developed.

The SHIC Board of Directors approved a projected budget for 2023 and has reviewed and modified the 399 400 projection during the year to best meet the SHIC mission. The approved projected budget addressing the 2023 Plan of Work was \$3,451,637. 401

403 Extra funds not needed for the operating budget were invested in securities with Wells Fargo Bank and 404 modeled after NPB's investment plan. The investments are a series of FDIC insured Certificates of 405 Deposit, laddered to provide on-going operating funds as the certificates reach maturity.

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407 3) SHIC Working Groups have been formed to provide input and oversight as the Center fulfills its 408 mission.

- The Working Groups give the opportunity to provide program oversight and decision-making, 410 supplemented and informed by pork producer, veterinary practitioners, and subject matter expertise. 411 To complete the SHIC Plan of Work, two working groups have been formed. 412
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414 The Monitoring and Analysis Working Group is charged with assessing foreign, transboundary 415 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 416 417 also responsible for improving the health of the nation's swine herd through the development and 418 oversight of on-going projects. These include monitoring for domestic diseases affecting swine health 419 and analyzing health and other data to support on-farm and prospective producer decision making. 420 The Working Group reviews and selects research and program activities according to the Plan of Work.

421

The Preparedness and Response Working Group is responsible for oversight of the swine viral and 422 423 bacterial disease matrices research. It is responsible for funding decisions to fulfill other matrices-424 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 425 426 for the information and analysis necessary to support the proportional pork producer and pork 427 industry response to these emerging diseases. The Working Group reviews and selects research and 428 program activities according to the Plan of Work.

429

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

431

When SHIC was formed July 1, 2015, by a grant from the National Pork Board, it was with the 432 433 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 434 sufficient return on the investment to justify keeping it running." In December 2021, National Pork 435 436 Board announced an additional \$15 million investment of Pork Checkoff funds in SHIC, extending 437 funding for the center through 2027.

- 438 5) SHIC Staff Transition
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SHIC announced the retirement of the Executive Director, Paul Sundberg, DVM, PhD, at the end of2023. Dr. Sundberg has been the Executive Director since SHIC was formed in 2015.

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The SHIC Board of Directors chose Megan Niederwerder, DVM, PhD, to replace Dr. Sundberg as
 Executive Director beginning January 1, 2024. Most recently an assistant professor in the Department
 of Diagnostic Medicine/Pathobiology, College of Veterinary Medicine at Kansas State University, Dr.
 Niederwerder has been the SHIC Associate Director since April 1, 2022.

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In November, SHIC's Board of Directors selected Lisa Becton, DVM, MS, as the organization's next
 associate director. Becton will begin her tenure with SHIC in January 2024. Most recently, Dr. Becton
 served as the National Pork Board's Director of Swine Health.

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452 Swine Health Information Center 2023 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.

- 458 459 a. Pork producers
- i. A partial list of producers/companies: AMVC Swine Health Services; Brenneman Pork,
 Carthage Veterinary Service; Christensen Farms; Clemons Food Group; JBS; The Maschoff's;
 lowa Select Farms; Pipestone; Pork Veterinary Solutions, Prestage Farms; Schwartz Farms;
 Seaboard Foods; Smithfield Foods, Hog Production Division; Suidae Health and Production;
 Swine Vet Center; Topigs Norsvin; 21st Century Strategic Forums; 21st Century Pork Club
- 465 ii. Iowa State University Pork Industry Center
- 466 iii. State Pork Associations individually and through the NPB Octoberfest
- 467 iv. NPB's Board of Directors, ASF Task Force
- 468 v. NPB/AASV Depopulation Working Group
- 469 vi. National Pork Producers Council's Animal Health and Food Security Policy Committee
- 470 vii. Pork Industry Forum
- 471 viii. UMN Allen D. Leman Swine Conference
- 472 ix. US SHIP House of Delegates
- 473 b. Allied industry
- 474 i. Advanced Animal Diagnostics
- 475 ii. American Feed Industry Association
- 476 iii. Antitox Corporation
- 477 iv. APC Swine Advisory Group

478		v.	Aptimunne Biologics
479		vi.	Boehringer Ingelheim Vetmedica
480		vii.	Ceva
481		viii.	IDEXX
482		ix.	Institute for Feed Education and Research
483		х.	Medgene
484		xi.	Merck Animal Health
485		xii.	National Association of Farm Broadcasters
486		xiii.	National Institute for Animal Ag
487		xiv.	North American Meat Institute
488		xv.	SAFOSO
489		xvi.	Tetracore, Inc.
490		xvii.	United Soybean Board
491		xviii.	Zoetis
492	с.	Veteri	narians
493		i.	2023 AASV annual meeting
494		ii.	AASV Board of Directors meetings
495		iii.	McKean ISU Swine Disease Conference
496		iv.	Swine Medicine Education Center, Iowa State University
497		۷.	Western Canada Association of Swine Veterinarians Conference
498	d.	US Ani	imal Health Association, including allied industry, USDA and State Animal Health Officials
499		i.	Committee on Animal Health Surveillance and Info Systems
500		ii.	Committee on Foreign and Emerging Diseases
501		iii.	Committee on Animal Emergency Management
502		iv.	Swine Health Committee
503		۷.	Global Animal Health and Trade Committee
504	e.	Veteri	nary Diagnostic Laboratories, Colleges of Veterinary Medicine, and Academics
505		i.	Conference of Research Workers in Animal Diseases
506		ii.	Foundation for Food & Agriculture Research
507		iii.	Kansas State University Department of Diagnostic Medicine/Pathobiology
508		iv.	Kansas State University Department of Statistics
509		۷.	Kansas State University Biosecurity Research Institute
510		vi.	Iowa State University Veterinary Diagnostic Laboratory
511		vii.	Iowa State University Veterinary Diagnostic and Production Animal Medicine
512		viii.	NAPRRS/NC229 International Conference for Swine Viral Diseases
513		ix.	North Carolina State University
514		х.	Ohio Animal Disease and Diagnostic Laboratory, Ohio State University
515		xi.	South Dakota State University Veterinary Diagnostic Laboratory
516		xii.	Texas A&M University Institute for Infectious Animal Diseases
517		xiii.	University of Arizona College of Veterinary Medicine
518		xiv.	University of Georgia Center for the Ecology of Infectious Diseases

519		xv.	University of Georgia Global Infectious Disease Intelligence Consortium			
520		xvi.	University of Illinois at Urbana-Champaign Department of Pathobiology			
521		xvii.	University of Minnesota Center for Animal Health and Food Safety			
522		xviii.	University of Minnesota Veterinary Diagnostic Laboratory			
523		xix.	University of Minnesota Veterinary Population Medicine			
524		xx.	University of Texas at Austin			
525	f.	State A	Animal Health Officials			
526		i.	Numerous State Veterinarians/State Animal Health Officials			
527		ii.	SAHO ASF Working Group			
528	g.	US Cer	nters for Disease Control and Prevention			
529		i.	Centers for Disease Control and Prevention Arboviral Diseases Branch Division of Vector-			
530			Borne Diseases			
531	h.	US De	partment of Agriculture			
532		i.	USDA Ag and Food Research Initiative Commodity Board Co-funding Program			
533		ii.	USDA Ag Research Services Director			
534		iii.	USDA Ag Research Services Foreign Arthropod Borne Animal Disease Research Unit			
535		iv.	USDA Ag Research Services Plum Island Animal Disease Center			
536		v.	USDA Ag Research Services Virus Prion Research Unit			
537		vi.	USDA Animal and Plant Health Inspection Service (APHIS), Administrator			
538		vii.	USDA APHIS ASF Technical Working Group			
539		viii.	USDA APHIS ASF Packing Plant Technical Working Group			
540		ix.	USDA APHIS Virtual and In-person Use of Oral Fluids with ASF meetings			
541		х.	USDA APHIS, Deputy Administrator, Veterinary Services			
542		xi.	USDA APHIS Division of Agricultural Select Agents and Toxins			
543		xii.	National Veterinary Stockpile			
544		xiii.	USDA APHIS North American ASFV Forum			
545		xiv.	USDA APHIS One Health Coordination			
546		xv.	USDA APHIS Trade Sector			
547		xvi.	USDA APHIS Veterinary Services Leadership Team and Veterinary Services staff			
548		xvii.	USDA Center for Epidemiology and Animal Health			
549		xviii.	USDA Center for Veterinary Biologics			
550		xix.	USDA National Animal Health Laboratory Network			
551		xx.	USDA National Import Export Services			
552		xxi.	USDA National Institute of Food and Agriculture Tactical Sciences for Agricultural			
553			Biosecurity			
554		xxii.	USDA National Institute of Food and Agriculture Animal Health and Disease			
555		xxiii.	USDA National Wildlife Services			
556		xxiv.	USDA National Veterinary Services Laboratory, Foreign Animal Disease Diagnostic			
557			Laboratory			
558	i.	US De	partment of Homeland Security			
559		i.	Customs and Border Protection			

560		ii.	Science & Technology Directorate
561	j.	Interna	ational
562		i.	Animal Nutrition Association of Canada
563		ii.	Australian Commonwealth Scientific and Industrial Research Organization, Australia
564		iii.	Canadian Food Inspection Agency, Canada
565		iv.	Canadian Innovation Pork, Canada
566		v.	Canadian Pork Producers Association, Canada
567		vi.	Canadian West Swine Health Intelligence Network, Canada
568		vii.	Ontario Animal Health Network, Canada
569		viii.	SunPork Fresh Foods, Australia
570		ix.	University of Montreal, Canada
571		х.	University of Saskatchewan Western College of Veterinary Medicine, Canada
572		xi.	US Delegation, WOAH, World Organization for Animal Health, France
573		xii.	National Service of Agrifood Health, Safety and Quality (SENASICA), Mexico
574			

Progress on the Swine Health Information Center 2023 Plan of Work

577

578 **Preparedness**

579

580 Cleanup and Decontamination of Feed Mills to Decrease Disease Transmission Risk

Much work has been done on the opportunity and risk of swine pathogens to be transmitted via 581 contaminated feed. In practice, if feed is contaminated the mill from which it came is likely to also be 582 583 contaminated. This could be true with both endemic and foreign animal disease pathogens. To be prepared, research is needed to discover the most efficient, least cost, least intrusive protocols for 584 decontaminated feed mills and equipment. This project set forth to understand the best flushing, 585 586 thermal processing, and decontamination techniques for a feed mill contaminated with porcine 587 epidemic diarrhea virus (PEDV), porcine reproductive and respiratory syndrome virus (PRRSV), and 588 Seneca Valley virus 1 (SVV1)

590 Formaldehyde flushes (either liquid or dry) were most effective at reducing viral concentrations in both 591 the feed and the environment; however, no method eliminated viral RNA from the environment. 592 Although PEDV and SVV1 RNA were detected via PCR, upon inoculation to pigs, treatments failed to 593 cause infection which provides evidence of successful mitigation. However, PRRSV viral particles were 594 able to cause replication in pigs when introduced from both feed and dust samples even when the 595 inoculum samples were negative for PRRSV via PCR.

596

589

597 Thermal processing reduced the detectable RNA in both feed and the environment for all viruses. 598 Replication of SVV1 and PEDV was not observed in the swine bioassay, but PRRSV replication was 599 observed in the post-thermal processing feed. Increased temperatures may be required to inactivate 600 PRRSV if contamination were to occur pre-thermal processing.

601

The complete facility decontamination (removal of organic matter with heated pressure washing, disinfection with 1% Virkon, disinfection with 5% household bleach, environmental heat held at 140°F for 48 hours) was the only decontamination treatment where PEDV, PRRSV, and SVV1 RNA was nondetectable after completion of all steps.

606

607 Overall, chemical flushing, thermal processing, and facility decontamination reduce the viral RNA 608 presence, but more research is needed to understand how these techniques affect the infectivity of 609 these viruses.

610

612 SHIC Wean-to-Harvest Biosecurity: SHIC Project Looks at New Technique for Evaluating Trailer 613 Cleanliness

Normally, trailer cleanliness is determined by visual evaluation by a person that inspects the trailer to determine if it is free of organic material and suitable to return to a farm. However, studies have demonstrated that visual inspection of cleaned transport trailers may be insufficient to ensure cleanliness and reduce disease transmission risk because viruses and bacteria are microscopic in nature and cannot be seen by the human eye. Further, visual inspection to determine if a trailer is clean usually occurs after the invested cost of propane to dry the truck has occurred.

620

621 ATP bioluminescence uses a chemical reaction where a swab is used to detect the presence of ATP. The 622 more ATP that is present, the greater the chemical reaction. This technology uses the same chemical 623 process a firefly uses to illuminate. When ATP is exposed to the enzyme a light is produced. The more ATP that is present the brighter the light. The intensity (brightness of the light) is measured in relative 624 light units (RLU). A greater RLU indicates more ATP and reduction in overall cleanliness. So, this 625 technology can be equated to the brightness of a firefly. The brighter a firefly glows; the more ATP is 626 627 present. In this case, the brighter the swab glows, the more ATP is present, the more potential 628 microbial contamination is present.

629

The goals of this project were to determine the areas of the trailer with the greatest surface contamination, the correlation between microbial counts and RLUs, and the number of locations that are needed to accurately determine surface cleanliness.

633

The results from this study indicated that the areas of highest concern sampled in this study were the nose access door and the back door flush gate as detected both by ATP bioluminescence and bacterial culture. A key finding of this research was that nose access door was the area least likely to be adequately cleaned, but only a few trailers actually had nose access doors. Nearly all of the trailers evaluated had a back door flush gate and therefore makes it a logical place to swab a livestock trailer to determine the overall cleanliness.

640

These data suggest that ATP bioluminometers can be used in livestock trailers to quickly determine the general cleanliness of the trailer without the need for a visual inspection. Separately, bacterial swabs to determine bacterial levels should also be used to determine the effectiveness of the cleaning protocol. As the next step, SHIC is funding a follow-up project to see if the same technology can be applied to farrowing rooms.

646

647 SHIC Awarded \$650K Grant from USDA NIFA to Investigate ASFV Stability in Soybean Products

648 SHIC continues a 4-year \$650,000 grant from the USDA National Institute of Food and Agriculture – 649 Agriculture and Food Research Initiative Competitive Grants Program for research designed to reduce 650 the risk of imported feed ingredients, specifically soybeans, from spreading African swine fever virus in 651 the domestic swine herd. This project will define the stability of ASFV in soybean products commonly used in complete feed diets as well as improve diagnostic capabilities and surveillance tools for the
 detection of ASFV in contaminated soybean products and complete feed.

654

The project is entitled "Stability and detection of African swine fever virus in soybean products fed to pigs" and is part of the Tactical Sciences for Agricultural Biosecurity Program Area. The two research objectives of the project are to 1) assess stability of ASFV in soybean products commonly imported into the US and 2) increase the utility of diagnostic tools to detect ASFV in contaminated soybean products. Project goals include identifying soybean products at highest risk for ASFV introduction and increasing diagnostic screening capabilities for ASFV contamination of feed.

661

662 SHIC has awarded the US Department of Homeland Security Science & Technology Directorate a 663 subcontract to complete the research objectives and is collaborating with DHS on the procedures.

664

665 National Bio and Agro-Defense Facility Tour Informs SHIC Board of Directors and Pork Industry 666 Representatives

National Bio and Agro-Defense Facility directors and research leaders invited SHIC Board of Directors
 members and staff to tour the new facilities in Manhattan, Kansas, in late July. The team explored
 potential collaboration to meet SHIC's objectives of minimizing the impact of emerging disease threats
 through preparedness, and targeted research investments.

671

In addition, presentations and touring of the facility provided important insight into potential collaboration opportunities to other pork industry representatives who share a mission to protect US swine herd health. In early April 2023, NBAF provided a facility and research update to staff leaders from the American Association of Swine Veterinarians, National Pork Board, National Pork Producers Council, and SHIC. USDA will own and operate the Manhattan, Kansas, state-of-the-art NBAF facility they term a national asset, intended to help protect the nation's agriculture industry, farmers, and citizens against the threat and potential impact of serious animal diseases.

679

680 Per the USDA website, NBAF will replace the Plum Island Animal Disease Center, a biosafety level-3 681 facility that is more than 68 years old. When complete, USDA Agricultural Research Service and Animal 682 and Plant Health Inspection Service will transfer their research and diagnostic missions to NBAF and 683 will jointly operate the facility. In December 2022, contractor construction and commissioning were 684 completed. The USDA team at NBAF currently has access to the facility and started a phase of 685 transition from Plum Island Animal Disease Center to the new site.

686

687 SHIC Identifies JEV Research Gaps to Fuel Preparedness/Response Efforts

688 SHIC, along with industry partners, compiled a comprehensive list of research gaps to facilitate next 689 steps in the ongoing efforts towards reducing the risk of JEV introduction and spread, understanding 690 JEV's impact on production, and investigating how on-farm factors influence JEV transmission. The list 691 includes priorities that may be the responsibility of entities other than SHIC and are divided into fluid 692 immediate, intermediate and longer-term groups. 693 Immediate preparation/response

- Production loss. Investigate trade implications of a JEV incursion into the US; estimate the potential
 economic losses to the US pork industry due to production losses on sow farms, disrupted
 domestic and international markets, and trade restrictions if JEV is introduced.
- Epidemiology. Investigate the mechanism of JEV spread through a production site, defining the
 risks or epidemiological factors, including vector-free transmission, playing a role in the extent of
 spread and variation of clinical signs within a litter and across litters. Goals include identifying
 mitigation strategies to minimize JEV impact on farm production.
- 702

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697

- Diagnostics. Design novel, or confirm current, diagnostic assays for JEV (PCR, antibody) at US
 veterinary diagnostic laboratories can distinguish between other flaviviruses in the US (West Nile
 virus, St Louis encephalitis virus) and will detect all five genotypes (I-V) of JEV.
- 4. Eradication. Model spatiotemporal spread of JEV post-incursion to identify mitigation strategies for
 biocontainment and rapid eradication from the US.
- 5. Communication. Determine the most effective consumer and producer messaging on JEV being a
 "mosquito disease," with the goal of minimizing negative effects on pork production and
 consumption while maximizing safety and protection of swine personnel in the event of JEV
 incursion.
- 714
- 715 Intermediate response
- Surveillance. Investigate surveillance targets (species, high risk locations in US, sample types) and
 diagnostic assays (PCR, antibody) to develop an effective surveillance plan for earliest detection of
 a JEV incursion into the US.
- 719
- 720 7. Compatible cases. Investigate syndromic surveillance for case compatible VDL submissions in the
 721 US of reproductive disease from sow farms (abortions, mummified fetuses, stillborns, neonatal
 722 tremors) to define the annual or seasonal number of compatible cases, including the percent of
 723 cases in which no definitive diagnosis is determined.
- 8. Challenge model. Develop experimental challenge models for JEV to interrogate interventions and
 their effect on clinical disease severity, pathogenesis in pregnant sows, transmission rates, virus
 replication, and prevalence within and across litters.
- 728

- 729 Longer-term response
- 9. Vaccines. Develop vaccine candidates for use in US commercial swine, to minimize production
 losses if JEV is introduced, that could be deployed post-outbreak and would allow differentiation of
- vaccinated from infected animals.
- 733

- 10. Cross-protection. Determine the extent of JEV cross-protection that is present in US commercial
 swine after exposure to other flaviviruses (WNV, SLEV) endemic to the US.
- 736

739

- 737 11. Mosquito control. Investigate effective mosquito control measures for swine farms in the US,
 738 including recommendations based on site design, ventilation type, and manure storage.
- 12. Vectors. Investigate and characterize the competence of potential vector host species in the US for
 JEV, including their geographic proximity to feral and commercial swine populations, and
 propensity to feed on pigs or ardeid birds.
- 743

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750

- 13. Wildlife. Define the risk and mitigation of known wildlife hosts, such as feral swine and ardeid birds,
 in the role of JEV introduction and spread to commercial swine in the US.
- 14. Novel hosts. Investigate and characterize the competence of novel vertebrate host species (non ardeids and non-swine) in the US to act as amplifying or dead-end hosts of JEV, including their
 geographic distribution and proximity to commercial or feral swine.
- 15. Sequencing. Investigate the molecular pathogenesis differences between genotype 4 and historical
 JEV genotypes, including an estimation of virulence factors based on whole genome sequencing.
- SHIC Discusses JEV Domestic and International Collaboration Opportunities with FFAR and Australian
 Organizations
- Along with the Foundation for Food & Agriculture Research (FFAR), SHIC is continuing to investigate collaborative JEV opportunities and interests with the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO). The discussions include CSIRO scientists in Biosecurity, Disease Prevention & Detection, and Invasive Species & Diseases, with a goal of aligning biosecurity priorities for North America and Australia and to see if there are common research priorities.
- Domestically, SHIC is working with industry, university, and federal partners to address the research
 needs and enhance the ability of the US swine industry to prevent, prepare, and respond to JEV if
 introduced. SHIC is developing a memorandum of understanding with the Foundation for Food and
 Agriculture Research to engage them in collaborative funding. During their August meeting, the SHIC
 Board of Directors accepted a proposed \$500,000 2023 budget modification to enable collaborative
 funding for the JEV Research Program.
- 768

769 Monitor and Mitigate Risk to Swine Health

771 SHIC Wean-to-Harvest Biosecurity Research Program

772 SHIC Round 1 of Wean-to-Harvest Biosecurity Research Program

SHIC, along with the Foundation for Food and Agriculture Research and Pork Checkoff, joined together
to fund and launch a two-year Wean-to-Harvest Biosecurity Research Program in the summer of 2022.
In October 2022, a call for research proposals was announced with the goal of investigating costeffective, innovative technologies, protocols, or ideas to enhance biosecurity during the wean-toharvest phases of production. After review by a focused task force, 10 of the 41 proposals received
were accepted for funding early in 2023.

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770

- Institutions receiving awards during this first round of funding, for research beginning in 2023, were
 Iowa State University, Carthage Veterinary Service, North Carolina State University, the University of
 Minnesota, and Swine Vet Center.
- 783
- 784 Titles of round one Wean-to-Harvest Biosecurity Program projects awarded are:
- 785 Transportation Biosecurity
- Evaluating the effects of alternative livestock trailer cleaning methodologies on the relative risks of
 introducing diseases (PEDV) to farm sites when loading out hogs to terminal points of
 concentration
- Evaluation of readily available technologies for truck cabin decontamination
- Creating a truck automated sanitation classification (TASC) platform using multiple data recording
 approaches currently used in the swine industry a pilot and scalable study
- Ensuring site and transportation biosecurity using bioluminescence
- Rerouting between-farm transportation vehicle movements to minimize the dissemination of
 endemic and emerging diseases in North America
- 795

796 Site Biosecurity

- Assessment of manure pumping effects on disease onset in wean-to-finish pig sites
- Evaluation of electrostatic precipitation for biocontainment of viral and bacterial pathogens
 emitted from finishing facilities
- Development and evaluation of an electrostatic precipitator (ESP) prototype to mitigate airborne
 spread of pathogens under farm conditions
- Evaluation of deployable fan coverings for biocontainment of airborne swine pathogens
- Industry-wide assessment of bioexclusion practices in wean-to-harvest sites, and development and
 validation of a rapid risk assessment bioexclusion tool
- 805

The Wean-to-Harvest Biosecurity Program not only reflects SHIC's responsiveness to an identified health vulnerability but further illustrates collaboration, with FFAR and NPB in this instance, to stretch SHIC's 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, part ofSHIC's mission.

811

812 SHIC Round 2 of Wean-to-Harvest Biosecurity Research Program

During the spring of 2023, SHIC announced a second round of research proposal solicitation to investigate cost-effective and innovative technologies, protocols, or ideas to enhance biosecurity during the wean-to-harvest phase of pig production. The first round of proposal solicitation, selection, and funding was completed in February 2023.

817

The updated research priorities in the second round of solicitation continued to focus on site and transportation biosecurity. They covered 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.

822

From this Wean-to-Harvest Biosecurity Research Program call which was funded in collaboration with the Foundation for Food & Agriculture Research and the Pork Checkoff, five additional projects for funding were selected. This brings the total number of projects awarded by the program for addressing a significant biosecurity gap in US swine production to 15.

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Institutions receiving awards in the second round are Lowe Consulting, Pipestone Research, Texas Tech
University, University of Missouri, and University of Montreal.

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Titles of round two Wean-to-Harvest Biosecurity Program projects awarded are:

- Self-vaccinating pigs to save labor, improve efficacy and enhance biosecurity: *Mycoplasma hyopneumoniae*, influenza A virus, ileitis, and erysipelas evaluations
- Determining the economical and epidemiological benefit of cleaning and disinfecting market haul
 trailers within the US swine industry
- Comparison of a rail-mounted automated power washer to a commercial manual power washing
 crew in terms of cleanliness, manpower, and water usage efficiency
- Development of an effective and practical biosecurity entrance system
- Using sensors and psychological profile to increase compliance of wean to market barn biosecurity

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841 SHIC Wean-to-Harvest Biosecurity: Investigating Manure Pumping Effects on Disease Interim Report

With funding from SHIC, the Foundation for Food & Agriculture Research, and Pork Checkoff, a team has provided a preliminary results report on their study examining manure pumping effects on disease onset in wean-to-finish pigs. Their objective is to identify practices related to manure pumping that can be managed to decrease incidence of disease onset in these pig populations. The study will identify risk factors associated with disease onset in wean-to-finish sites following manure pumping and spread as well as detection of PRRSV and PEDV in pigs and environmental surfaces of wean-to-finish sites before and after manure pumping.

In their preliminary analysis, the outcome of interest was the cumulative mortality in the two weeks following the pumping event, divided by the total number of existing pigs on site until the pumping date (percentage). Other risk factors, including manure pumping-related practices, transport method (tank or drag hose), manure application method to the crop (direct injection or airway), and facility storage (deep pit or lagoon) were tested.

855

A median of two pumping events per pig lot was observed. The pig mortality rate in the two weeks following the first pumping event was 21.3% lower in sites that transported manure using tanks compared to sites using drag hoses. No statistical difference in mortality was observed between sites that applied manure to surrounding fields using either direct injection or airway. Likewise, no statistical difference was observed in mortality between sites that included manure storage in deep pits versus lagoons or concrete vats.

862

The preliminary data analysis also found that using tanks to transport manure to crop fields that are farther away from the pumped site was associated with a lower mortality in the two weeks following the first pumping event when compared to drag hose. These results demonstrated an association between the distance at which manure was applied and disease onset and mortality rates after pumping events. Final results of this ongoing study will be posted when available.

868

869 SHIC Leads Tongue Tip Diagnostic Sample Research

870 Research proposals investigating tongue tips as a novel diagnostic sample type were solicited as part of 871 a SHIC released public call for research proposals. SHIC's research priority is to understand the 872 potential breadth of tongue tips as a sample type for monitoring emerging diseases.

873

Diagnostic investigation of tongue tips from stillborn pigs and neonatal mortalities may be used to gain information about PRRSV, or other pathogens, circulating during gestation and being vertically transmitted from the gestating sow to her litter. Tongue tips might also be used to monitor viral pathogen horizontal transmission in a variety of ages of pigs. Research into the use of tongue tip monitoring will help provide producers and their veterinarians with important information that they may need to effectively respond to an emerging disease outbreak.

880

881 More information is needed about diagnostic test sensitivity or specificity using tongue tip tissues 882 compared to other sample types such as neonate processing fluids; diagnostic lab processing 883 procedures to support reliable, credible test results; comparing different pathogens' tongue tip test 884 results using whole genome sequencing; and confirming tongue tip test results using virus isolation.

885

Also, if tongue tip monitoring can be used to investigate vertical and/or horizontal disease transmission, more information is needed about how to apply tongue tip monitoring to support recovery from emerging diseases. Therefore, using tongue tips to achieve herd PRRS stability or elimination as a model for an emerging disease response needs to be investigated.

During their October meeting, the SHIC Board of Directors approved \$250,000 of modifications to the 2023 SHIC budget so funds would be available for the tongue tip diagnostic research proposals. To date, institutions funded have been the University of Minnesota and Iowa State University. Titles of funded proposals are:

- Optimizing PRRSV Surveillance: A study on the Sensitivity of Tongue Tip Testing Protocols in
 Sow Herds
- The use of tongue tip fluids to monitor viral pathogens in the nursery and grow-finish phases of
 swine production
- An exploratory study to assess whether tongue tip fluids could be a diagnostic tool in growing pigs
- Optimizing ton-tip sampling protocols for enhanced whole genome sequencing and PRRS viral
 isolation
- Assessment of tongue tip fluids from stillborn piglets as a risk-based sample
- 904

905 CBP Establishes Public Interdiction Reporting Dashboard

906 SHIC, along with the National Pork Board, National Pork Producers Council, and American Association 907 of Swine Veterinarians, has been working with U.S. Customs and Border Protection on efforts to 908 prevent entry of foreign animal disease vectors to the US through screening and awareness. As part of 909 the ongoing process, CBP has recently launched a Public Interdiction Reporting Dashboard.

910

According to the CBP, millions of pounds of fresh fruits, vegetables, animal products, and other items enter the United States from other countries every year. Although these items appear to be harmless, there could be hidden threats in that baggage and in those truckloads, trainloads, and containers of fresh items that could seriously threaten U.S. agriculture, our natural resources, and our economy. CBP agriculture specialists and the CBP officers at U.S. ports of entry target, detect, intercept, and thereby prevent the entry of these potential threats before they have a chance to do any harm.

917

SHIC applauded CBP's efforts to make these records publicly available for stakeholders to see the work
 CBP is doing to keep ASF and other foreign animal diseases out of the country to protect domestic
 agriculture. Data on the dashboard includes the number of suspected swine products intercepted at
 the border each fiscal year since 2020 and is updated monthly. The dashboard is available here:
 https://www.cbp.gov/newsroom/stats/agriculture-enforcement-statistics.

923

924 SHIC Funded MSHMP Reports on 2023 Results and Progress

The Morrison Swine Health Monitoring Project (MSHMP), funded primarily by SHIC, 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 continues to monitor trends in pathogen incidence and prevalence, including PRRS and the PRRS 1-4-4 L1C variant and data analysis looked at the association of manure pumping activities and PRRS outbreaks as well as helped with outbreak investigations by comparing PRRSv sequences. MSHMP is facilitating sharing of health information by tracking multiple diseases, including transport and health relationships, and is growing by adding boar stud and growingpig data to the sow information already gathered.

933

934 Continued progress includes successfully building a system that allows the MSHMP team to quickly 935 understand whether a porcine reproductive and respiratory virus (PRRSv) sequence they receive for review has been identified elsewhere. Another example of progress is the development of PRRS strain 936 937 analysis or regional heat maps that will enable timely visualization of disease movement or evolution. 938 When cases like a recent concerning PRRS sequence, 1-4-4 Lineage 1C, arise, participants are willing 939 and interested in sharing information, feedback and continue to add more epidemiological 940 information. The project is also working to develop the capability for adding more pathogens to its 941 database.

942

943 MSHMP supports monitoring swine disease incidence as a national system in place for emerging 944 pathogen detection, a key element of SHIC's mission. Pig farm population growth, emerging pathogen 945 tool finetuning, transport data usability and platform building for project information sharing are all 946 key areas of action.

947

948 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.

954

955 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 956 957 data is actively and passively collected and organized. Following successive screening steps in which 958 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 959 public. In addition to the three USDA-classified tier 1 reportable foreign animal diseases of swine – ASF, 960 classical swine fever, and foot-and-mouth disease - which represent the main content, reports of 961 962 significant changes in the epidemiological situation of production diseases such as PRRS or PRV have 963 been included.

964

The project has been successful in finding and communicating multiple 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 Hispaniola.

969 Improve Swine Health Information

971 SHIC and CEID Welcomed Ideas for a JEV Information Website

In October 2022, the SHIC joined with the Center for the Ecology of Infectious Diseases, University of
Georgia to host a symposium entitled Japanese Encephalitis Virus: Emerging Global Threat to Humans
& Livestock. One of the initiatives that came from the symposium was an agreement between SHIC and
CEID to build and launch a JEV Information Sharing Network website, which is now live.

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970

This information-sharing website is a CEID-maintained repository of pertinent JEV information available
 to anyone interested in JEV infectious disease dynamics. The objective is to have an immediate JEV
 information resource that can answer the pork industry's initial questions and needs if JEV enters the
 US.

981

After staff at CEID invited all industry stakeholders to provide input on what specific information should be included and would provide value to the JEV Information Sharing Network website, the centralized source of information content was categorized under these headings: Updates, Information, Resources, and Data. In the Information section, topic areas include ecology, epidemiology, economic impacts, and response. The Resources section contains technical literature, academic and government resources, SHIC's JEV Fact Sheet, and content from the 2022 symposium.

- The website also describes how visitors can join a newly developed JEV Listserv managed by CEID. JEVISN.org will be continually updated as further information is gathered, data is generated, and research is completed.
- 991

992 SHIC Applauded Ramped-Up USDA APHIS ASF Outreach

Following detection of African swine fever in China in 2018 and the Caribbean in 2021, SHIC and the other pork industry associations have worked with USDA Animal and Plant Health Inspection Service to further increase efforts to protect US swine from the transboundary disease. As a result of that collaborative work, USDA APHIS outreach campaigns designed to increase awareness and to target international travelers as well as pork producers, veterinarians, and pig owners have been launched.

998

As part of their international traveler campaign, APHIS placed signs in 10 international airports (Los Angeles (LAX), New York (JFK), Chicago O'Hare, Atlanta, Miami, San Francisco, Newark, Houston, San Juan (Puerto Rico), and Des Moines). Signs encouraged travelers not to bring prohibited pork products into the US. In an announcement, USDA said, "APHIS identified these airports through a pathway risk analysis that showed they present the highest risk of passengers transporting potentially infected, prohibited products."

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In addition to signage, the campaign uses digital and social media advertising focused on the top 25
 international airports by travel volume. People searching for terms associated with international travel
 were also targeted by the campaign. Analysis shows APHIS' campaign has produced over 63.5 million

digital impressions and resulted in nearly 150,000 visits to their web page. At the time of this report,airport signs had reached over 150 million people based on airport volume.

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1012 The second campaign, APHIS' Protect Our Pigs awareness campaign, was designed to support 1013 commercial pork producers, veterinarians, and pig owners, by providing information and resources to 1014 help safeguard the US pork industry. APHIS recognizes these stakeholders as the first line of domestic 1015 defense against ASF.

1016

1017 The campaign included debut of aphis.usda.gov/ProtectOurPigs, a website to house key ASF materials. 1018 Content includes downloadable fact sheets and posters, instructional videos, shareable social media 1019 graphics, and an interactive biosecurity guide. "By working together and becoming educated, APHIS, 1020 producers, veterinarians, and owners will be ready to respond immediately should an ASF outbreak be 1021 detected," APHIS wrote.

1022

APHIS hosted a second ASF Action Week, an annual event incorporating webinars, reminders, and resources along with opportunities to answer and discuss questions about ASF and effective preparedness and response. APHIS encourages interested parties to sign up for email alerts for the latest information on Action Week and other related activities.

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1028SHIC Organizes Session at Allen D. Leman Swine Conference on Emerging Diseases and Outbreak1029Investigations

SHIC funded and served as a Session Chair at the 2023 Leman Swine Conference on September 18,
2023, in St. Paul, MN for the Session entitled "Disease Outbreak Investigations". SHIC also co-funded
and moderated an additional breakout session, "Discerning Emerging Diseases".

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1034 **2023 Travel Season Reminder: Report Lack of Secondary Screening**

During June of 2023, as international travel increased, SHIC offered a reminder to report, while entering the US and going through customs, traveler agricultural experiences. Some travelers who selfreported visits to livestock production sites have continued to not be diverted to customs agriculture specialists for secondary screening. SHIC, along with the American Association of Swine Veterinarians, National Pork Board, and NPPC, asked international travelers to report if they were not diverted for secondary screening upon arrival in the US.

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During World Pork Expo 2023, US Customs and Border Protection representatives shared their experience and protocols to lessen these occurrences. Two CBP representatives, along with Ozcar, a member of the beagle brigade, shared how they approach their role of protecting the US pork industry.

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All international travelers returning to the US, or those arriving from other countries, after visiting a farm or being in contact with animals in an ASFV-positive country, or country with any other foreign animal disease, should be aware of the expected protocol. These persons should declare this information to US CBP via written form, airport kiosk, verbally, or through the CBP's Mobile PassportControl app.

1051

1052 If NOT diverted for secondary screening after declaring having been on a farm or in contact with 1053 animals in an ASF or other foreign animal disease positive nation, travelers have been reminded to 1054 email the following to psundberg@swinehealth.org so SHIC, AASV, NPB, and NPPC can aggregate this 1055 information and share it with CBP to help identify areas for continued focus:

- Your name (optional please specify if you do NOT want your name shared)
- 1057 Country (or countries) visited
- 1058 Date and time of return
- 1059 Airline and flight number
- 1060 Arrival airport
- 1061 Declaration method (written form, kiosk, or verbal)
- Customs and Border Patrol employee name, if possible (displayed on right side of shirt)
- 1063 Any other pertinent circumstances

1065 SHIC Reports on African Swine Fever Vaccines Approved in Vietnam

1066 SHIC's Global Swine Disease Monitoring Report provided a detailed overview of the process and 1067 expectations of two locally manufactured African swine fever vaccines the Vietnamese Ministry of 1068 Agriculture and Rural Development have officially approved for domestic commercial use. With this 1069 decision, NAVET-ASFVAC by Navetco Central Veterinary Medicine Company and AVAC ASF LIVE by 1070 AVAC Vietnam Joint Stock Company have become the world's first commercial vaccines against ASF.

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According to confirmed sources at Vietnam's Ministry of Agriculture and Rural Development, the vaccines against ASF will be available for purchase by Vietnamese farmers and will not be provided by the government. The estimated price for these vaccines is approximately \$1.50 per dose. The two vaccines have differing rules for use surrounding the age of piglets at administration and duration of immunity.

1077

At the Vietnamese National Center for Veterinary Drugs and Vaccines Control, rigorous safety and potency trials were conducted for each vaccine to ensure quality standards. In these trials, the efficacy of the vaccines was defined as the percentage of animals presenting antibodies against ASF measured by ELISA at day 21 post vaccination. As of August, a pilot vaccination of 600,000 doses of ASF vaccine has given positive results. Both companies worked with specialized agencies and other collaborators to test the vaccines.

1084

1085 Several significant challenges related to the successful implementation of the vaccine remain 1086 unresolved. These challenges include:

Lack of a DIVA (differentiating infected from vaccinated animals) feature in both vaccines,
 making it difficult to distinguish vaccinated animals from infected ones.

- Absence of an effective molecular surveillance system to monitor the circulation of wild and vaccine variants in the pig population, which is crucial for understanding the virus's dynamics and the vaccine's efficacy.
- The need to establish a sustainable plan for documenting and assessing the vaccine's effectiveness in real-world scenarios. This requires robust reporting systems to gather accurate data on the vaccine's status and outbreak reports, helping to evaluate its impact on the target population thoroughly.
- 1096

1097 SHIC-Funded MSHMP Launches New Website

1098 The Morrison Swine Health Monitoring Project, funded primarily by SHIC, continues to monitor trends 1099 in pathogen incidence and prevalence. In 2023 a new MSHMP website optimizes the project's 1100 information sharing ability for both the participant and swine industry communities at 1101 https://mshmp.umn.edu/.

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1103 MSHMP staff say the website represents a significant milestone in their mission to enhance 1104 collaboration and communication within the swine industry. The website contains 10 sections, 1105 including Home, About, History, People, Reports, Outreach, Ongoing Projects, News, Resources, and 1106 Contact Us. Project participants and industry stakeholders will find easy access to MSHMP outputs as it 1107 facilitates effective communication and dissemination of crucial information.

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1109 MSHMP is facilitating sharing of health information by tracking multiple diseases, including transport 1110 and health relationships, and is growing into adding boar stud and growing pig data to the sow 1111 information already gathered.

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1113 SHIC-AASV Webinar Shares Perspectives on Emerging PRRS Virus Strains

As PRRSV strains continued to affect pork production in the US and around the world, SHIC and AASV held a webinar on February 21, 2023, to provide the latest information on challenges caused by emerging strains of this virus. Webinar presenters addressed the PRRSV L1C variant of RFLP 1-4-4 and PRRSV L1C 1-2-4 affecting the US swine population and, Rosalia, a PRRSV-1 strain with increased virulence affecting swine production in Spain.

1119

SHIC's mission includes sharing global disease risk and perspectives like these surrounding PRRSV in the effort to safeguard US swine herd health. Over 300 individuals registered for the webinar with 167 participants watching live from 18 countries and 20 US states. Attendees learned about Rosalia's significant impact on swine production in Spain, how US veterinary diagnostic laboratory data reveals PRRSV movement and predicts spread, as well as US on-farm experiences with prevention and control measures for the PRRSV L1C variant.

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1127 Porcine Sapovirus Webinar Demonstrates Need for Diligence in Diagnostics

1128 SHIC and the American Association of Swine Veterinarians hosted a webinar on porcine sapovirus 1129 (PSaV), a potentially emerging disease, on August 30 with 394 registrants from 22 countries.

- 1130 Speakers shared
- A historical perspective on PSaV, including etiology, prevalence at different farms and different farms and different ages of pigs, cell culture adaptation, and antibody assays.
- On farm, clinical, discovery of PSaV on a client's farm and the lessons learned in the process.
- A second field perspective discussing a mid- to late-lactation piglet diarrhea which presented, as could be expected, as caused by multiple pathogens, especially coccidia.
- Appropriate diagnostic sample collection and testing. Diagnostic samples should come from acutely affected pigs. Fresh and fixed samples of small intestines and colon are needed as well as feces. Tests used for diagnosis include histopathology, PCR, and RNAscope. Differentials for PSaV diagnosis are enteric coronaviruses, rotavirus, *Cystoisospora suis*, and others.
- A western Canadian perspective first reporting PSaV being detected in cases of piglet diarrhea in the first quarter of 2023. Their pursuit of a diagnosis followed a similar process as their US counterparts with sampling and other diagnostics being pursued when more common causes were ruled out. Their next steps are to fully validate PCR assays, implement surveillance in the province, and conduct further genetic analysis of more Canadian strains.

1146 Strep. zoo Experiences Provide Response Blueprint During SHIC/AASV Webinar

Recent US experiences and a series of severe *Streptococcus equi* subspecies *zooepidemicus* outbreaks in Canada and globally since 2019 led to a Swine Health Information Center/American Association of Swine Veterinarians webinar on November 29, 2023. Presentations from Canadian and US experts provided 173 live participants from seven countries and 26 US states field experiences, background, and what you need to know to take action during a *Strep. zoo* outbreak.

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Prior to 2019, *Strep. zoo* had only been sporadically reported as causing disease in pigs in Asia. The first US cases with significant mortalities were reported in Ohio and Tennessee in 2019 with subsequent identification in Pennsylvania and Indiana. Outbreaks were also reported in Canada in 2019, 2021, and 2022.

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1158 Dr. Frank Marshall of Marshall Swine and Poultry of Camrose, Alberta, shared a recent client 1159 experience with *Strep. zoo* in their 5600-sow, three-site system during the webinar. He detailed the 1160 clinical picture from the farm, postmortem and necropsy findings, and the diagnostic process. Because 1161 clinical signs of *Strep. zoo* can mimic African swine fever and other hemorrhagic diseases, the 1162 differential diagnosis process requires diligence, including being aware of zoonotic potential.

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Dr. Marshall worked closely with Dr. Matheus Costa from the University of Saskatchewan on diagnostic workups. Dr. Costa outlined his work on *Strep. zoo* noting it is capable of infecting and colonizing a wide range of hosts. Dr. Costa called *Strep. zoo* a very adaptive bacterium and shared research showing it is a part of the normal microbiome of some, but not all, pigs.

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1169 Dr. Ganwu Li of Iowa State University shared information on the genetic analyses of strains causing the 1170 US *Strep. zoo* outbreaks in 2019 (Ohio and Tennessee) and 2021 (Indiana). The 2021 outbreak isolate

- 1171 from Indiana, which caused a mortality of 2.75% in adult sows, was found to be distant from both Ohio 1172 and Tennessee outbreak isolates and the historical isolate from Asia.
- 1173

1174 The final presentation during the webinar came from Dr. Gus Brihn, USDA Animal and Plant Health 1175 Inspection Service, who addressed zoonotic potential of *Strep. zoo* and stated there is still much to 1176 learn about the bacterium. From an infection prevention and control point of view, he recommended 1177 use of personal protective equipment when working with sick animals, hand hygiene, and husbandry, 1178 such as reducing activities stressful to swine, as keys to prevention.

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1180 SHIC Programs Highlighted at AASV Annual Meeting Underscore Mutually Beneficial Relationship

1181 Consistent with SHIC's mission to protect and enhance the health of the United States swine herd, it 1182 strives to share information and resources with those on the front lines of the swine health battle. At 1183 the 2023 American Association of Swine Veterinarians Annual Meeting, SHIC-funded research and 1184 programs were shared to help practitioners serve their producer customers with the latest tools for 1185 swine disease prevention, preparedness, and response.

1186 Presentations and papers in the AASV Annual Meeting Proceedings detailing swine health research 1187 with SHIC-related support include:

- "PCR detection of ASFV nucleic acid in oral swabs from clinical and nonclinical sows of three swine farms in Vietnam"
 - Assessed the feasibility of oral swabs as a sample type for ASFV detection when submitted to a diagnostic laboratory in a novel molecular transport media.
- "An update on activities of the ASF working group for boar stud business continuity during an outbreak"
 - Assessed the risk of ASFV transmission through movement of liquid, cooled boar semen to propose fortifications to the gaps present during an ASFV introduction in the US.
- "Bayesian latent class analysis of the sensitivity and specificity of a novel PCR and indirect ELISA for African swine fever virus antibody"
 - Evaluated novel diagnostic tests for ASFV in serum and oral fluids collected from a field study in Vietnam as part of the SHIC/USDA-Foreign Agricultural Service project.
- "Progression of the newly emerged PRRSV L1C 144 variant in breeding herds"
- Reviewed detection of the newly emerged PRRSV lineage 1C RFLP 144 (L1C144) variant
 in breeding herds through data from the Morrison Swine Health Monitoring Project for
 lessons learned and future response.
- The SHIC-supported MSHMP and Swine Disease Reporting System were also highlighted in the AASV proceedings as industry resources for identifying endemic disease trends, such as seasonality, benchmarking, and prevalence across production phases. Papers referencing MSHMP and/or SDRS data include "PRRS: The fight continues" (Carthage Veterinary Service), "Adsorption of PRRS virus strains to Minnesota soils, a possible transmission route" (University of Minnesota), and "The time is now to eliminate porcine epidemic diarrhea virus" (Swine Vet Center).

- SHIC's Rapid Response Team was highlighted as a resource for outbreak investigations and 1211 1212 hazard data analysis in AASV proceedings papers including "An outbreak investigation of 1213 Actinobacillus pleuropneumoniae serotype 15 in Iowa in 2021-22" (Iowa State University, et al.) and "Biosecurity from 30,000 feet: Web-based platforms enabling an epidemiological 1214 1215 perspective (above the trees to see the forest)" (Pig Improvement Company, et al.). And SHIC's Wean-to-Harvest Biosecurity Research Program to enhance grow/finish site and transport 1216 1217 biosecurity was referenced in the proceedings entitled "Biosecurity: Why do we do it and who do we do it for?" (Suidae Health & Production). 1218
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1220 SHIC Wean-to-Harvest Biosecurity Results Presented at NAPRRS/NC229 Conference

North American PRRS/NC229 International Conference of Swine Viral Diseases brings together swine industry researchers, professionals, and field practitioners. Though inspired by PRRS-related concerns, the conference has expanded to include emerging and transboundary swine disease topics. During the 2023 NAPRRS/NC229 ICSVD, SHIC hosted a special session, "Biosecurity in the US Swine Industry." SHIC invited four principal investigators in its Wean-to-Harvest Biosecurity Research Program, that is cooperatively funded with the Foundation for Food & Agriculture Research and Pork Checkoff, to speak about their bioexclusion, biocontainment and transport biosecurity research results.

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SHIC's Wean-to-Harvest Biosecurity Research Program has funded 16 research projects to date with a focus on addressing biosecurity gaps in the US swine herd. Launched in fall 2022, the Program maintains the goal of investigating cost-effective, innovative technologies, protocols, or ideas to enhance biosecurity during the wean-to-harvest phases of swine production for the benefit of pork producers.

1235 Presenters during SHIC's special session at the NAPRRS/NC229 ICSVD were:

- Swine Disease Monitoring and the Need for Enhanced Wean-To-Harvest Biosecurity Megan
 Niederwerder, Swine Health Information Center
- Development and Evaluation of an Electrostatic Precipitator (ESP) prototype to Mitigate
 Airborne Spread of Pathogens Under Farm Conditions Montserrat Torremorell, University of
 Minnesota
- Rerouting Between-farm Transportation Vehicle Movements to Minimize the Dissemination of
 Endemic and Emerging Diseases in North America Gustavo Machado, North Carolina State
 University
- Ensuring Site and Transportation Biosecurity Using Bioluminescence Dustin Boler, Carthage
 Veterinary Service, Ltd.
- Industry-wide Assessment of Bioexclusion Practices in Wean-To-Harvest Sites, and
 Development and Validation of a Rapid Risk Assessment Bioexclusion Tool Gustavo Silva, Iowa
 State University

1250 SHIC Standardized Outbreak Investigation Program Web-Based Application

SHIC's Standardized Outbreak Investigation Program (SOIP) was introduced in early 2023 with a downloadable standardized outbreak investigation Word-based form. Now, a web-based application to conduct outbreak investigations is available. Developed in response to an industry need for a standardized tool to make sustainable progress on biosecurity, this expert-built application provides for consistent investigation and data collection. For use of the web-based version, veterinarians will contact the ISU-based administrator for access, a one-time process, at soip@iastate.edu.

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By employing the SOIP application, veterinarians have a standardized way to conduct a biosecurity hazard analysis and epidemiological investigation to identify and prioritize biosecurity hazards. The consistent approach to terminology and data collection facilitates comparisons across the industry to identify biosecurity hazards and entry events most frequently associated with outbreaks.

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1263 The SOIP application can be used now for endemic disease prevention and outbreak investigations. It 1264 can be used by veterinarians and producers to identify and prioritize biosecurity hazards so the 1265 production system can implement biosecurity control measures accordingly. It also facilitates 1266 preparation for seasonal or epidemic disease challenges.

For the future, the SOIP application prepares the industry to respond to emerging and transboundary diseases. Producers and veterinarians will be able to rapidly identify, control, and eliminate these challenges with the standardized data and enhanced biosecurity control measures it inspires.

1271 Surveillance and Discovery of Emerging Disease

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1273 SHIC's Domestic Swine Disease Monitoring Report Renewed for 2024

1274 Currently, SDRS is the only publicly available source of swine health information from U.S. VDLs, and 1275 the only publicly available source of pathogen activity in all age groups, from boar studs to breeding 1276 herds to grow-finish pigs, including a wide variety of specimens, including biological, feed, and 1277 environmental samples.

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1279 The SDRS database contains more than 1.4 million cases and holds information for seven porcine 1280 endemic agents, i.e., porcine reproductive and respiratory syndrome virus (PRRSV), porcine epidemic 1281 diarrhea virus (PEDV), porcine deltacoronavirus (PDCoV), transmissible gastroenteritis virus (TGEV), 1282 *Mycoplasma hyopneumoniae* (MHP), influenza A virus (IAV), and porcine circovirus type 2 (PCV2). A 1283 little over 100,000 PRRSV ORF5 sequences and confirmed tissue disease diagnosis are also shared with 1284 the SDRS, which contributes to positioning the project as one of the largest U.S. and international 1285 databases for veterinary diagnostic information.

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1287 The SDRS has been providing science-based spatiotemporal information on pathogen activity with 1288 great representativeness of the U.S. swine industry. SDRS offers an interactive free of charge 1289 benchmarking tool and monthly PDF, audio, and video reports containing the highlights for the most significant changes in the patterns of agent detection with the incorporation of feedback and interpretation from a panel of producers and practitioners, i.e., the advisory group (www.fieldepi.org/SDRS). Reports share information on the activity of endemic and emerging pathogens affecting the US swine population, assisting veterinarians and producers in making informed decisions on disease prevention, detection, and management.

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Rather than field observations, this reporting tool provides robust diagnostic data, with statistical analyses and Advisory Group input, that enables early identification and response to emerging and reemerging diseases in the US swine population. For example, data from the SDRS revealed higher infection rates of pigs post-weaning, a vulnerability that is now being addressed by SHIC's Wean-to-Harvest Biosecurity Program, launched in June 2022 and continued in 2023.

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During 2023-2024, data will continue to be imported from the participating laboratories. SDRS staff will continue working on data aggregation, database maintenance, server security, data mining, interpretation, and summaries. Retrospective and prospective monitoring algorithms will be updated and revalidated to scan the agent-specific percentage of positive cases at an overall and state level for the states having cases tested.

- The group will keep the online dashboards available at www.fieldepi.org/SDRS updated daily and incorporate the findings into monthly PDF, audio, and video reports. The SDRS project coordinator will collaborate on data aggregation, data mining, interpretation, reporting, and summaries. The software developer will oversee SDRS data integration, server maintenance, database security and security. The SDRS group will also keep recording a brief (target 15-20 minutes) audio/video report available at the SDRS podcast channels (Spotify, Google Podcast, Apple Podcast, and Amazon Music), on YouTube, SwineCast, and LinkedIn, summarizing the key take-homes from each month.
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Dashboards will continue to be updated on a daily basis for VDLs using HL7 and API connection, and weekly for KSU that is using CSV files for data sharing. And the project investigators will keep consulting the SDRS Advisory Group, which consists of a group of veterinarians/producers distributed across different U.S. regions and representing independent and integrated production systems to provide insights and perspectives on the patterns of results from the SDRS project.

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1321 USDA Grant Expands SHIC-Initiated Swine Disease Reporting System

After pioneering a SHIC-funded system to improve swine health by reporting pathogen test results from public veterinary diagnostic laboratories across the Midwest, a team led by faculty from Iowa State University's College of Veterinary Medicine has plans to glean even more insight from the vast data set. A new three-year, \$1 million grant from the USDA's National Institute of Food and Agriculture has been awarded to enable the Swine Disease Reporting System team and collaborators to expand how this data is utilized to inform disease trends and improve swine health.

1329 The NIFA funding will support advanced genetic analysis to identify new variations of pathogens as 1330 they develop, leveraging one of the largest known private collections of genetic disease data. That will 1331 provide even earlier warnings about new swine health risks.

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Expanded data analysis also will help determine if there are geographic areas where SDRS should seek more information. And there may be other novel uses for the data set. Part of the grant involves educating veterinary medicine students and graduate students in other fields on SDRS's trove of testing results, encouraging them to use it for conducting data-driven research or improving on-farm decision-making.

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Finally, the grant will also enable fine-tuning how the disease trend data is shared with producers. SDRS experts will meet with hog farmers and other industry partners to study possible improvements in how the information is communicated. Currently, data and analysis are shared monthly in an online dashboard and a podcast and SHIC publishes a monthly report and newsletter including the data.

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1344 SHIC Expands SDRS with Addition of Indiana ADDL Data

Starting in September 2023, diagnostic data from the Indiana Animal Disease Diagnostic Laboratory
(ADDL) at Purdue University has been included in the Swine Disease Reporting System. The Indiana
Animal Disease Diagnostic Laboratory at Purdue is a Level 2 laboratory accredited by NAHLN.

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1349 Including new veterinary diagnostic laboratories contributes to expanding the SDRS diagnostic test 1350 data by adding new regions. These acquisitions enhance the project's representativeness and capability 1351 to rapidly identify emerging or re-emerging animal health threats, informing producers and 1352 veterinarians. Indiana stakeholders actively requested the inclusion of the Indiana ADDL at Purdue that 1353 annually receives over 5,000 samples from hog farms in the state.

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SDRS currently aggregates data from five veterinary diagnostic laboratories, including the Iowa State
University VDL, University of Minnesota VDL, Kansas State University VDL, South Dakota State
University ADRDL, and Ohio Animal Disease and Diagnostic Laboratory. With the addition of IADDL, the
SDRS monthly report represents more than 96% of all swine samples submitted for testing across six
VDLs in the US members of the National Animal Health Laboratory Network.

1361 SHIC Diagnostic Fee Support Program Continues to Offer Additional Resources

There is risk of missing an emerging disease if a definitive diagnosis is not reached. SHIC's diagnostic fee assistance program was developed after porcine circovirus 2 (PCV2), porcine circovirus associated disease (PCVAD), porcine deltacoronavirus (PDCoV), porcine epidemic diarrhea virus (PEDV), and Senecavirus A (SVA) outbreaks surprised the US pork industry. In cases of high or ongoing morbidity or mortality, where cause is either not identified or diagnosis is questionable, SHIC offers help to pay for further diagnostic work.

1369 To qualify for fee assistance, the diagnostician of the case needs to initiate the process and the 1370 following requirements must be met:

- Case involves high or ongoing morbidity or mortality.
- Routine diagnostics matching the clinical presentation have been completed.
- Results of routine diagnostics are unsatisfactory due to veterinarian's clinical judgment or lack
 of identified cause.
- 1375 How Does the Process Work?
- 1376 1. Originating diagnostician will submit the online form to a panel of diagnosticians for review.
- SHIC will confirm the state animal health officer has been informed and a decision on initiating
 a foreign animal disease investigation has been considered.
- 13793. Originating diagnostician is responsible for a case record including Submitter Permission Form1380(forms available here) assuring permission for further testing.
- 13814. A SHIC Diagnostician Panel will contact originating diagnostician within 48 hours then provide a1382written report of recommendations subsequent to case review.
- 1383 5. Originating diagnostician provides the Panel report and additional results to submitter and is 1384 responsible for generating a final report to submitter, Diagnostician Panel, and SHIC.
 - 6. When the Final Report is accepted, SHIC will send diagnostic fee payment.
- 1385 1386

1387 SHIC-Funded Study Discovers First Association Between Astrovirus and Respiratory Pathology in Pigs

A study funded by SHIC is the first to report astrovirus being associated with respiratory pathology in pigs. In their work, "Direct detection of porcine epitheliotropic viruses: porcine astrovirus 4, porcine hemagglutinating encephalomyelitis, and porcine parainfluenza virus in clinical cases of undiagnosed respiratory disease," the research reports PoAstV4 being detected in lesions consistent with viral respiratory infection in 73% of pigs tested.

The objective of the study was to investigate if PoAstV4 could be detected within the microscopic lesions of diseased respiratory tissues. The diagnostic technique used detected PoAstV4, porcine hemagglutinating encephalomyelitis virus, and porcine parainfluenza virus in 117 influenza-negative bronchitis and/or tracheitis cases in young pigs.

- Results of the study showed PoAstV4 was detected in microscopic lesions from approximately 73% (85 of 117) of the cases. Porcine hemagglutinating encephalomyelitis virus was found in six of the 117 (5%) cases and porcine parainfluenza virus was found in five (4%). While these results do not prove that PoAstV4 is a cause of respiratory disease in pigs, the research suggests it provides strong evidence it may be a significant contributor to porcine respiratory disease complex. The next step, funded in 2023,
- 1402 will determine if a purified sample of the virus causes bronchitis and coughing in challenged pigs.
- 1403

1404 SHIC Helps Refine PCV3 Case Definition with VDL Study

1405 Currently, diagnosis of porcine circovirus type 3 is based on quantifying viral DNA by PCR and 1406 occasional confirmation by in situ hybridization of lesions associated with PCV3 infection. However, 1407 PCV3 has been detected in clinically and subclinically infected animals, and data to help standardize 1408 the PCV3 case definition is needed. A SHIC-funded study provided valuable insights into the diagnosis and prevalence of PCV3 in reproductive failure and surveillance cases submitted to the ISU-VDL as wellas the synergism of PCV3 with PRRSV and PCV2.

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The first objective of this study was to establish a Ct PCR value that correlates with the presence of lesions compatible with PCV3 infection. Researchers' retrospective investigation showed there is a correlation between Ct values and the presence of lesions. Cases confirmed by histopathology with lesions consistent with multisystemic inflammation showed Ct values below 30. In addition, the presence of PCV3 in these cases was confirmed by in situ hybridization, adding diagnostic value to the combination of histopathology and PCR detection.

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Another objective of this study was to evaluate commonly submitted sample types that could be used for subclinical PCV3 detection, such as oral fluids, processing fluids, and serum. Most of these samples were not linked to a specific clinical problem in their submission. Evaluation of the Ct value distribution of these samples demonstrates that a high proportion have Ct values above 32. These sample matrices could indicate viral shedding, vertical transmission on sow units, or viremia in grow-finish pigs. However, the clinical implication of positive results on these sample matrices cannot be extrapolated to assess the presence of PCV3-associated disease.

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An additional evaluation of submissions from reproductive failure associated with PCV3 showed that Ct values on cases confirmed only by PCR or a combination of PCR and histological evaluation do not differ. These results suggest that PCR on fetal tissue could be sufficient to confirm causation. However, a high proportion of cases showed co-infection with PRRSV and PCV2. The Ct values on these coinfection cases showed a positive correlation, suggesting that these viruses have a synergistic effect with a higher PCV3 viral load when these viruses are detected together.

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Researchers concluded that the diagnosis of PCV3-associated disease should be based on a combination of diagnostic tools, including lesions of multisystemic inflammation, PCR Ct values lower than 30, and additional confirmation by direct detection methods. The samples used for surveillance and subclinical evaluation could be used as a proxy for viral circulation in a sow herd or in grower pigs but should not be implicated as causing multisystemic inflammation or reproductive failure.

1439

SHIC Pursues Diagnostic Test Capable of Detecting Multiple Swine Viruses Simultaneously from Field Samples

Researchers at the University of Minnesota developed a workflow called TELSVirus, or Target-Enriched Long-Read Sequencing of Virus, that enables the real-time detection and genomic characterization of multiple viral pathogens from a single sample in a relatively short turnaround time (approximately 24 hours). As part of a SHIC-funded study, the researchers' main objective was to apply the TELSVirus workflow to porcine oral fluid samples to detect and characterize genomes of target viral pathogens.

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1448 Overall, the diagnostic test developed through TELSVirus enabled researchers to detect a high 1449 prevalence of co-circulating yet understudied viruses, including porcine bocavirus, porcine sapelovirus 1450 1, and porcine astrovirus 2 and 4, while also allowing for detection of viruses with known production 1451 impacts, such as PRRSV, influenza, and rotavirus. These viruses were often detected in the same oral 1452 fluid sample, and the high sequencing coverage afforded by TELSVirus allowed for robust viral variant 1453 analysis.

1454

Researchers also demonstrated that TELSVirus' limit of detection for PRRSV and influenza is comparable to that of qPCR, while providing the benefits of increased genomic information. Based on these results, TELSVirus has the potential to support real-time surveillance of endemic and emergent viruses, while also improving understanding of co-circulating viruses, their genetic diversity, and ultimately how they impact swine health and production.

1460

The next step is to do additional work and development of best practices for testing field samples using this process. The first attempt to incorporate TELSVirus as part of a veterinary diagnostic workflow showed promising results but is still a work in progress. Researchers are continuing discussions with the veterinary diagnostic laboratory to pursue further application of this testing platform.

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1466 **Responding to Emerging Disease**

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1468 SHIC-Funded JEV Risk Assessment Update in Progress

Following the outbreak of Japanese encephalitis virus in Australia in early 2022, SHIC funded a study to reassess the risk of JEV introduction and establishment in the US. Dr. Natalia Cernicchiaro, Kansas State University, is leading the efforts to build on a 2018 qualitative risk assessment to estimate the risk of emergence of JEV into the US.

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The updated risk assessment will add information regarding transmission, establishment, and spread by incorporating the latest scientific information, and elements contributing to the risk, to improve upon the previous work. As part of these efforts, three objectives are in progress, including 1) updating the systematic review of the literature on JEV (Oliveira et al., 2018) to inform risk assessment model parameters, 2) reassessing the risk assessment models to estimate the risk of JEV emergence into the US by incorporating the latest scientific information, and 3) soliciting expert opinion via questionnaire to members of an advisory board on JEV and swine production.

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The systematic literature review uncovered vector competence across 43-mosquito species. The host species in which mosquitoes mostly fed consisted of cattle, pigs (mostly wild boars), and birds (mostly chickens). With regards to the host competence for JEV infection, various host species were identified to exhibit JEV infection and/or antibodies. This included birds, dogs, feral horses, monkeys, rats, and pigs, which include both feral pigs and domestic pigs.

1487

1488 In meeting with the advisory group, researchers redefined some of the original study questions and 1489 elicited expert opinions on certain parameters pertaining to JEV introduction, transmission, and 1490 establishment. Based on the advisory group recommendation, Alaska and Hawaii are being1491 incorporated as additional regions considered in the risk assessment models.

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1493 SHIC-Funded Systematic Literature Review Reveals JEV Knowledge Gaps

Due to the ongoing risk of Japanese encephalitis virus emergence in the US, SHIC funded a systematic literature review intended to increase understanding of the virus's biology, components and dynamics of transmission, and environmental factors necessary for incursion and establishment. The recently completed systematic review is in addition to a separate JEV Risk Assessment funded by SHIC that is still in progress. As the US is considered a susceptible region with potential for the introduction of JEV, SHIC has focused on these projects designed to further strengthen and inform US swine industry response efforts, should they be needed.

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Led by Dr. Natalia Cernicchiaro, Kansas State University, and in collaboration with researchers from the United States Department of Agriculture National Bio and Agro-Defense facility and the National Feral Swine Damage Management Program, the study synthesized existing information on the role of domestic and feral swine in the transmission of JEV through a systematic review of 228 articles deemed relevant in a process designed to identify knowledge gaps.

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1508 The results, delivered to SHIC in June 2023, provided information on US susceptibility to JEV related to the availability of competent mosquito vector species, susceptible maintenance avian hosts, as well as 1509 1510 intensive travel and trade activities to and from Japanese encephalitis-affected countries. Additional 1511 information relevant to US risk is described, such as the similar climatic and environmental conditions to epidemic countries, lack of JEV surveillance, and the large populations of susceptible swine which 1512 can serve as amplification hosts. The considerable geographical expansion of JEV in recent decades, 1513 including the recent emergence of a new genotype in the eastern and southeastern Australian states, 1514 adds to US pork industry concern. 1515

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1517 JEV Threat to US Swine Industry Prompts Continued Research Fueled by USDA NBAF Grant

The potential for Japanese encephalitis virus transmission and spread in the US is the focus of a new investigation led by Dr. Natalia Cernicchiaro, Kansas State University College of Veterinary Medicine, and Dr. John Drake, Director of the Center for the Ecology of Infectious Diseases at the University of Georgia. With funding from and in collaboration with researchers from the United States Department of Agriculture, National Bio and Agro-Defense Facility, Foreign Arthropod-Borne Animal Diseases Research Unit, the team of researchers commenced the multi-year grant on August 1, 2023.

1524

Researchers will model transmission dynamics in the case of a JEV incursion, integrating climatic and regional factors, under specific local conditions, considering vectored and vector-free transmission among swine and other animal hosts. Additionally, a JEV spatial interaction model will be built to estimate, predict, and forecast how a JEV outbreak in the US may spatiotemporally spread.

1530 In the unique collaboration, Drake is building a JEV infectious disease spatial interaction model to 1531 explain how this virus is expected to spread after potential introduction into the US. Where a domestic 1532 outbreak begins and how quickly JEV spreads through both human populations and the US pork 1533 industry are questions Drake's research will help address.

1534

Drake's goal is to understand and predict JEV's movement across the US over weeks or months after a potential introduction. One of the expected outcomes of this project is to help the public health authorities and pork industry veterinarians understand how a JEV epidemic might be thwarted. The 2022 JEV outbreak in Australia that rapidly appeared in commercial swine operations across the eastern half of the country resulted in their government declaring a Communicable Disease Incidence of National Significance, further spurring to this project.

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1542 USDA APHIS Veterinary Services Addresses JEV Diagnostic Submission Process

Due to producer communication efforts by SHIC, along with the other pork industry associations, the threat of JEV has prompted the USDA APHIS Veterinary Services division to issue a statement regarding related testing and preparedness. The statement also addresses the diagnostic submission process and USDA plans for further preparedness activities.

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1548 Diagnostic testing for any animals with clinical signs suggesting of Japanese encephalitis virus (JEV) is available at no cost to animal owners and producers at the National Veterinary Services Laboratories 1549 1550 (NVSL) in Ames, Iowa. Veterinarians and producers must first notify their State or Federal Animal health officials if JEV is on a differential list, and these officials will assist in the submission and sampling as 1551 needed. NVSL uses both PCR and sequencing to identify and confirm the virus. While serology has 1552 proven useful in the surveillance and diagnosis of JEV in endemic countries, it is of limited use in JEV free 1553 1554 countries and will not be offered as an on-demand diagnostic test at NVSL at this time. USDA scientists are actively collaborating with partners to develop and characterize additional diagnostics, and in the 1555 future USDA will expand their active JEV research program to the National Bio and Agro-Defense 1556 Facility, once the facility is fully operational, to better understand the pathogenesis, evolution and 1557 epidemiology of JEV. 1558

- 1559 USDA APHIS Veterinary Services
- 1560 October 2023
- 1561

1562 SHIC Rapid Response Teams Stand Ready

1563 In response to events following the introduction of PED, SHIC funded Iowa State University to develop 1564 the Rapid Response Program in August of 2016. The program now includes a nationwide network of 1565 individuals called the Rapid Response Teams (RRT), who are trained, prepared, and committed to 1566 arriving within 72 hours of invitation from pork producers to conduct epidemiological investigations 1567 when a new transboundary or emerging disease threat occurs.

A transitional Project Coordinator has been appointed to provide support to RRT members and assist in conducting outbreak investigations of endemic diseases and to be available in the event of an animal health emergency where the RRT is called upon.

1572

1573 When requested by producers, RRT members have been invited to conduct investigations of outbreaks 1574 of endemic diseases. The transitional Project Coordinator gathered the information needed to prepare 1575 the outbreak investigation form and coordinated the investigations with all the relevant parties.

1576

1577 Rapid Response Teams, volunteer groups of specifically-trained industry experts, quickly carry out 1578 Rapid Response Program outbreak investigations, analyzing the patterns and pathways of entry for 1579 disease-causing pathogens in affected herds. SHIC trains, maintains, and funds the Teams to provide a 1580 coordinated industry disease response that can make anonymized recommendations to prevent 1581 infection of other swine units. Those recommendations can be rapidly circulated industry wide. Team 1582 members update training regularly and remain ready to respond when the need arises.

1583

The resources used for the Rapid Response Team online training are available for all, regardless of interest in becoming a team member. By registering on the SHIC website, veterinarians can access the training modules which serve as an excellent aid for developing their own rapid response protocol.

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1588 Rapid Response Team Investigation Form Refined to be Used as an Industry Standard

SHIC has funded the development of a standardized outbreak investigation instrument for the Rapid
 Response Team outbreak investigations. A working group of fourteen swine veterinarians was formed
 to develop the standardized instrument and approach to conducting outbreak investigations.

1592

1593 The working group aimed to create the industry-standard form and reporting instrument to; 1) assure that the most relevant information is being gathered, 2) enable the logging of data from the 1594 1595 investigations in a database that can be analyzed quickly for associations and patterns, and 3) generate buy-in and increase the likelihood of adoption by the entire industry. The standardized outbreak 1596 investigation is conducted as an integrated biosecurity hazard analysis and epidemiological 1597 investigation. Hazard analysis applied to biosecurity on swine farms is a method of collecting and 1598 1599 evaluating information on biosecurity hazards associated with introducing pathogens into a susceptible 1600 herd.

1601

A web-based version of the standardized instrument, which makes it easy for veterinarians to use and capture data from the investigations in a secure industry-wide database, has recently been developed by programmers in the Department of Veterinary Diagnostic and Production Animal Medicine at Iowa State University with funding from SHIC. In addition to the information entered into the investigation form, information may come from multiple sources, including uploaded files and images, weather data from publicly available weather sources, and animal movements from AgView. The web site deployment is set for December 2023.

1610 The web-based program will allow veterinarians to conduct outbreak investigations consistently and 1611 automatically generate reports. For a single producer or production company, the information from each investigation will be stored in a secure, searchable, and exportable database that will enable 1612 analysis of the information gathered over time. Anonymized data from the database will also be 1613 available for analysis. Every submission will strengthen the database, which can also be mined to find 1614 industry trends and opportunities to learn from the collective experience of the industry to answer 1615 questions like; what are the most frequent ways pathogens are introduced into swine herds, what are 1616 1617 the significant biosecurity hazards and what are the common gaps in biosecurity.

1618

1619 Regional Disease Warning Tool Results from SHIC Funding

With funding provided by SHIC, the Morrison Swine Health Monitoring Project team at the University of Minnesota developed and tested a tool to enable timely communication of regional disease activity, The Early Regional Occurrence Warning project. TEROW represents additional infrastructure to respond to emerging diseases and highlights efforts towards preparedness, as it can be utilized for a wide range of diseases with the application of standardized monitoring through MSHMP. On May 9, 2023, the first TEROW report was sent to participants and will be released weekly.

1626

Using porcine reproductive and respiratory syndrome in the beta testing, the research and development team developed a code to retrieve and summarize, for each enrolled site, the total number of sites within a 25(+)-mile radius experiencing an ongoing PRRS outbreak, as well as a trend indicator to show if the number of cases increased or decreased from the previous week.

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Researchers conducted several individual meetings with volunteer participants to accommodate possible concerns with confidentiality before rolling out TEROW reports. The final content and formatting of the report were developed with participant input by adding information that would facilitate report interpretation, thus becoming potentially more actionable.

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Each participating system provided a list of approved email recipients to receive the weekly systemspecific email. Researchers were able to fully automate reporting processes so participants receive weekly TEROW reports without any additional action steps on their part other than their regular participation in MSHMP.

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Developed automation not only generates TEROW reports but also automatically adjusts the radius if confidentiality criteria is at risk, as well as automatically sends system-specific reports to avoid manual errors. This tool fosters communication between industry stakeholders and provides the opportunity to quickly respond to infectious disease threats by making changes to their operations to decrease likelihood of exposure and thus reducing regional transmission and lowering regional disease pressure.

1647

1648 MSHMP's primary mission, capturing and analyzing swine health data on a weekly basis from 1649 participating farms, makes TEROW possible. TEROW remains open for producer participation.

1650 Vietnam ASF Research

1651 Introduction

1652 With the support of the National Pork Producers Council, in 2019 SHIC was awarded a grant from the 1653 USDA-Foreign Agricultural Service to support Vietnam in the prevention and control of ASF through the 1654 implementation of a project that builds the capacity of the country's pork production and veterinary 1655 workforce. The project officially closed in 2023.

1656

Section 1: Sharing knowledge and ideas. Strengthening veterinary services' capacity for mitigating ASF's impact on Vietnam

- 1659 This is a capacity-building program to train veterinarians, laboratory workers, and/or farm advisors or 1660 managers on methods described by The World Organization for Animal Health (WOAH) as necessary 1661 for functional national veterinary services organizations, with a focus on ASF prevention and control. 1662 The program was developed by the University of Minnesota Center for Animal Health and Food Safety
- 1663 (CAHFS) and local partners and institutions.
- 1664

Section 2: Implementation of field projects, and collection and analysis of samples

- These field projects were designed to provide valuable biological and epidemiological data about the ASF field situation in Vietnam, during their active ASF outbreak. One goal is to learn real-time lessons about ASF response and control in preparation for responding to and controlling an ASF outbreak in the United States.
- 1670
- 1671 A call for proposals was published in the spring of 2020, with project selection happening soon after.
- 1672 The call for proposals asked applicants to describe how they would accomplish the following:
- identifying pathways of viral entry onto the farms, to enhance biosecurity
- validating the use of swine oral fluids to confirm farm positive/negative ASF status (Appropriate sampling frequency and number would be assessed.)
- exploring the potential to isolate the virus to one area of the farm, enabling other areas to continue
 to provide ASF-free meat
- validating cleaning and disinfection procedures that enable repopulation of the farm as soon as it is
 safe
- supporting a variety of diagnostic tests that could detect and eliminate ASF
- 1681
- 1682 ASF Field Projects Completed
- 1683
- Potential of Rodents to be a Vector in the Transmission of African Swine Fever on Two Commercial
 Farms in Vietnam with Differing Biosecurity Levels
- 1686 The first objective was to determine whether rodents trapped in and around ASF-infected farms 1687 harbored ASFV virus, and, if so, which animal samples are the best ones from which to detect viral 1688 infection.
- 1689

Live traps were placed nightly at each study farm, outside facilities at entry points and inside facilities near feed sources. Trapping continued at each farm for 10 to 36 days or until 10 rats were captured. A total of 34 rats were trapped among the five farms, with two to 10 captured per farm.

1693

Samples from rats in and around farms undergoing ASF outbreaks were negative for ASF across several sample types, in a testing process that examined biological as well as mechanical vector potential. This work suggests that rats (and presumably similar rodents) do not serve as important vectors for ASFV.

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Building on the negative results from Experiment 1, the second experiment examined whether rats were susceptible to challenge with ASFV, and, if so, whether they were able to transmit the virus to susceptible rodents.

After they were inoculated, the rats did not show clinical signs of ASFV during the observation periods. There were no differences between the body temperature of control rats and inoculated rats, although temperatures of all rats (control, inoculated, and contacts) climbed during the second week of the experiment, then fell back to baseline.

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At each sampling point, blood, spleen, liver, lung, and ileum were polymerase chain reaction (PCR)tested for ASFV. None of the samples was positive for ASFV. Serum analyses using an ELISA test to detect antibodies were negative for all rats at all collection points. Despite robust challenges, intraperitoneally and orally, rats were not observed to become ill from nor infected with ASFV, out to an incubation period of 21 days.

1711

1712 This work on Vietnamese farms with differing biosecurity levels provided information that suggests 1713 rodents are not a high risk of being ASF vectors.

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1715Using Standard Laboratory PCR Testing, and Comparing Available POC Technology, to Assess the1716Validity of Current ASF Test and Remove Practices in Commercial Swine Farms in Vietnam

The value of pork in Vietnam has increased because supply has decreased; therefore, standard ASFV control measures have centered around a modified "test-and-remove" or "tooth extraction" protocol. A common "tooth extraction" protocol for a sow farm is to remove any sow exhibiting clinical signs compatible with ASF, plus the four sows (two per stall) in the stalls on the sides of the index (clinical) animal.

1722

The first objective was to test the efficacy of the "tooth extraction" protocol for elimination of ASFV from ASF-infected sow farms. On 17 (33%) of the 52 farms with ASF outbreaks, the index sow and 14 neighbor sows were ASFV PCR negative. On 19 (54%) of the 35 farms where the index sow was ASFV PCR positive, removal of the index sow and her direct contact neighbors did not remove all ASFV PCR positive sows identified by sampling.

1728

The second objective was to use the blood samples from the first objective to compare five commercial point of care (POC) assays—two rapid antigen-detection tests (aka "quick tests" (QTs)), POC QT A and 1731 QT B and three nucleic acid or PCR assays (POC PCR A, B, and C) against the standard laboratory-based 1732 WOAH ASFV PCR (STAND).

1733

1734 Compared to STAND, the three POC PCR performed equally with 84-85% diagnostic sensitivity and 95-1735 98% diagnostic specificity on field samples and 98-100% diagnostic specificity on known negative 1736 samples.

1737

1738 Compared to STAND, the diagnostic sensitivity and specificity of QT A and QT B were 60% and 88%, and
1739 53% and 74%, respectively. Based on known negative samples, both QT tests were 100% diagnostically
1740 specific.

1741

Summary: 1) "Tooth extraction" did not eliminate ASFV from sow farms; 2) ASFV DNA was detected in
blood from sows showing no clinical signs; 3) POC tests showed poor diagnostic performance. Limit
POC PCR use on clinically ill animals.

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1746 ASF Research Projects in Vietnam Examining the Use of Serum and Oral Fluid ELISAs

Two separate research projects on ELISAs being conducted in Vietnam continued and provided a final and a preliminary report. 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 United States and Canada. COVID-19-related issues have delayed completion.

1754

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 on commercial farms in Vietnam and in preparation for the virus becoming endemic in the United States. 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.

1760

1761Determining the Pathways for ASF Introduction into Boar Studs and Risk of ASF Transmission via1762Semen Movements During an ASF Outbreak

The overall objective was to determine the risk of introducing ASF to a sow farm as a result of semen movement from apparently healthy boar studs in an ASF disease control area. A proactive risk assessment (RA) was performed that looked at the potential risk of semen movements during an outbreak.

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An ASF Boar Semen RA workgroup (WG) was established; the group's members included 19 boar stud subject matter experts (SMEs), six pork producer representatives, 12 federal/state agency veterinarians, and 16 academics. The WG was asked to help answer these questions:

1771 1. What are the pathways of ASF introduction into boar studs?

- The 10 potential entry pathways are 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.
- 17763. How likely are these 10 pathways to lead to ASF infection of a boar stud in a disease control1777area?
- 1778a. As a result of WG meetings and studying the findings from published scientific reports1779and data from outbreaks in Vietnam, each of the pathways was evaluated and assigned1780a likelihood rank that ranges from negligible to high.
 - The likelihood of water being a pathway to ASFV infection of a boar stud in a control area was negligible, as long as no surface water is used in the boar stud operation.
 - The likelihood of feed, insects/arthropods, and wildlife (including infected feral pigs) being pathways to ASFV infection was negligible to low, as long as farms continue their standard biosecurity practices, such as providing boars with tandem feed bins, practicing insect control, providing indoor housing, and providing double fencing.
- The likelihood of people, fomites, domestic animals (including replacement boars), and biological materials to be pathways to ASFV infection was low, as long as farms follow requirements and procedures such as shower-in/shower-out people entry, with downtime from other pigs; decontamination and disinfection of materials entering the stud; and housing of replacement boars in isolation barns away from the boar stud and lab.
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This proactive RA is an evolving, product-specific risk assessment that will be reviewed before distribution to the swine industry, state animal health officials, and the U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS). It will be reviewed and updated as necessary before and during an ASF outbreak to incorporate the latest scientific information and preventive measures. If the Incident Command System (ICS) is activated in response to an ASF outbreak, Incident Command staff will have this RA to evaluate industry requests for movement of liquid, cooled boar semen from a boar stud in a control area.

1801

1802Time and Temperature Required for Complete Inactivation of ASFV

The objective of this project was to determine the optimal baking time and temperature required to completely inactivate ASFV in aluminum-surface-contaminated swine feces. Specifically, this project tested 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 were 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.

1810

1811 The highly virulent ASFV strain currently circulating in Vietnam was inactivated at 54°C within five 1812 minutes. However, heat treatment did not eliminate the viral genomic DNA, as the swabs were still 1813 PCR positive. One major limitation of this study is that virus isolation was used as the means to 1814 evaluate virus inactivation. Subsequently, an amendment using bioassay was conducted.

1815

1816 With support from the SHIC (grant no. 20-071), swabs collected from contaminated trays at all time-1817 points post-incubation 54°C and 63°C were found to be PCR positive, indicating that heat treatment 1818 could not eliminate viral genomic DNA. On the other hand, swabs collected from contaminated trays at 1819 five minutes post-incubation at either 54°C or 63°C were negative by virus isolation assay, indicating 1820 that holding ASFV in the presence of feces at 54°C for five minutes was sufficient to inactivate the 1821 virus, according to virus isolation.

1822

1823 One major limitation of the previous study was that virus isolation was used as the means to evaluate 1824 virus inactivation. The virus isolation assay might not be sensitive enough to detect the virus in samples 1825 that have low levels of infectious virus.

1826

The primary objective of the amendment was to conduct a pig bioassay to verify if holding ASFVcontaminated feces at 54°C for 10 minutes would completely inactivate the virus. Consistent with the previous results, holding ASFV-contaminated feces at 54°C for 10 minutes resulted in negative virus isolation. However, all four pigs inoculated with the content collected from trays after a 10-minute incubation at 54°C became infected with the virus, with viral genomic DNA detected in their blood at five days post-inoculation. Therefore, incubation of ASFV-contaminated feces at 54°C for 10 minutes was not effective at completely inactivating the virus.

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1835 Evaluating 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 penside tests and to determine the sensitivity and specificity of the pen-side tests for detection of ASF in the field. In this study, performance of three pen-side tests for ASFV detection, one PCR test for detection of viral genomic DNA and two lateral flow tests for detection of viral antigens, were evaluated.

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The first objective was to determine the time from infection to the earliest detection. Ten pigs were experimentally infected with an ASFV strain. Whole blood and oral swab samples were alternatively collected from five pigs every other day post-infection and tested with the three pen-side tests. The antigen test did not work well when tested with oral swabs. Compared with the reference laboratory real-time PCR test, the pen-side PCR test exhibited 97.8% sensitivity and 100% specificity. The antigen had 100% specificity but only 47.8% sensitivity, mainly because it failed to detect infection from samples collected early or late after infection.

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The second objective was to evaluate the diagnostic performance of the tests with samples collected from the field. In whole blood and oral swabs collected from 205 pigs, there were 34 positives and 171 negatives as determined by the reference laboratory real-time PCR. All pen-side tests had 100% specificity, regardless of the sample types tested. The sensitivity of the pen-side PCR test was 88.2% and 70.4%, respectively, when tested with whole blood and oral swab. The sensitivity of the antigen test was 50% and 11.11%, respectively, when tested with whole blood and oral swabs.

1857 The results of this study show that the PCR pen-side test has better performance than the antigen test, 1858 as it can detect infected pigs earlier and for a longer duration after infection than the antigen test. In 1859 addition, the pen-side PCR test works with whole blood and oral swabs, while the antigen test works 1860 only with whole blood.

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1862 Field Evaluation of Oral Fluids as a Convenient, Aggregate Sample for Early Detection of ASF

Oral (rope) fluid is an easily collected group sample that can be tested at veterinary diagnostic laboratories for the presence of bacterial and viral pathogens circulating in pig herds. It is widely used to detect endemic pathogens in swine such as PRRSV, PCV2, SIV, *M. hyopneumoniae* etc. Oral fluid is a sample type that could be helpful in surveillance to screen swine herds for early detection of ASF. The objective of the study was to conduct a field evaluation of oral fluids in the ASF endemic country of Vietnam for early detection of ASF virus, during active outbreaks.

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Between 2021 and 2023, three independent oral fluid studies were completed. In all three studies, pigs were sourced from family farms diagnosed with ASF and willing to contribute to the study. One infected farm at a time was evaluated in each study. Upon confirmation of ASF in the farm, apparently healthy pigs from the infected farm were purchased and transferred to a clean study farm and assigned to pens (varying pen sizes in each study).

1875

1876 In each pen, ropes were hung, pigs were allowed to chew the ropes for 30 minutes and oral fluid was 1877 collected on a daily basis until the end of study or till the pigs refused to chew the ropes. Whole blood 1878 and oropharyngeal swabs were collected from individual pigs either every other day or daily depending 1879 on the study. Rectal temperatures of the pigs were also measured and clinical signs were monitored on 1880 a daily basis. When the pigs developed fever and other clinical signs of ASF, their blood samples were 1881 tested to confirm/rule out ASF.

1882

Each study was conducted for a different period of time (depending on the clinical picture observed and the disease progression) to maximize the number of oral fluid and paired whole blood samples collected. Samples were tested according to the Canadian National Center for Foreign Animal Diseases standard protocol for testing oral fluid and whole blood for ASF.

1887

Based on the overall data of this project, ASFV DNA can be detected in oral fluids within 0-3 days of the initial detection of viremia in the pen. This is consistent with the results from a previous study on experimentally inoculated animals under experimental conditions. If the viral load is low in the pen, it may take up to 3 days to detect in oral fluids. This work confirms and further validates oral fluids as a reliable aggregate sample for screening swine herds for early detection of ASF.

1894 Identifying Pathways of Entry of ASFV onto Farms to Enhance Information for Improving Biosecurity 1895 in Vietnam

The project was focused learning lessons to prevent ASF entry into farms and identifying risk factors of virus introduction on the farm in collaboration with owners and veterinarians on farms in Vietnam that operate in an endemic area for ASF. Data was collected via a survey based on questions from the outbreak investigation instrument developed for the Swine Health Information Center-funded Rapid Response Program.

1901

Several major categories were examined on an individual production level including swine movement, pickup and deliveries, people movement, pork/food product entry, manure removal, domestic/wild animals and insects, and the air/water. The top ten shared risks to the spread of ASF included entry of water, feed trucks, replacement breeding animals, semen, visitors, tools (both for breeding replacements and cull animals), livestock trailers (for both weaned pigs and replacement pigs) as well as pork and other food entering the premises.

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1909 Swine Health Information Center Communications

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To disseminate information to stakeholders, SHIC employs a variety of tools and processes. These include the SHIC website, e-newsletter, articles development/distribution, news releases, media interviews with Drs. Paul Sundberg and Megan Niederwerder, social media, SHIC Talk podcast, and SHIC/AASV webinar series. SHIC also participates in industry events to provide access to information essential to protection of US swine herd health. Google Analytics data of SHIC website traffic is used to measure impact of media efforts.

1917 **1.** Activity on www.swinehealth.org

1918 **NOTE:** Due to Google Analytics converting to GA4 on April 1, 2023, without the possibility of merging 1919 data from the two versions, data is reported in two segments – January 1-March 30 and April 1-1920 December 19. The algorithms used due to this Analytics platform change differ so the measures are 1921 not identical, consequently they are reported separately below.

- 1922 **1)** Top pages on SHIC website with number of visits January 1-March 31, 2023
- 1923 Homepage 2,695
 - Global Disease Monitoring Report 1,028
 - Domestic Disease Monitoring Report 808
 - Seneca Valley Virus Summary 2 570
 - Disease Monitoring Reports 521
- 1928 About 434
 - Call for Research 432
 - Wean-to-Harvest Biosecurity 379
- African Swine Fever 371
- 1932 Latest News 361

1933	2) Top pages on SHIC website with number of views – April 1-December 19, 2023
1934	 Homepage – 13,595
1935	 Global Disease Monitoring Report – 5,865
1936	 Domestic Disease Monitoring Report – 4,437
1937	 Disease Monitoring Report Landing Page – 2,351
1938	 October 2023 SHIC Newsletter – 2.016
1939	 Seneca Valley Virus Summary – 1.919
1940	• About – 1,743
1941	• African Swine Fever – 1.597
1942	• Call for Research – 1.464
1943	2. Website impact (January 1-March 31/April 1-December 19, 2023, For comparison, January 1-
1944	November 20, 2022, results are included in parentheses after each applicable line.)
1945	 Over 8,156/40,046 individual sessions (30,276)
1946	 5,796/12,767 separate users (20,666)
1947	 15,967/74,932 total page views (58,199)
1948	 Average of 1.96/NA pages per session (1.92)
1949	• Average session duration of 1:25/2:07 (1:22)
1950	Top countries
1951	o 2,924/7,102=10,026 users were from the USA (11,095)
1952	 172/1,167=1,339 users were from China (257)
1953	 278/652=930 users were from Canada (804)
1954	 546/197=743 users were from Germany (1,641)
1955	 167/394=561 users were from The Philippines (431)
1956	 188/235=423 users were from the United Kingdom (1,043)
1957	 120/284=404 users were from India (520)
1958	 96/268=364 users were from Taiwan
1959	 107/187=194 users were from The Netherlands
1960	 0/167 users were from Australia (264)
1961	
1962	3. Press releases
1963	Eight SHIC-specific press releases have been issued as of December 19, 2023:
1964	 SHIC Awarded USDA NIFA Grant to Investigate ASFV Survival in Soybean Products –
1965	February 2023
1966	 SHIC Announces Wean-to-Harvest Biosecurity Program Round One Projects – March 2022
1060 1907	 SHIC Pursues More Wean-to-Harvest Biosecurity Research – March 2022
1960	 Sinc Fulsues while wean-to-harvest biosecurity Research – Watch 2025 Second Bound of SHIC Wean-to-Harvest Biosecurity Projects Funded – July 2023
1909	 Dykhuis and Thomas Join SHIC Board of Directors – July 2023
1970	

1971	 SHIC Announces Staff Transitions – August 2023
1972	SHIC-Funded Domestic Swine Monitoring Report Accomplishments Continue –
1973	September 2023
1974	 SHIC Selects Lisa Becton as Next Associate Director – November 2023
1975	
1976	4. Press release impact
1977	Emails were sent to 260 ag news outlets for each press release. Farm broadcasters continued as a very
1978	important media outreach for SHIC.
1979	
1980	Individual emails are sent to the top five pork media editors as well as five farm broadcasters with each
1981	press release. Press releases were picked up by these national editors and farm broadcasters covering
1982	the US pork industry, many times resulting in one-on-one interviews with the executive and associate
1983	director. So far this year, more than 80 interviews with Drs. Sundberg and Niederwerder have taken
1984	place. Publications, radio networks, and stations receiving personalized emails include:
1985	 National Hog Farmer/Farm Progress Publications - 3 editors
1986	PORK/Farm Journal
1987	Agri-Pulse - 3 editors
1988	Feedstuffs
1989	 Successful Farming and associated daily e-newsletter
1990	Brownfield Network
1991	Rural Radio Network
1992	 WHO Radio – Des Moines, Iowa
1993	 WMT Radio – Cedar Rapids, Iowa
1994	 KWMT Radio – Fort Dodge, Iowa
1995	 Market Talk Ag – National
1996	Red River Farm Network
1997	Agriculture of America – National
1998	Ag Daily News Podcast
1999	This Week in AgriBusiness
2000	
2001	SHIC communications efforts are amplified by stakeholders who share our articles in their publications
2002	including online newsletters, social media posts, and presentations. These stakeholders include

- 2003 National Hog Farmer, PORK, USAHA, NPPC, NPB, and others.
- 2004

2005 5. Event Interview Opportunities

2006 Multiple media interviews were given throughout the year. Participation in the National Association of 2007 Farm Broadcasters annual meeting and Trade Talk, AASV Annual Meeting as well as other industry 2008 events always have good results.

2009

2011 6. **Articles Prepared for Partners** As of December 19, 2023, content was provided for 55 articles for the AASV weekly e-letter and other 2012 partners, including: 2013 2014 SHIC-AASV Webinar Will Address Emerging PRRS Strains L1C 1-4-2 and Rosalia • SHIC Wean-to-Harvest Biosecurity Program Selecting from 41 Competitive Proposals 2015 ٠ 2016 CBP Establishes Public Interdiction Reporting Dashboard • 2017 • SHIC 2023 Plan of Work Builds on Progress and Adds New Emphases 2018 SHIC and CEID Welcome Ideas for JEV Information Website • 2019 • SHIC Drives Standardized Outbreak Investigation Instrument Development 2020 SHIC Applauds Ramped-Up USDA APHIS ASF Outreach • 2021 SHIC Announces Wean-to-Harvest Biosecurity Program Round One Projects • 2022 SHIC-AASV Webinar Shares Perspectives on Emerging PRRS Virus Strains ٠ 2023 SHIC Releases Round 2 of Wean-to-Harvest Biosecurity Program RFPs • SHIC Identifies JEV Research Gaps to Fuel Preparedness/Response Efforts 2024 • SHIC Programs Highlighted at AASV Annual Meeting Underscore Mutually Beneficial 2025 • 2026 Relationship 2027 SHIC-Funded JEV Risk Assessment Update in Progress • National Bio and Agro-Defense Facility Tour Informs Pork Industry Representatives 2028 ٠ 2029 SHIC Wean-to-Harvest Biosecurity Program RFP Round 2 Deadline Approaching • 2030 SHIC Diagnostic Fee Support Provides Answers for Nebraska Practitioner • 2031 SHIC Receives Second Round of Research Proposals for Wean-to-Harvest Biosecurity Program • 2032 SHIC-Funded Study Discovers First Association Between Astrovirus and Respiratory Pathology in • 2033 Pigs 2034 Regional Disease Warning Tool Results from SHIC Funding • USDA Grant Expands SHIC-Initiated Swine Disease Reporting System 2035 • 2036 Travel Season Reminder: Report Lack of Secondary Screening • Dvkhuis and Thomas Join SHIC Board of Directors 2037 • 2038 • Second Round of SHIC Wean-to-Harvest Biosecurity Projects Funded 2039 SHIC Continues Research Focus on Wean-to-Harvest Biosecurity ٠ 2040 JEV Knowledge Gaps Identified with SHIC-Funded Literature Review • 2041 SHIC Expands SDRS with Addition of Indiana ADDL Data • 2042 SHIC Reports on African Swine Fever Vaccines Approved in Vietnam • JEV Threat to US Swine Industry Prompts Continued Research 2043 • 2044 SHIC-Funded MSHMP Launches New Website • 2045 SHIC-AASV Industry Chatter Webinar Will Address Porcine Sapovirus • 2046 SHIC Representatives Tour NBAF Seeing Benefit for US Livestock Industry • SHIC Announces Staff Transitions 2047 • 2048 SHIC Issues RFP for Tongue Tip Diagnostic Sample Research • 2049 SHIC Seeks Associate Director Due to Staff Transition • 2050 • SHIC Funds Regional Swine Disease Warning Tool Development and Testing 2051 Porcine Sapovirus Webinar Demonstrates Need for Diligence in Diagnostics • 2052 Interim Report: Manure Pumping Effects on Disease in Wean-to-Finish Pig Sites • SHIC-Funded Study Pursues Comprehensive PCV3 Diagnostic Features 2053 •

2054	SHIC Seeks Input for 2024 Plan of Work
2055	• SHIC Prompts Study for Simultaneous Detection of Multiple Swine Viruses from Field Samples
2056	 SHIC-Sponsored JEV Information Sharing Website Now Available
2057	Reminder: SHIC Seeks Input for 2024 Plan of Work
2058	 Potential for JEV in US Leads to USDA Statement on Preparedness and Testing
2059	 SHIC-Directed ASF Research Projects in Vietnam Successfully Closed
2060	Strep zooepidemicus Experiences Spur SHIC-AASV Webinar on November 29
2061	 SHIC Presents Biosecurity-Focused Special Session at NAPRRS Symposium
2062	SHIC's Biosecurity Program Studies Transport Trailer Cleanliness Using Bioluminescence
2063	 SHIC-Funded Domestic Swine Disease Monitoring Report Accomplishments Continue
2064	 SHIC Wean-to-Harvest Biosecurity Results Presented at NAPRRS/NC229 Conference
2065	 SHIC-Funded Review on Aerosol Biosecurity Published
2066	 Strep. zoo Experiences Provide Response Blueprint During SHIC/AASV Webinar
2067	 SHIC Standardized Outbreak Investigation Program Web-Based Application
2068	 SHIC Renews Morrison Swine Health Monitoring Project Funding for 2023-2024
2069	 SHIC Funds Study Investigating Feed Mill Decontamination Methods
2070	 SHIC Funds Tongue Tip Research Projects for Emerging Disease Monitoring
2071	

2072 7. SHIC e-newsletters and Eblasts

SHIC E-newsletter Stats

Edition	Date Sent	# Sent	Opens	Opens %	Unsubs	Clicks	Click %
January 2023 newsletter	1/4/2023	3171	1002	35.2%	3	222	6.2%
February 2023 newsletter	2/8/2023	3170	1023	36.1%	5	198	5.3%
PRRS Strains Webinar Eblast	2/17/2023	3162	966	34.2%	4	118	3.7%
March 2023 newsletter	3/10/2023	3207	970	34.1%	1	190	5.2%
April 2023 newsletter	4/5/2023	3203	1032	36.2%	1	142	4.1%
May 2023 newsletter	5/3/2023	3221	1080	37.9%	3	253	7.7%
June 2023 newsletter	6/6/2023	3215	835	29.4%	0	122	3.1%
July 2023 newsletter	7/6/2023	3231	1330	46.8%	2	452	5.6%
August 2023 newsletter	8/2/2023	3227	1026	36.2%	3	640	5.7%
Sapovirus Webinar Eblast	8/10/2023	3224	626	21.8%	2	382	4.1%
September 2023 newsletter	9/7/2023	3236	999	35.3%	3	538	5.3%
October 2023 newsletter	10/4/2023	3233	1198	42.4%	2	478	5.7%
November 2023 newsletter	11/8/2023	3231	901	31.5%	0	470	4.0%
S. zoo Webinar Eblast	11/21/2023	3232	1344	47.7%	0	430	5.0%
December 2023 newsletter	12/8/2023	3252	1019	36.1%	1	635	5.9%
2023 Averages			1023	36.1%		351	5.1%
2022 Averages			989.47	34.4%		178	4.6%
Benchmarks**				34.5%			1.33%

* Clicks = following a link from the newsletter to the SHIC website.

** Benchmarks = industry standard per Constant Contact, email distribution platform used.

2073 8. SHIC Talk Podcast

In 2023, SHIC Talk episodes continued to be produced. The podcast is hosted by Barb Determan and
 features guests on "industry chatter" topics. Three episodes have been produced in 2023. SHIC Talk is
 available on the SHIC website as well as Apple Podcasts, Google Podcasts, Spotify, Amazon
 Music/Audible, TuneIn/Alexa, and iHeart Radio. All time downloads of all episodes total 2394 as of
 December 19, 2023.

2079

2080 2023 Episodes 2081

2082	•	New Standardized Outbreak Investigation Instrument	April 2023
2083	•	2023 Plan of Work with Drs. Sundberg and Niederwerder	January 2023
2084	•	Vietnam ASF Research Results with Dr. Sundberg	November 2023

2085

2086 Podcast Downloads

2087	Title WI		Downloads (All time)
2088	Ep 16 ASF Research Results from Vietnam	Nov 20, 2023	42
2089	Ep 15 New Standardized Outbreak Investigation Instrument	Apr 4, 2023	107
2090	Ep 14 2023 Plan of Work with Sundberg + Niederwerder	Jan 19, 2023	74
2091	Ep 13 Wean-to-Harvest Biosecurity Program	Sep 15, 2022	123
2092	Ep 12 ASF Update Niederwerder, Snelson, Wagstrom, and Webb	Jul 27, 2022	162
2093	Ep 11 SHIC FAD-Prevention Feed Research	May 23, 2022	123
2094	Ep 10 Australian JEV Outbreak	Apr 28, 2022	147
2095	Ep 9 Biosecurity Dr Clayton Johnson	Jan 31, 2022	234
2096	Ep 8 Morbillivirus Drs Arruda and Li	Jul 14, 2021	194
2097	Ep 7 SHIC Fact Sheets	May 26, 2021	115
2098	Ep 6 SHIC Progress - Drs Connor and Olsen	Apr 20, 2021	128
2099	Ep 5 PRRS 1-4-4- 1c - Drs Yeske and Linhares	Feb 15, 2021	219
2100	Ep 4 ASF Research in Vietnam	Dec 2, 2020	238
2101	Ep 3 Rapid Response Program - Drs Holtkamp and Donovan	Oct 14, 2020	174
2102	Ep 2 Coccidiosis - Drs Pittman & Schwartz	Sep 18, 2020	145
2103	Ep 1 Introductory Episode	Aug 5, 2020	171

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2105 9. SDRS Communication Multiplication

2106 In addition to being distributed in the monthly SHIC newsletter and posted on the SHIC website, the Swine Disease Reporting System team at Iowa State University amplifies the reports' distribution. A 2107 total of 340 subscribers from 151 organizations receive the reports via email. The PDF report reaches 2108 seven countries and since the implementation of the podcast platforms (Spotify, Apple Podcast, 2109 2110 Amazon Music, and Google podcast), the audio report has been listened to by 36 different countries 2111 (https://rss.com/podcasts/sdrs/). The SDRS report is also distributed through video format on LinkedIn 2112 (https://www.linkedin.com/in/fieldepi-field-epidemiology-46814a194), Youtube (Swine Disease

2113 Reporting System SDRS - YouTube), and Instagram (https://www.instagram.com/isufieldepi/), 2114 accumulating over 20,000 views in these social media platforms.

2115

2116 **10.** External Events

SHIC's executive and associate directors participate in external events which help share the Center's information and messaging. Whether participating themselves or coordinating subject matter experts on SHIC-related topics and projects, these events amplify SHIC's presence. An example is the National Hog Farmer's Global Virtual Hog Industry Conference. Numerous conference presentations have the same impact and reach.