Emerging global threats and what we must do to stop them

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The mission of the Swine Health Information Center (SHIC), launched in 2015 with Pork Checkoff funding, 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 (SHIC, 2023). Emerging infectious diseases are a constant threat to the swine industry and are generally considered those pathogens which are new or those pathogens which have recently changed characteristics, such as an expanded geographic range, a difference in primary production phase affected, or an increase in clinical pathogenicity to the herd (USDA, 2017). Considering the threats of emerging diseases to the swine industry, this talk will cover some of SHIC’s activities and actions that swine veterinarians can take to help protect and mitigate emerging disease risks to the North American swine population.

**Monitoring domestic and global swine diseases**

As part of SHIC’s strategic mission to improve swine health information and monitor risks to swine health, SHIC publishes monthly domestic disease monitoring reports and global disease monitoring reports. Similarly, the Canadian Community for Emerging and Zoonotic Diseases publishes a weekly intelligence report covering all species (CEZD, 2023). Routinely reviewing reports such as these is important to maintain an acute awareness of emerging swine diseases in North America and throughout the world. For example, an emerging disease identified through global disease monitoring as a priority for North American prevention and preparedness activities is Japanese encephalitis virus (JEV). The U.S. and Canada are currently negative for this mosquito-borne virus which has waterbirds as a natural reservoir host but is capable of infecting pigs and humans. In 2022, an outbreak of JEV genotype IV spread rapidly across new regions of Australia affecting breeding swine herds and causing reproductive failure, stillbirths, mummified fetuses, and abortions (Australian Government, 2023).

**Obtaining a definitive diagnosis**

As part of SHIC’s strategic mission to surveil and discover emerging swine diseases, SHIC offers support for diagnostic fees designed to identify newly introduced or emerging swine diseases. Additional diagnostic testing is supported in cases where an etiology is not readily detected, or the presumed etiology is negative on routine testing. Diligently pursuing a definitive diagnosis is critical for early and rapid identification of newly emerging diseases, swift implementation of control strategies, and reducing production impacts and risk of spread. For example, porcine sapovirus (PSaV) was identified as an emerging cause of diarrhea and enteritis in nursing piglets after routine diagnostics for porcine epidemic diarrhea virus, porcine deltacoronavirus, transmissible gastroenteritis virus, and rotaviruses were negative (Shen et al., 2022). The clinical presentation, production impacts, and control strategies for PSaV was recently the topic of a SHIC/AASV webinar featuring both U.S. and Canadian experiences. Cumulatively, presentations highlighted the risks of narrowly focusing on a single pathogen during a diagnostic investigation, which may result in missed detections of emerging or less common pathogens (SHIC/AASV Webinar, 2023).

**Performing outbreak investigations**

As part of SHIC’s strategic mission to respond to emerging diseases and mitigate risks to swine health, SHIC funded the development of the Standardized Outbreak Investigation Program to enable consistent epidemiological investigations of newly emerging swine diseases and identify biosecurity hazards after field outbreaks. Through deliberate data collection post-disease incursion, entry events most frequently associated with outbreaks are identified as the highest biosecurity hazards on the farm. For example, the outbreak investigations of *Actinobacillus pleuropneumoniae* (APP) serotype 15 cases in central Iowa from November 2021 to January 2022 revealed mortality removal through rendering transport as a significant hazard. Identification of entry events at high risk for domestic disease entry enables biosecurity practices to target specific vulnerabilities and close biosecurity gaps for foreign and emerging swine disease incursion.

**Enhancing biosecurity across all phases of swine production**

As part of SHIC’s strategic mission to mitigate risks to swine health and respond to emerging diseases, the Wean-to-Harvest Biosecurity Research Program was launched by SHIC in September 2022 along with the Foundation for Food & Agriculture Research and the Pork Checkoff in response to an identified biosecurity gap. Considering the interconnectedness of the swine industry, biosecurity vulnerabilities and higher endemic disease prevalence in pigs post-weaning serve as a risk of emerging disease introduction and spread for all phases of swine production. To achieve a comprehensive biosecurity approach, new tools and technologies are currently being investigated through this program across three areas, including 1) site bioexclusion to prevent disease introduction, 2) site biocontainment to prevent disease spread, and 3) transport biosecurity to prevent disease movement from markets and first points of concentration back to the farm (SHIC/FFAR/Pork Checkoff, 2022). For example, funded research projects presently underway investigate innovative biosecurity solutions such as self-vaccination technology to reduce the need for vaccine crews, novel biosecurity entrance systems as a replacement to shower-in, alternative cost-effective methodologies for livestock trailer and truck cabin disinfection, and understanding motivators for increasing biosecurity protocol compliance of personnel.

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