



**FOUNDATION FOR
FOOD & AGRICULTURE
RESEARCH**

Japanese Encephalitis Virus Research Program Request For Research Proposals February 12, 2024

The Swine Health Information Center and the Foundation for Food & Agriculture Research have partnered to fund a \$1M research program to enhance US prevention, preparedness, and response capabilities for Japanese encephalitis virus, a transboundary disease risk for US introduction.

Launched in 2015 with Pork Checkoff funding, the mission of the Swine Health Information Center (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. The Foundation for Food & Agriculture Research (FFAR) is a non-profit organization established in the 2014 Farm Bill to build public-private partnerships that fund bold research addressing food and agriculture challenges.

As part of SHIC's strategic mission to monitor risks to swine health, SHIC publishes monthly disease monitoring reports to maintain an acute awareness of emerging swine diseases throughout the world. An emerging disease identified through global disease monitoring as a priority for North American prevention and preparedness activities is Japanese encephalitis virus (JEV), a zoonotic disease transmitted by *Culex* mosquitoes infected with the virus. The US is currently negative for this mosquito-borne virus which has waterbirds as a natural reservoir host but is capable of infecting pigs, humans, and horses.

Historically, JEV has been primarily maintained in endemic Southeast Asia and Pacific Island nations. In 2022, an outbreak of JEV genotype IV spread rapidly across new geographic regions of Australia affecting breeding swine herds and causing reproductive failure, delayed farrowing, stillbirths, mummified fetuses, abortions, and weak piglets. This recent incursion of a new JEV genotype into areas previously free from disease, as observed in Australia with the invasion and expansion of JEV genotype IV in eastern and southeastern states, warrants the need for a close investigation of this disease and its potential for incursion and establishment in the US.

The US represents a geographic region susceptible to the introduction of JEV. Biosecurity practices focused on mosquito control are often the most effective as JEV is transmitted through the bite of an infected mosquito. Knowing the availability of competent insect vectors, susceptible avian and porcine hosts, and similar environmental conditions in the US compared to JEV endemic countries creates concern for the US pork industry as well as with public health officials. Research priorities for JEV are designed to further strengthen US swine industry preparedness as well as inform response efforts, should JEV be introduced into the country.

Understanding the potential impacts of JEV on pork production in the US is critical to protecting the health of the US swine herd as well as mitigating the risk of this emerging disease. Critical research investments are necessary to prevent JEV incursion, ensure rapid detection of JEV if

introduced, inform stakeholder response, mitigate production losses on the sow farm, identify effective control measures, and develop clear messaging to consumers on the safety of pork.

SHIC and FFAR are inviting proposal submissions from qualified researchers for funding consideration to address JEV research priorities described in the detailed Request for Research Proposals (RFP) below, including topic areas of 1) transmission and epidemiology, 2) mosquito control, 3) diagnostics, 4) communication, 5) surveillance, 6) compatible cases, 7) challenge models, 8) vaccines, 9) cross-protection, 10) competent vectors, 11) role of wildlife, 12) novel hosts, and 13) viral sequencing.

Proposals should clearly state which of the below SHIC/FFAR JEV Research Priorities will be addressed through the project. Collaborative projects that include the pork industry, international organizations, allied industry, academic institutions, and/or public/private partnerships are highly encouraged. Projects that demonstrate the most urgent and timeliness of completion, provide the greatest value to pork producers, and show efficient use of funds will be prioritized for funding. Projects are requested to be completed within a 12 – 18 month period with sufficient justification required for extended project duration.

Total funding available for the SHIC/FFAR JEV Research Priorities outlined below is \$1M. **Individual awards are capped at \$250,000 but proposals may exceed cap if sufficient justification is provided.** Matching funds are encouraged but not required; the \$250K cap applies to only those funds requested from SHIC/FFAR. All projects should strive to be unique, have a high impact, show value to pork producers, and have industry-wide benefit.

The deadline for proposal submission is 5:00 PM CDT on April 15, 2024. SHIC and FFAR are co-hosting an informational webinar on February 22, 2024 at 3:00 PM CST to provide additional details about the application criteria. Attendees must [register to attend](#) the webinar. The proposal template and instructions for completion and submission can be found at www.swinehealth.org. For questions, please contact Dr. Megan Niederwerder at mniederwerder@swinehealth.org or (785)452-8270 or Dr. Lisa Becton at lbecton@swinehealth.org or (515)724-9491.

SHIC/FFAR JEV Research Priorities

1. Investigate the mechanism of JEV spread throughout a single production site, defining the risks or epidemiological factors playing a role in the extent of transmission and variation of clinical signs within a litter and across litters. Goals include identifying mitigation strategies to minimize JEV impact on farm production.
 - a. Define the role of vector-free or direct pig-to-pig transmission in the epidemiology of JEV.
2. Investigate effective mosquito control measures for swine farms in the US, including recommendations based on site design, ventilation type, and manure storage. Chemical insecticide residues and withdrawal periods should be indicated.
3. Design novel or confirm current US diagnostic assays for JEV (PCR, antibody) can distinguish between JEV and other flaviviruses in the US (West Nile virus, St. Louis encephalitis virus) which may produce cross-reactivity and can detect all five genotypes (I-V) of JEV.

4. 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 a JEV incursion.
5. 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.
 - a. Examples may include feral swine, commercial swine, high-risk backyard swine, mosquitos, water birds, migratory birds, sentinel animal systems such as chickens, lagoon effluent, bird feces, oral fluids, tonsils, human encephalitis cases.
6. Investigate syndromic surveillance for case compatible veterinary diagnostic laboratory submissions in the US of reproductive disease from sow farms (abortions, mummified fetuses, stillborns, neonatal tremors) to define the annual or seasonal number of compatible cases, including the percent of cases in which no definitive diagnosis of endemic disease or toxicosis is determined.
7. 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.
8. Develop vaccine candidates for use in US commercial swine to minimize production losses if JEV is introduced, focusing on subunit, vectored, mRNA, or killed vaccines, that could be deployed post-outbreak and would allow differentiation of vaccinated from infected animals (DIVA).
9. Determine the extent of JEV cross-protection that is present across US commercial swine after exposure to other flaviviruses (West Nile virus, St. Louis encephalitis virus) endemic to the US.
10. 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.
11. 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.
12. 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.
 - a. Examples may include non-ardeid bird species, microbats, fruitbats, opossums.
13. Investigate the molecular pathogenesis differences between genotype IV and historical JEV genotypes, including an estimation of virulence factors based on whole genome sequencing.