DHS Plum Island Animal Disease Center Science Program: Classical Swine Fever

Science and Technology

SCIENTISTS ON THE FOREFRONT

The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) operates the Plum Island Animal Disease Center (PIADC). At PIADC, DHS S&T and Department of Agriculture (USDA) Agriculture Research Service (ARS) and Animal and Plant Health Inspection Service (APHIS) scientists are able to study knowledge gaps and test, evaluate, and develop counter measures and outbreak prevention and control measures for classical swine fever (CSF) and other transboundary animal diseases. PIADC is one of the few facilities within the U.S. that is permitted to utilize live CSF virus (CSFV) as part of its scientific activities.

OVERVIEW OF CLASSICAL SWINE FEVER

CSF, also called hog cholera or swine fever, is a contagious, viral disease affecting domestic and wild swine. The severity of the illness varies based on the virulence of the virus strain, the age and relative health of the swine, and the level of herd immunity. Acute infection by highly virulent strains results in high mortality among animals not previously exposed to the virus. The clinical presentation of CSF—fever, constipation, diarrhea, hemorrhage within the skin, reproductive loss—mimics many other swine diseases, complicating its diagnosis. Clinical recognition of less virulent strains may also be challenging among older animals.

Swine are infected primarily through oral or oronasal routes, or even through other mucous membranes or breaks in the skin. CSFV is shed in secretions from the mouth, nose, and eyes, and is present in bodily fluids. The virus remains infectious in swine blood and tissue, enabling disease spread when swine are fed uncooked swill containing these materials. CSFV also remains infectious in refrigerated, frozen, cured, and smoked meats, necessitating controlled movement of pork and pork byproducts during outbreaks. Strict biosecurity measures (e.g., inspecting travelers and cargo) to prevent inadvertent introduction of infected animals or animal byproducts through illegal importation are crucial to maintaining an area's CSF-free status.

CSF is a trade-restricting, transboundary disease—countries with confirmed cases are subject to international trade restrictions aimed at reducing the risk of introducing CSF to disease-free areas. This disease is not a threat to human health and does not represent a food safety concern, but established CSF outbreaks in the U.S. would disrupt critical agriculture markets and pork exports. A 1997-1998 outbreak in the Netherlands cost over $2 billion, much of which resulted from the need to depopulate healthy animals outside of disease control areas due to restrictions on movement. The disease is endemic to many countries, including parts of Asia, South and Central America, and the Caribbean.[1] Its prevalence in Africa is unknown due to a lack of surveillance. The U.S. has remained free of CSF since its eradication in 1978.[2]

MITIGATING THE THREAT OF CLASSICAL SWINE FEVER

There is no treatment for infected swine. To prevent further spread, affected animals must be euthanized, and their carcasses properly disposed. However, single-dose, modified live virus and two-dose, subunit vaccines are available to prevent CSF infection. The National Veterinary Stockpile, operated by USDA APHIS, maintains manufacturer-managed inventories of CSF vaccine for domestic use, to be administered as part of an emergency outbreak response.[3]

DHS previously funded a project to enable the importation and distribution of a modified, live CSF vaccine. The results showed efficacy of a plant-based recombinant subunit CSF vaccine candidate (vaccine components are made by genetically modifying the plant). S&T also funded a USDA ARS PIADC project on the development of a modified, live virus vaccine candidate with a marker to differentiate an infected from a vaccinated animal. Moreover, S&T completed a cooperative research and development agreement with an industry partner and evaluated a recombinant, subunit CSF oral vaccine candidate.

CSF can be transmitted to healthy pigs via exposure to contaminated vehicles, pens, feed, or clothing.