

On Guard Against Foreign Animal Diseases

Since the establishment of the U.S. Department of Agriculture by President Abraham Lincoln in 1862, much has changed in the battle against animal diseases that threaten our food security and public health. Along with more people, animals, and agricultural products crossing international borders comes a higher risk of an intentional, accidental, or natural occurrence that may result in an outbreak of a foreign animal disease.

Scientists work to control and prevent diseases that occur in the United States, but they also work diligently to upgrade traditional tools and develop new technology to mitigate infectious-disease outbreaks that are occurring elsewhere. Foot-and-mouth disease and African swine fever are two examples.

To address these concerns, the Agricultural Research Service, the chief scientific research agency of USDA, maintains a comprehensive animal health biodefense research program dedicated to protecting livestock against potential harmful biological agents. The goal is to ensure the safety of the nation's agriculture and food supply through improved disease detection, prevention, control, and—when feasible—eradication.

ARS's Animal Health national program has several research components, one of which is biodefense research to support federal and state regulatory agencies as they prepare for potential foreign-animal-disease outbreaks. This component supports President Barack Obama's national strategy for countering biological threats by targeting priority diseases that pose the greatest economic and public-health threats to the United States. To improve our response to foreign-animal-disease out-

breaks, we develop diagnostics, vaccines, and biotherapeutics that our scientists have engineered for controlling and eradicating specific diseases. If these countermeasures meet the required standard, they may be added to the National Veterinary Stockpile—the nation's repository of vaccines, personal protective equipment, and other critical veterinary products.

One disease agent of high priority is classical swine fever virus, a highly infectious virus of pigs that threatens the U.S. pork industry. Scientists in the ARS Foreign Animal Disease Research Unit at the Plum Island Animal Disease Center are investigating this disease. Among their many accomplishments, they have shown that the virus contains three heavily glycosylated—or sugar-coated—proteins, which play a critical role in virulence and immune responses. This and other discoveries provide essential information for developing the next generation of vaccines.

Research has also been renewed to study another pig disease, the deadly African swine fever, that's threatening global economies.

Continued research at Plum Island on foot-and-mouth disease (FMD), one of the most economically devastating diseases affecting animals worldwide, has resulted in major breakthroughs. For example, researchers have discovered the primary site where FMD virus infection begins—a region in the back of the cow's throat. This advancement will aid in developing countermeasures and effective tools to block viral transmission.

Global eradication of FMD and other foreign animal diseases has been proposed for many years. While some parts of the world, such as South America, are on the

verge of eradicating FMD with currently available tools, others require new tools and sustainable approaches relevant to their methods of livestock production. There is a clear need for alternative control methods, particularly vaccines that can address the major shortcomings of our current stock. New vaccines, diagnostics, and control strategies could help break the endemic transmission cycles of viruses that continue to circulate and remain active in particular regions.

To help achieve these goals, international collaborations are essential. The Global Foot and Mouth Disease Research Alliance—a worldwide association of animal research organizations—was formed to generate and share knowledge and discoveries among global partners and to develop better tools to combat FMD.

No one can predict with certainty the cause of the next animal-disease outbreak. But we can prepare by escalating our ability to rapidly detect, identify, and characterize new and emerging animal pathogens. We continue our work with collaborators to address major problems that limit control and eradication of foreign animal diseases. This includes understanding the ecology, pathogenesis, and transmission of diseases in relevant animal species and, importantly, developing new and cost-effective technologies to rapidly detect, control, and eradicate the most damaging animal diseases.

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