High Consequence Pathogens, Including Potential Bioweapons: Countermeasure Development at the Biosecurity Research Institute

Background

The growing public health problems associated with mosquito and tick-transmitted diseases such as Zika, chikungunya, West Nile and Lyme disease are currently receiving a great deal of attention and causing great fear to individuals and the general public. The vectors, such as mosquitoes and ticks, that spread these diseases can rapidly infect entire regions of our nation. To control the spread of disease, it is important to monitor and take appropriate measures to control or eliminate the hazards. Lack of funding for training and research in arthropod-borne diseases is creating a void that is making it difficult to respond to the threat of increased vector-borne diseases and address the public's concerns in a timely manner.

Description

The Biosecurity Research Institute (BRI) at Pat Roberts Hall is one of fewer than six high containment facilities in the United States that can conduct research on livestock experimentally infected with a broad range of highly pathogenic organisms. The BRI is the designated facility at Kansas State University for work on organisms classified by the U.S government as select agents (SA). One of the defining factors for SA designation is that these agents have the potential for weaponization. As such they are of high priority, but require highly specialized facilities and highly trained and approved personnel to ensure constant accountability, safety and security. The primary purpose of the research is to improve understanding and to develop diagnostics and vaccines that can better prepare the U.S. to detect and respond to foreign pathogens that threaten agriculture and public health.

This state-of-the-art facility is comprised of an ACL/BSL-3 insectary suite (3 rooms at BSL-3E) available for arthropod transmission studies, a mosquito rearing room, 14 BSL-3/3Ag research laboratories, including five rooms to enable research on livestock, an ABSL-3 vivarium small animal area, a pathogen storage room (BSL-3E), as well as education, training and administrative spaces.

The BRI is the first nonfederal facility ever to be approved to work with African swine fever (ASF) and classical swine fever (CSF) viruses, two highly contagious pathogens associated with high mortality in pigs. Recent acquisitions of ASFV and CSFV have enabled research that has led to testing of promising new vaccines for CSF and innovative molecular genetic studies to improve our understanding of ASF in swine. Research on Rift Valley fever virus has involved the first livestock studies to be conducted in the U.S. since the 1980s. Other SAs worked with at the BRI include highly pathogenic avian influenza, anthrax, glanders, plague and brucellosis.

Non-SAs used at the BRI include Japanese encephalitis (JEV), yellow fever and Zika virus, all of which are zoonotic pathogens that can infect humans with high morbidity and potentially high mortality. All three of these viruses are transmitted by mosquitoes, and the BRI has capabilities for research with mosquito vectors. Recent mosquito experiments with JEV, a priority pathogen for study at the National Bio and Agro-defense Facility (NBAF), are the first such studies to be conducted in the U.S. since the 1940s. This virus is closely related to West Nile virus that has probably infected more than 2 million people and more than 1,900 deaths since 1999. Our experiments with JEV demonstrated susceptibility of North American mosquitoes that could be effective vectors in the event this virus is introduced into the United States. Research with Zika virus, which has infected over 4,000 people in the U.S., includes investigating mosquito transmission and collaborative studies to evaluate new vaccines for Zika.

With interdisciplinary biosecurity research programs, agrosecurity initiatives and the development of collaborative research, the BRI is the platform for transitioning work currently conducted at the Plum Island Animal Diseases Center (PIADC) to the National Bio and Agro-defense Facility (NBAF), which is being constructed adjacent to the BRI.

Relevance

The mission of the BRI, "Leading through research and education to protect agriculture and the public from biological threats," is epitomized by its integration of interdisciplinary work on pathogens that contaminate food or infect livestock, people, and plants.

It is important to develop new programs that will provide comprehensive training in basic and applied aspects of vector biology/medical entomology, arbovirology, and the epidemiology of arthropod-borne diseases.

Providing education and training to graduate students and postdoctoral fellows will help create a competent cadre of interdisciplinary professionals who will work together to anticipate and respond to arthropod-borne disease outbreaks. Working with some viruses can only be performed in high containment and the BRI is equipped and ready to undertake this research.

Agency Contact Information

David Christian "Chris" Hassell
Deputy Assistant Secretary of Defense for Chemical and Biological Defense, Department of Defense Homeland Security, Science & Technology
Matthew Coats, 202-254-6018
matthew.coats@hq.dhs.gov