Research & Development for U.S. Bio/Agro-defense: Protecting Agriculture and Preserving Public Health

Background

Awareness is increasing on the risks posed to U.S. agriculture and public health due to processes such as 1) the accidental or deliberate introduction of disease agents previously confined to other parts of the world, 2) the emergence of hitherto unknown pathogens or 3) the acquisition of new capabilities by microbes previously considered benign.

The 2018 White House National Biodefense Strategy outlines five goals with associated objectives for strengthening the biodefense enterprise, including to "Strengthen biosafety and biosecurity practices and oversight to mitigate risks of bioincidents" and to "Ensure a vibrant and innovative national science and technology base to support biodefense."

Description

The Kansas State University Biosecurity Research Institute (BRI) at Pat Roberts Hall is a linchpin of U.S. bio/agro-defense capabilities because of its capacity to support research and development of diagnostic tools, contribute to greater understanding of the basic biology and life cycle of poorly-understood pathogens, and provide a testing ground for possible countermeasures and treatments.

The BRI is one of a few high-containment facilities in the U.S. allowing research on livestock experimentally infected with a broad range of highly pathogenic organisms. For example, the BRI is the designated facility at K-State for work on organisms classified by the U.S. government as select agents. These are agents that have the potential to be weaponized and require specialized facilities and highly trained personnel to ensure constant safety and security. Research at the BRI has already resulted in development and testing of two vaccines for highly pathogenic influenza, a vaccine for classical swine fever, and vaccines for Rift Valley Fever virus. These diseases are either zoonotic or potentially devastating to agriculture, or both.

Among the specialized facilities at BRI are 1) a state-of-the-art Arthropod Containment Level 3 Laboratory and supporting mosquito rearing room that allows researchers to investigate interactions between pathogens and their insect vectors and 2) a food production research suite that supports research on pathogens entering the food production process at various points. BRI has hosted research on mosquito-borne diseases such as Japanese encephalitis and Zika as well as on deadly foodborne pathogens, including Shiga-toxin-producing *Escherichia coli* and potential deliberate contaminants such as *Bacillus anthracis*.

Plant pathogens are also under study at the BRI, including known and emerging pathogens that threaten Kansas and worldwide production of three of the top five crops grown globally, namely wheat, corn and rice. Research topics include improving our ability to predict and detect the emergence of new pathogen varieties with enhanced virulence as well as mitigation strategies for existing and novel types. One example is wheat blast, which is a newly emerged and globally spreading disease causing substantial losses in South America and Southern Asia. This disease, and others, have the potential to disrupt food security and to destabilize already weakened nations.

Relevance

America is unprepared for a bioterrorism attack targeting agriculture — crops or livestock — or food. Interruptions to the food supply, either natural or man-made, threaten public health and economies. Furthermore, a growing worldwide population, changes in land use and climate, and increased global mobility and trade all increase the likelihood of the spread of previously unknown diseases. Improvements in basic science, vulnerability assessments and mitigation strategies are needed to address these real threats.

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