

Foreign Animal Disease Threats and the National Bio and Agro-defense Facility

Agriculture Security is National Security

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The risk of a transboundary or foreign animal, zoonotic, or plant pathogen devastating America’s agricultural economy is not a No. 1 news item today, and often, it doesn’t make headlines until we’re in the midst of a disease outbreak. Despite our false sense of security, any shock to the U.S. agricultural economy would shake the global economy as well. We only need to take a brief look back into recent U.S. and world history to remind us how vulnerable we are.

THREATS TO BIOSECURITY

The “Amerithrax” attacks in 2001 might be the instance that most often comes to mind when biological weapons are discussed. Powdered anthrax sent in the mail or in missiles causing direct loss of human life is certainly a terrifying proposition, but all elements of U.S. agriculture — our food supply — are potential targets of a biological weapon. This isn’t just a hypothetical notion when you consider the evidence. In 2002, U.S. troops in Afghanistan found *al-Qaeda’s* list of 16 pathogens that were selected as potential bioweapons as shown in Figure 1. Only six of them targeted people with anthrax second on the list. Another six were pathogens of livestock and poultry, and four were crop pathogens.

A much more contemporary example comes from North Korea. In 2015, Kim Jong Un produced video footage of the Pyongyang Biotechnical Institute. Claiming this facility is a factory for making biological pesticides to combat

worms and caterpillars that affect North Korea’s cabbage crops, the images unexpectedly revealed equipment that could be used for bulk production of live microbes, and large dryers designed to create powdered formulations of bacterial spores. Melissa Hanham, a North Korea specialist at the James Martin Center for Nonproliferation Studies in Monterey, California, blogged, “It is hard to avoid the conclusion that the institute is intended to produce military-size batches of anthrax;” “Regardless of whether the equipment is being used to produce anthrax today, it could be in the near future.”¹

External pathogens can certainly cross borders by the natural movement of people and goods, but the devastation caused by an accidental introduction of a foreign pathogen is no less real than one used as a biological weapon.

The porcine epidemic diarrhea virus (PEDv) outbreak in the U.S.

occurred from September 2013 to August 2014. Farms in 32 states lost more than 8 million piglets during this time, which was dubbed the “year of PEDV” in the pork industry. Financial losses incurred by producers drove up the cost of pork by 25 to 30 percent, affecting consumers, packers, processors, distributors, and retailers.² Although the suspicion is that PEDv came to the U.S. in feed products from China, the FBI never confirmed that introduction of the virus was accidental. Either way, PEDv has evolved from a foreign disease threat to an enduring problem within the U.S.

Crops are a major component of global food security, and an even greater concern. According to the UN Food and Agriculture Organization (FAO) assessment, a mere 15 crop plant species provide 90 percent of the world’s food energy intake. Wheat, rice, and

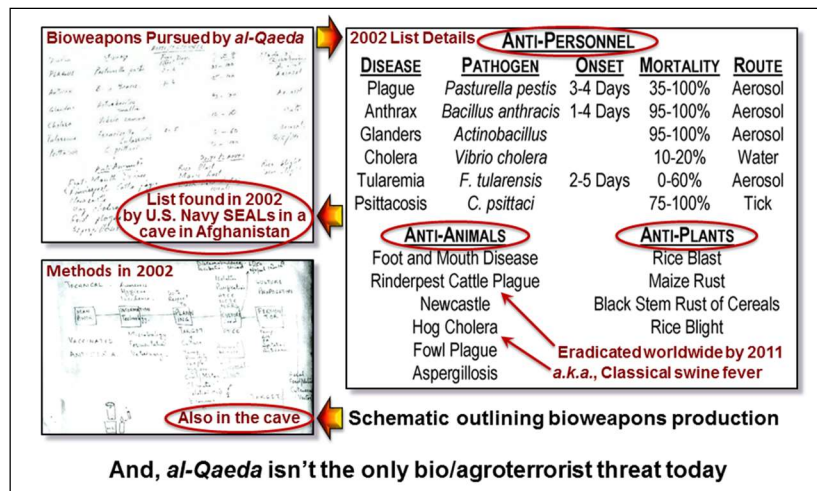


Figure 1: *al-Qaeda* Bioweapons Goals in 2002.



Figure 2: National Bio and Agro-defense Facility



Figure 3: Biosecurity Research Institute

maize make up 2/3 of that 90 percent.³ In 2016, Bangladesh saw a major loss in cultivated wheat from the introduction of a foreign species of wheat blast. This fungal disease can kill up to 100 percent of wheat crops. Wheat blast is endemic in South America, and it likely entered Bangladesh via a shipment of grain. The epidemic spread to an estimated 15,000 hectares of wheat, which was burnt to contain the disease; however, recurrence and spread affected neighboring India in 2017.⁴

If these or a number of other plant or animal pathogens were used to target the U.S., it could cost hundreds of billions of dollars and take decades to recover from the consequences. Zoonotic diseases, which make up most of the global pandemic concerns, are an even greater threat. The economic and public health consequences resulting from a widespread infection of both animals and humans could be catastrophic.

NATIONAL BIO AND AGRO-DEFENSE FACILITY

Thankfully, critical research and development infrastructure improvements are underway to confront some of these threats. The U.S. Department of Homeland Security (DHS) is building the National Bio and Agro-defense Facility (NBAF) in Manhattan, Kansas.⁵ Artist renderings of NBAF provided by DHS are shown in Figure 2. The mission of NBAF is to protect U.S. livestock from foreign/transboundary animal diseases and to safeguard food

animal health and public health by developing new animal vaccines, novel advanced countermeasures, and rapid diagnostic capabilities. NBAF will replace the aging Plum Island Animal Disease Center, Plum Island, NY, which is nearing the end of its lifecycle. FADs on the NBAF research agenda include African swine fever (ASF), classical swine fever (CSF), foot and mouth disease (FMD), Rift Valley fever (RVF), Japanese encephalitis (JE) Nipah virus, and Ebola virus. The last four are zoonotic diseases, and no effective countermeasures currently exist for Nipah or Ebola.

The \$1.25-billion state-of-the-art facility will be the only BSL-4 biocontainment laboratory in the U.S. capable of working with high-consequence pathogens like Nipah and Ebola in livestock. The U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) and Animal and Plant Health Inspection Service (APHIS) will be the primary research and diagnostic tenants. NBAF construction should finish in 2020 and operations are scheduled to begin in 2022.

While NBAF is under construction, Kansas State University (K-State) has been jump-starting NBAF research at the Biosecurity Research Institute (BRI) in Pat Roberts Hall, a biocontainment laboratory immediately adjacent to the NBAF site. The BRI includes five BSL-3Ag rooms that can be configured for research with cattle, pigs, sheep, goats, poultry, and other less typical agriculture species such as white-

tailed deer. In addition to BSL-3Ag labs, the BRI has dedicated BSL-3 space for conducting research on crop and food pathogens. Figure 3 includes photos of some of these spaces within the BRI. The BRI is unique in the breadth of food-related biocontainment research and development that can be conducted under one roof — on food crops, food animals, and the resulting food products.

Research with CSF and ASF was not previously approved outside of federal laboratories, but the BRI's capabilities have allowed this work to occur at K-State. Research with the zoonotic threat RVF has progressed in the BRI from pilot work with vaccine strains to novel research with wild-type strains to determine U.S. wildlife susceptibility. The first-ever studies to evaluate the ability of U.S. mosquitos to serve as vectors for JE virus are being accomplished here as well. In addition to new vaccines and diagnostics being developed, the inclusion of students, technicians, scientists, and other experts in high-level containment means K-State is training the future workforce for NBAF.

“SILICON VALLEY FOR BIODEFENSE”

Despite forward action on NBAF, the U. S. remains underprepared for the next bioterrorism attack. Recognizing this, the bipartisan Blue Ribbon Study Panel for Biodefense sounded the alarm in October 2015. The report the panel published — *A National Blueprint for Biodefense: Leadership and*



*Tom Daschle, Former U.S. Senate Majority Leader, 01/26/2017

Figure 4: “The Silicon Valley for Biodefense”

*Major Reform Needed to Optimize Efforts*⁶ — highlighted 33 major shortcomings requiring urgent attention by Washington, D.C. policymakers. The top three most problematic were: (1) no national leader; (2) no strategic plan; and (3) no dedicated budget. Unfortunately, these shortcomings have not yet been corrected.

While reviewing the 2015 Blue Ribbon report at K-State, it was noted that few of the conclusions addressed U.S. agriculture vulnerabilities to a bioterrorist attack. As a result, K-State raised the issue with panel members, and in January 2017, the university hosted a Blue Ribbon Study Panel hearing entitled, “Agrodefense: Challenges and Solutions.” The goal was to inform both stakeholders and policymakers about the ever-increasing biological threats to America’s agricultural infrastructure. The results were published in October 2017.⁷

During the January hearing, Blue Ribbon Panel member and former Senate Majority Leader Tom Daschle declared: “K-State has really become ‘the Silicon Valley for biodefense’ (Figure 4). Its Biosecurity Research Institute, links to the Kansas Intelligence Fusion Center (KIFC) and the National Bio and Agro-defense Facility are all illustrative of the extraordinary effort that is underway in Manhattan.”⁸ Although the KIFC is 50 miles away from Manhattan, it is

worthy of additional mention. Whereas most fusion centers focus on assisting law enforcement in solving crimes, the KIFC focuses on preventing terrorism and crime. The KIFC was one of the first state-level intelligence operations set up post-9/11, and it began with the intent of working “left of boom,” or prior to an event, versus “right of boom,” or after an event. With the KIFC evaluating biological threats that are over the horizon, it positions Kansas and “the Silicon Valley for biodefense” to be making advance preparations for potential biothreats reaching the U.S.

K-State provides many bio/agrodefense capabilities, and there are innumerable private-sector assets in the region. Additional assets nearby include the USDA Center for Grain and Animal Health Research with its embedded Arthropod-Borne Animal Disease Research Unit; the Kansas Department of Agriculture; and the K-State College of Veterinary Medicine. K-State donated the land to build NBAF, the state of Kansas provided \$307 million, and the city of Manhattan supported the project with \$5 million, so the commitment of Kansas citizens to protecting agriculture — crops, livestock — and food is clear.

K-State president Richard Myers was Chairman of the Joint Chiefs of Staff when America went into Afghanistan in 2002, and he was in a senator’s office preparing for his

confirmation hearing the morning of September 11, 2001, prior to heading to his office in the Pentagon. Senator Daschle was the U.S. Senate Majority Leader on September 11, and he was the target of a bioterrorist attack; one of those weaponized anthrax-laden letters in 2001 was addressed to him. Kansas and South Dakota (Daschle’s home state) know agriculture and the vulnerabilities associated with feeding the world. Kansans, South Dakotans, and their compatriots on farms and ranches across the nation confront those vulnerabilities — agriculture security issues — each and every day.

President Myers and Senator Daschle do not have to theorize about terrorists’ intentions or wonder if biological weapons are a real threat; they know. Their mutual, resolute belief on this topic can be articulated in just five words: “Agriculture security is national security.”

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¹ Warrick, Joby. "Microbes by the ton: Officials see weapons threat as North Korea gains biotech expertise." The Washington Post, December 10, 2017.

² Tonsor, G. and Schultz, L. *Assessment of the Economic Impacts of PEDv: Swine Committee Meeting*, 2016

³ United Nations Food and Agriculture Organization: <http://www.fao.org/docrep/u8480e/u8480e07.htm>

⁴ Islam, M. Tofazzal, et. al. "Emergence of wheat blast in Bangladesh was caused by a south American Lineage of *Magnaporthe oryzae*." BMC Biology. 14:84, 2016.

⁵ National Bio and Agro-defense Facility (NBAF); <http://www.k-state.edu/nbaf/>

⁶ *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts*, Bipartisan Report of the Blue Ribbon Study Panel on

Biodefense, October 2015; <http://www.biodefensestudy.org/>

⁷ *Special Focus: Defense of Animal Agriculture*, Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, October 2017; <http://www.biodefensestudy.org/>

⁸ "Kansas State University is the 'Silicon Valley for biodefense, according to Blue Ribbon Study Panel," Kansas State University, January 30, 2017; <https://www.k-state.edu/media/newsreleases/2017-01/blueribbon13017.html>