

STATEMENT FOR THE RECORD

By

**STEPHEN HIGGS Ph.D., F.R.E.S., F.A.S.T.M.H
ASSOCIATE VICE PRESIDENT FOR RESEARCH AND
DIRECTOR, BIOSECURITY RESEARCH INSTITUTE
KANSAS STATE UNIVERSITY**

Before the

**COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY**

**“PUTTING FOOD ON THE TABLE – A REVIEW OF THE IMPORTANCE OF
AGRICULTURAL RESEARCH”**

NOVEMBER 2, 2017

Good morning Chairman Comstock, Vice-chairman Abraham, Ranking-Member Lipinski, and Members of the Subcommittee on Research and Technology.

My name is Stephen Higgs, and I am the Director of the Biosecurity Research Institute (BRI), Pat Roberts Hall, Kansas State University.

Thank you for the opportunity to speak to you today regarding the importance of our relationships with the National Bio and Agro-defense Facility that is under construction in Manhattan, Kansas, and the significance of this with respect to potential threats to American Agriculture

Kansas State University’s Biosecurity Research Institute (BRI): Agriculture research and current and expected relationships with the National Bio and Agro-defense Facility (NBAF)

The mission of Kansas State University’s Biosecurity Research Institute (BRI) is “leading through research and education to protect agriculture and the public from biological threats.” The construction of the 113,000 square-foot facility was completed in 2007 at a cost of approximately \$54 million. Within the 41,000 square-foot space dedicated to research and education, 31,300 is designed and operated for high-containment research suitable for pathogens requiring biosafety level three (BSL-3) procedures. The agricultural focus of the BRI’s program is unusual in its breadth, with purpose-designed areas equipped for research on foodborne pathogens, plant pathogens, and pathogens that infect animals, including livestock and humans.

Following the selection of Manhattan, Kansas as the site for construction of the National Bio and Agro-defense Facility (NBAF) in 2009, the State of Kansas committed \$5 million a year for seven years – the NBAF Transition Fund – to support research, education, and training activities aligned with the mission of NBAF. Research at the BRI since 2009 has included studies with more than 20 different pathogenic organisms including *Bacillus anthracis* (anthrax), *Brucella melitensis* (brucellosis), *Yersinia pestis* (plague), porcine epidemic diarrhea virus, porcine

reproductive and respiratory syndrome virus, and Schmallenberg virus. Recent studies on animal pathogens have focused largely on agents that were listed as priorities for NBAF; however, research on other animal pathogens — such as highly pathogenic avian influenza, yellow fever virus, and Zika virus — and research on plant and foodborne pathogens has continued in designated areas.

Refocusing on NBAF priority pathogens at the BRI has required some construction work and considerable investment to meet federally mandated regulations related to research with the high-consequence pathogens that will ultimately be used at the NBAF. The long approval process that involved multiple inspections by Centers for Disease Control and Prevention (CDC), U.S. Department of Agriculture (USDA), and Department of Homeland Security (DHS) personnel culminated in the BRI gaining approval as the first non-federal U.S. facility to work on African swine fever virus (ASFV) and classical swine fever virus (CSFV), also known as hog cholera. Prior to receiving approval, one veterinary pathologist was supported by the NBAF transition fund to work in the Australian Animal Health Laboratories (the Australian government's NBAF equivalent). Both of these pathogens could cause high mortality rates in domestic and feral swine if introduced into the U.S., with significant effects on production and trade. Multidisciplinary and collaborative research at the BRI has focused on methods of diagnosing the pathogens, approaches to developing vaccines — including expression of viral proteins using a variety of platforms — and, in collaboration with scientists at Lawrence Livermore National Laboratories, research to characterize at a genetic level the interactions between the ASFV and the infected swine host. Some funding has been provided by stakeholder industries, notably the National Pork Board.

From 2011-2016, another veterinary pathologist was supported, in part by DHS funds and in part by Kansas NBAF transition funds, to work at the Plum Island Animal Disease Center (PIADC). Her doctoral project on ASFV was co-supervised by two PIADC USDA scientists. Upon graduation, the student was offered and accepted a position at the Friedrich-Loeffler Institute (Germany's NBAF equivalent). As we move forward with workforce development for NBAF, it is important that we align training with needs and develop and execute a retention plan.

Research in the BRI with Rift Valley fever virus (RVFV) involved the first studies with livestock to be performed in the U.S. since the 1980s. Ongoing collaborative research between K-State scientists and scientists of the USDA's Arthropod Borne Animal Diseases Research Unit (ABADRU), based at the Center for Grain and Animal Health Research (CGAHR) in Manhattan, Kansas, is investigating — for the first time ever — the capacity of RVFV to infect North American white-tailed deer. As observed with West Nile virus that was introduced in the U.S. in 1999, the involvement of wild animal reservoir species is a critical component by which foreign transboundary animal diseases (TADs) can become established in the U.S. if they are accidentally or deliberately introduced here.

Work with Japanese encephalitis virus (JEV) at the BRI included the first infections of North American mosquitoes with currently circulating JEV strains and detailed evaluations of infections of swine. With the exception of JEV, all of the viruses and most of the other pathogens that will be used at the NBAF are designated as Select Agents (SA). The term SA was first used in the 1997 Select Agent rule (42 CFR part 73) to define biological agents and toxins

determined to “have the potential to pose a severe threat to public health and safety.” The Federal Select Agent Program (FSAP) was expanded by new USDA rules in 2002 to include pathogens determined to have the potential to pose a severe threat to animal health or animal products (9 CFR part 121) or to plant health or plant products (7 CFR part 331). These additional SA rules were called for by the USA PATRIOT Act (2001) and Public Health Security and Bioterrorism Preparedness and Response Act (2002), which were written in response to the 911 attacks and subsequent Amerithrax letters.

These studies have involved multiple K-State scientists, primarily from the College of Veterinary Medicine, with expansion of their research support teams. Since the commencement of NBAF-related research in 2011, over 250 people have completed training, passed the required background checks, and been approved for Select Agent Registration. With a turnover of approximately 15 SAR-approved people per year, the BRI now has an SAR-approved workforce of approximately 115 people at a given time, with an additional 30 researchers that work on pathogens that are not SA.

NBAF will require a workforce of approximately 400 people, but it is unlikely that many of the existing PIADC staff will relocate to Manhattan. As a result, K-State is committed to helping train the future NBAF workforce. The BRI research already mentioned contributes to this workforce training effort because graduate, veterinary, and undergraduate students are working on many of the projects supported by the NBAF transition fund.

In addition, an \$887,000 award from DHS supports “Research and Development Fellowships for Transboundary Animal Disease Professionals.” A supporting award of \$500,000 from the NBAF transition fund indicated K-State’s commitment. Although the training is primarily based at the BRI, we developed an agreement with Boston University’s National Emerging Infectious Diseases Laboratories (NEIDL) to provide training for fellows in BSL-4 practices and procedures. The inclusion of BSL-4 pathogen research in livestock at NBAF is an entirely new scope above and beyond what can be performed at PIADC or anywhere else in the U.S. No facility in the U.S. can presently provide the BSL-4 training for agricultural research that will be needed in the NBAF. With appropriate investment, this training could be developed at the BRI. In 2017, we held a class on TADs taught by K-State faculty under the direction of Dr. Alfonso Torres, a past director of PIADC. The BRI’s relationship with Dr. Torres includes his position as an external advisory board member, but also as a facilitator that has enabled me to participate in teaching a course at PIADC.

Training at the BRI has been expanded for alignment with the needs of NBAF, to include five new for-credit courses offered through the Department of Diagnostic Medicine and Pathobiology in the College of Veterinary Medicine. For the USDA, we have taught a high-containment laboratory practices and techniques course offered over two years to scientists selected by the USDA from 15 different countries, but we were recently informed that funds are inadequate to support the course in 2018.

The operation of the BRI by K-State was a significant factor in the selection of Manhattan as the site for NBAF construction. Furthermore, not only was the land on which NBAF is being constructed donated by the University to DHS, but the State of Kansas also provided \$307

million as a contribution to construction costs, and the City of Manhattan contributed another \$5 million. These early commitments to support NBAF provided a foundation on which we have built an excellent, trusting relationship with DHS and the USDA. We expect to continue our research, educational, and training activities on NBAF priority pathogens at the BRI, and we will work to build upon our existing relationships with DHS and the USDA. As NBAF progresses toward operation, we expect to expand our activities to help train the needed workforce. We will consider any request from DHS and USDA to support current PIADC needs and needs related to bringing NBAF online.

Last week, two K-State leaders and I met with the new Deputy Administrator of USDA's Office of National Programs to discuss workforce development and training related to NBAF and how the BRI, College of Veterinary Medicine, and CGAHR staff could work together to plan strategically to accomplish staffing and research goals. In addition to research, NBAF will also have responsibility for the diagnosis of pathogens in samples collected from animals with symptoms such as vesicular diseases that could indicate infection with TADs. Ultimately, we want to provide expertise and other support to enable NBAF to gain SA approval, begin its research mission, and establish training programs that have been ongoing at the PIADC for decades.

Kansas and Kansas State University's role in the field of agriculture research

Kansas State University is a leader in addressing global food system challenges as we work to feed a world population that is estimated to reach more than 9 billion by 2050. As a land-grant university, we are proud of our 150-year commitment to making the best use of resources and protecting our population. Areas in which we excel include:

- Developing and using cutting-edge tools such as unmanned aerial systems and mobile applications to collect and analyze phenotypic plant data such as disease resistance, plant height, or seed size to develop improved crop varieties;
- Developing feed nutrition, genetics, and artificial insemination techniques that help pigs grow 30 percent faster — with 20 percent less feed per pound of gain — than they did 20 years ago;
- Developing technologies and strategies to help farmers effectively manage groundwater;
- Fighting antimicrobial resistance in agricultural production through research that helps reduce use of antibiotics while protecting animals from common diseases and helps identify how diseases are spread through feed ingredients and other vectors;
- Applying knowledge gained from international agricultural research in areas such as sorghum breeding to increase U.S. production and fight the sugarcane aphid, a growing threat in Kansas;
- Fighting common wheat diseases that decrease worldwide yields with interdisciplinary teams that have developed wheat breeding lines with genetic resistance to disease vectors and the diseases themselves;
- Decreasing postharvest loss by developing new controls for pests of food products and detecting resistance to fumigant pesticides for stored grain;
- Engineering better agricultural machinery and precision agriculture to help farmers optimize production; and
- Developing vaccines to protect animal health.

As mentioned above, research at the BRI, together with related training and education, is considerably broader than the activities planned for NBAF that focus strictly on TADs in livestock (excluding poultry). With principle investigators from K-State's College of Agriculture (Department of Plant Pathology, Department of Animal Science and Industry), the BRI has conducted research on wheat blast disease and multiple Shiga-toxin producing strains of *E. coli*. As described above, since 2009, projects supported by several state, federal, and industry awards have involved more than 20 different pathogens, including *Bacillus anthracis*, known as anthrax. As new pathogens like Zika virus continue to emerge, the BRI has the capability and expertise to quickly respond and develop collaborative projects to improve our understanding of the agents and assist with the development of diagnostics and vaccines.

K-State's National Agricultural Biosecurity Center located in Pat Roberts Hall with the BRI, has received funding to support the U.S. National readiness program that provides training to first responders who would be involved in controlling an outbreak of a foreign animal disease (FAD). The NABC has received funds from the Kansas NBAF transition fund to identify routes by which TADs might enter the U.S. and thus more effectively target surveillance at high-risk areas.

On June 15 of this year, Dr. John Floros, Dean of K-State's College of Agriculture, gave testimony to the Senate Committee on Agriculture, Nutrition, and Forestry and described the importance of agricultural research. As mentioned in his testimony, K-State has four federally funded Feed the Future Innovation Laboratories. On November 4, 2015, Dr. Tammy Beckham, then Dean of K-State's College of Veterinary Medicine, delivered testimony to the House Committee on Agriculture on "American Agriculture and Our National Security" and discussed the significant issues revealed in the bipartisan report of the Blue Ribbon Study Panel on Biodefense (see below).

NBAF capabilities compared with PIADC and BRI's relationship with PIADC

Although not representing views of DHS or USDA, as the K-State's BRI Director, I am reasonably well informed on the mission and research intents for NBAF, both from personal interactions with DHS and USDA personnel and from publicly available information. The NBAF is not just a substitute for the Plum Island Animal Diseases Center (PIADC), but rather will provide a new capability that has long been missing from the repertoire of the nation's ability to understand and respond to the world's most dangerous pathogens. Approximately 70% of new, emerging, and reemerging human diseases are estimated to have transmission cycles that involve other animals — so-called zoonotic diseases. Stopping or slowing the spread of zoonotic diseases in the animal host could go a long way in protecting human health, but there has been little focus on that approach to date. Research at the PIADC precludes working on zoonotic diseases such as JEV and RVFV.

The NBAF will not only address this obvious omission from a program designed to better understand the threat of TADs, but much more importantly, it will enable research with livestock infected with agents that require BSL-4 containment. National, federally funded laboratories to study these highly dangerous pathogens are operated in a few other countries, and yet, the U.S. has lacked this capacity. NBAF will overcome this deficiency and therefore a long-term federal

funding commitment to support not just the operation of the facility, but also the vitally important research and training that will be performed there is critical.

Since the 1950s when the PIADC became operational, revolutionary advances have occurred in materials and technologies related to the construction and the safe, secure operation of biocontainment facilities. The NBAF will employ all that are currently available to become the most advanced facility of its kind in the world. The Kansas NBAF transition fund has supported a project at the BRI to evaluate the efficiency of the autoscan HEPA filtration housing systems that will be installed as a critical safety feature to ensure containment of pathogens in research areas of the NBAF. Such state-of-the-art design elements will ensure a level of safety, security, and structural integrity that exceed the standards set for such facilities.

NBAF will involve technologies that are highly dependent on a degree of computer connectivity monitoring that was unimagined when PIADC was built. With this dependence on IT comes both enhanced awareness and control for safety and security and some vulnerabilities for intrusion and disruption. In 2015, the BRI organized a Biocontainment Information Technology Directors conference, the first such meeting of its kind. Participants included PIADC personnel. IT personnel at the BRI remain in contact with the meeting participants, including those from PIADC.

BRI and Kansas State University's Research and Development activities with federal, state and local agencies and industry stakeholders

The BRI and other K-State entities have a diverse range of formal and informal relationships with both government agencies and industry. These go beyond financial relationships involving extramural funding and support of academic activities. For example, researchers at the USDA ABADRU and at PIADC have been given adjunct appointments in K-State academic units, including the College of Veterinary Medicine and the Department of Entomology in the College of Agriculture. Embedding future NBAF scientists into our research and educational activities not only provides opportunities for collaborative research, but also enables full participation on the committees of doctoral students that will have the relevant skills and interest for future employment at the NBAF. As mentioned above, the BRI provides high-containment research space for USDA ABADRU scientists.

A dedicated position of NBAF Liaison reports directly to the K-State president, and this enables leveraging long-established relationships with local and multinational industries whose interests and expertise are related to NBAF activities. Under this direction, stakeholder meetings have been organized in Manhattan to bring together PIADC personnel, including USDA scientists, DHS managers, senior Federal officials, and potential industry partners. This work complements some of the activities of the DHS NBAF Partnership Development Director, with whom we have a longstanding relationship.

Awareness of Threats to U.S. Agriculture and the Blue Ribbon Study Panel on Biodefense

In 2003, the National Academies of Sciences releases its report, "Countering Agricultural Bioterrorism," having been charged to "*Evaluate the ability of the United States to deter, prevent, detect, thwart, respond to, and recover from intentional biological attacks on the nation at the live plant and live animal stage of food and fiber production.*" The impetus for this was

the realization that not only was U.S. agriculture susceptible to foreign diseases that could devastate productivity, but also that malicious actors had developed capacity to produce — and indeed had successfully produced in large quantities — agents that could be deliberately used against our agricultural industry.

In October 2015, a bipartisan report of the Blue Ribbon Study Panel on Biodefense was published. “A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts”¹ made 33 major recommendations, but perhaps the most important conclusions were that:

- (1) “there is no centralized leader for biodefense;”
- (2) “there is no comprehensive strategic plan for biodefense;” and
- (3) “there is no all-inclusive dedicate budget for biodefense.”

One might have hoped that this stark declaration of the nation’s lack of preparedness to detect, respond to, or, ideally, to anticipate and prevent an attack would have resulted in action, and yet the panel’s follow-up report released in December 2016 proved otherwise. “Biodefense Indicators” revealed little progress on addressing any of the recommendations.

To begin addressing the agricultural shortcomings in the 2015 Blueprint, two members of the Blue Ribbon Study Panel held a hearing at K-State on January 26, 2017 titled, “Agrodefense: Challenges and Solutions.” Kansas Congressman Roger Marshall provided a “Congressional Perspective” to launch the hearing. Nine others then presented to the Blue Ribbon members during three formal sessions. The first panel that I was on dealt with “Prevention and Deterrence;” the second with “Surveillance and Detection;” and the third with “Preparedness, Response, Recovery, and Mitigation.” In addition, a luncheon keynote by Indiana State Veterinarian Dr. Bret Marsh, titled “Leadership in Protecting the Agricultural Sector,” was highly informative.

In October 2017, the Panel published its findings from this hearing in “Defense of Animal Agriculture.”² One pertinent comment was that “DHS and USDA should develop a business plan for the operation of the National Bio and Agro-defense Facility” that “should engage the public and private sectors; consider domestic and global markets for agrodefense research and development; and identify a dollar figure that defines both need and opportunity.” A concern was expressed that “the president’s Fiscal Year 2018 budget request would eliminate all agriculture and animal-specific research by the DHS Science and technology Directorate.” The panel is meeting again today to discuss “the Implementation Plan for the National Biodefense Strategy and how the Administration should go about implementing the Strategy.”

The day before the Blue Ribbon Study Panel hearing at K-State last January, the Panel heard from the Kansas Intelligence Fusion Center (KIFC) regarding its Biothreat Team efforts. I would like to conclude my written testimony by noting the relevance of the KIFC endeavors to this Committee’s work and today’s topic.

Shortcomings with the biological intelligence enterprise has been a major concern of the Blue Ribbon Study Panel, and the members were pleased to hear that Kansas has focused on biothreats for years, having cleared subject matter experts (SMEs) with expertise on infectious diseases of plants, animals, and people. That allows the KIFC to work to prevent disease

outbreaks of all kinds (operating “left of boom”) rather than just attempting to diminish the severity of an outbreak after it hits (operating “right of boom”). Moreover, biological intelligence can monitor naturally occurring disease outbreaks globally — potentially predicting how and when the disease might come to the U.S. — and it can assess telltale signs of terrorist groups and state actors working on bioweapons. With agricultural pathogen SMEs involved on the Biothreat Team, the KIFC is not limited to monitoring only human biothreats.

When NBAF becomes operational in 2022/23, it will be able to conduct biological threat assessments on emerging livestock pathogens, whether animal-only or zoonotic. The BRI could conduct those assessments today for plant, animal, and food pathogens, with the exception of zoonotic pathogens for which there is no treatment (BSL-4 pathogens). When the BRI was completed about a decade ago, the required infrastructure was put in place to allow us to interface with the intelligence community regarding emerging biological threats.

Conclusion

Awareness of the impact that readily available biological agents would have if they were used against us is increasing — in both ourselves and in those who would harm us. Such action would not only disrupt “putting food on the table,” but also would have serious consequences on employment, trade, and the global economy. This awareness is not new, but modern technologies make such an event increasingly feasible and increasingly likely. Interestingly, in 1999, then-K-State President Jon Wefald testified before the U.S. Senate’s Emerging Threats Subcommittee regarding the surreptitious “agricultural biological weapons threat” to America’s agricultural economy and food supply.” K-State had proposed a “Homeland Defense Food Safety, Security and Emergency Preparedness Program” earlier in 1999. One cannot help but ask at what point we will be having such discussions while trying to manage — under crisis conditions — a biological event that is rapidly spreading out of control from state to state.

1. Blue Ribbon Study Panel on Biodefense. *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts – Bipartisan Report of the Blue Ribbon Study Panel on Biodefense*. Hudson Institute: Washington, DC, October 2015.
2. Blue Ribbon Study Panel on Biodefense. *Special Focus: Defense of Animal Agriculture*. Blue Ribbon Study Panel on Biodefense: Washington, DC. October 2017.