

**Hearing of the United States Senate
Committee on Agriculture, Nutrition, and Forestry**

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Statement for the Record

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Chairman Roberts, Ranking Member Stabenow, and distinguished members of the Committee, I am honored to appear before you today on behalf of Kansas State University (K-State) for this hearing entitled, "Agriculture Research and Securing the United States Food Supply." K-State President Richard Myers sends his regards; he understands the importance of this hearing and your deliberations. Securing America's food supply has seldom been more crucial.

There are many biological threats to United States agriculture, and as concluded by the bipartisan Blue Ribbon Study Panel on Biodefense (now the Bipartisan Commission on Biodefense), the U.S. lacks leadership, a strategic plan, and a dedicated budget to address these threats.¹ Since few elements dealt with agriculture, K-State raised the bio/agrodefense issue with Blue Ribbon Panel members. That led to a Panel hearing on the K-State campus on January 26, 2017. The outcome of that was a special focus report entitled, "Defense of Animal Agriculture."²

Early detection and accurate identification of a pathogen as soon as possible after an introduction is absolutely critical to enable the implementation of rapid and appropriate countermeasures. The reason for this is simple: with increasing time, the likelihood of pathogen dispersal from the site of introduction increases. Early detection enables countermeasures to be focused to contain and eradicate the pathogen in a relatively small area before dispersal.

Better still, with appropriate and timely intelligence and knowledge, we would have an idea what global pathogens are most concerning and how they might be introduced into the U.S. Surveillance is always imperfect, but focusing U.S. efforts in high risk areas could help prevent introduction of foreign pathogens or, at the very least, help control and eradicate them at the point of entry.

The success of detection, identification and control depends on a knowledge and understanding of the pathogen and these are only possible through research. Research provides data on where and when the pathogen is occurring and potential routes of introduction (pathway analysis). This

¹ *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts*; A Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, October 2015

² *Special Focus: Defense of Animal Agriculture*; Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, October 2017

knowledge can guide us to focus detection efforts and surveillance activities at locations of highest risk.

Research provides technologies and reagents for rapid and accurate detection and identification of specific pathogens. Research provides technologies and reagents to control specific pathogens. Research provides the understanding to enable strategic planning to optimize the implementation of these tools.

Since 2007, research at the Biosecurity Research Institute (BRI) at Pat Roberts Hall (PRH) has been developing and testing diagnostics, vaccines and the understanding to effectively protect US agriculture from foreign threats. The BRI/PRH is a unique facility working on threats to plants, animals and post-harvest food products. The research is complemented by essential training to sustain and build upon our current expertise in this area.

Based on President Myers' previous testimony before this body, I would like to start by restating his bottom line on December 17, 2017. As you know, his perspectives on matters of national security, including biosecurity, are unique for a university president due to his service as Chairman of the Joint Chiefs of Staff from October 01, 2001 to September 30, 2005.

PRESIDENT MYERS' BIO/AGRODEFENSE BOTTOM LINE IN 2017

"Well-conceived Presidential Directives have not gotten the job done. Key components of American critical infrastructure — agriculture and food — are vulnerable to terrorist attacks with bioweapons and undeliberate infectious disease outbreaks, and the U.S. is unprepared to confront these threats. Congress must enact enforceable statutes before it's too late."

Clearly, he was focused on infectious disease threats to U.S. crops and livestock in his testimony. However, the points that he made are no less relevant to the SARS-CoV-2 — COVID-19 — pandemic that we have been battling in 2020. The U.S. should have been better prepared.

Wrapping up his testimony, President Myers highlighted the vital importance of biothreat intelligence analysis and the deficiency of such expertise within the intelligence community (IC). After his 2017 testimony, a Marine intelligence analyst in the audience approached him to reaffirm his concerns about the lack of biological knowledge within the IC overall. Although she happened to be a biothreat subject matter expert (SME), she noted that there are far too few within the federal government. That IC SME shortage is especially problematic within the agriculture and food realm. Additional IC information will be provided below.

2020 PANDEMIC ILLUMINATES FOOD SUPPLY CHAIN VULNERABILITIES

The SARS-CoV-2 pandemic has elucidated glaring deficiencies in America's "field to fork" food supply chain. Long-ignored warnings came home to roost in 2020. One highly informative article about it focused on meatpacking companies specifically.³ It notes that these companies had been

³ Michael Grabell and Bernice Young, "Meatpacking Companies Dismissed Years of Warnings but Now Say Nobody Could Have Prepared for COVID-19," ProPublica, Aug. 20, 2020;

warned for years about the potential detrimental impact that a human pandemic could have on their abilities to operate. Interestingly, it suggested that many of these companies were, in fact, prepared a decade ago, but their preparation waned when Swine Flu, H1N1, proved to be much less problematic than predicted. After that, they saw no need to stockpile masks or other biosafety materials when they had not needed them for H1N1.

SARS-CoV-2 proved that thinking to be totally wrong and the companies — along with America and the world — paid the price. Processing plants closed, workers died, animals ready for market were culled, milk was dumped, etc. The outcomes were horrendous.

ADDITIONAL FOOD SUPPLY VULNERABILITIES

Clearly, a global pandemic even if the pathogen does not directly infect crops and livestock can negatively impact the food supply chain due to severe shortages of human resources. Nonetheless, far too little attention is paid to what impact infectious diseases of the food supply — food crop pathogens and food animal pathogens — could have nationally and globally. Hopefully, SARS-CoV-2 will serve as a wakeup call for the possibility of something similar happening to agriculture.

Food Plant Threats — Consider the United Nations (UN) Food and Agriculture Organization (FAO) assessment that “just 15 crop plants provide 90 percent of the world's food energy intake, with three — wheat, maize and rice — making up two-thirds of this.”⁴ Ninety percent makes the protection of food crops rather significant. Moreover, if wheat, corn, or rice are targeted successfully by bioterrorists or if there is a natural disease outbreak that devastates the global supply of any one of the three, the world’s population will suffer massively. This is a matter that the Wheat State takes very seriously.

Although it did not materialize into a global disaster, the pathogen Wheat Blast — *Magnaporthe oryzae* — hitting Bangladesh in 2016 certainly wreaked havoc there. Wheat Blast can kill 100% of individual crops, and it likely got to Bangladesh in a shipment of grain from South America where it is endemic. The outcomes were devastating in areas of the country where it occurred, and even though infected fields were burned, there was a recurrence in 2017; the new outbreak spread to India too. The U.S. should learn from this in order to avoid a similar outcome. However, grain shipments from South America are likely still coming to the U.S. Research on wheat blast has been ongoing, safely and securely, at K-State’s BRI/PRH since 2009.

Food Animal Threats — With respect to livestock, the Porcine Epidemic Diarrhea virus (PEDV) foreign animal disease (FAD) outbreak in the U.S. in 2013 highlighted biosecurity problems here that must be addressed. It resulted in over 8 million pigs dying, and significant financial losses incurred by producers drove up the cost of pork markedly. It is suspected that PEDV came to the

⁴ See United Nations Food and Agriculture Organization: <http://www.fao.org/docrep/u8480e/u8480e07.htm>

U.S. in feed products from China, and the virus probably got here by accident. Regardless, the impacts were substantial and PEDV is now an enduring endemic problem to deal with in the U.S.

The greatest livestock threat to America today is probably African swine fever virus (ASFV) that ravaged China and much of Europe the past couple years. Prior to the outbreak in China, half the world's swine population was located there, and China's recovery efforts are still ongoing. Based on how PEDV likely got to the U.S., the same or similar pathways from China must be considered and monitored. If ASFV arrives in the U.S., our pork industry could be decimated. Research at the BRI/PRH has proven that ASFV can survive and remain infectious in animal feed products under conditions as experienced during long periods of transportation in shipping containers.

Additionally, highly pathogenic avian influenza (HPAI) continues to be a global threat annually and one that cannot be ignored. It is also a zoonotic disease concern — being transmitted from animals to people — so it is especially dangerous.

KANSAS INTELLIGENCE FUSION CENTER

With respect to the knowledge, understanding and research that is vital for awareness and preparedness to combat foreign diseases threats to U.S. agriculture, the Kansas Intelligence Fusion Center (KIFC) has a biothreat team that helps provide advance warning of infectious diseases potentially hitting the U.S. The KIFC appears to be the only fusion center of about 80 nationwide that has a biothreat team with SMEs capable of assessing the full range of biohazards to food crops, food animals, the food supply, and people. These have included BRI/PRH-affiliated SMEs from K-State, and multiple from the University of Kansas Medical Center and various state agencies. These SMEs allow the KIFC to assess global intelligence for the purpose of preventing bioterrorism attacks and preparing for natural infectious disease events emerging globally. Thus, the KIFC focuses “left of boom” (prior to an attack or outbreak) rather than “right of boom” (after the event) like other fusion centers.

This model should be emulated beyond Kansas, because it allows state-specific strategic planning with regard to “vulnerability assessments, mitigation strategies, and response planning and recovery” as called for in HSPD-9.⁵ On the ground — front line — expertise is essential for early warning when a new disease hits the U.S. Intelligence capabilities cannot just reside in Washington, DC where they are currently understaffed for addressing biothreats.

K-STATE'S ONGOING PROTECTION OF AMERICA'S FOOD SUPPLY

Protecting U.S. agriculture is a mission of America's land-grant universities that began in 1862 when President Lincoln signed the Morrill Act. These institutions participate in protecting agriculture and food in their states each and every day.

This Committee always leverages the expertise at the land-grant universities and, clearly, these institutions can and should play a leading role to develop the resources, technologies, plans and

⁵ Homeland Security Presidential Directive/HSPD-9 – *Defense of United States Agriculture and Food*; Jan. 30, 2004

human resources needed to address threats to agriculture. K-State stands ready to participate on any national teams and to lead when asked or when necessary. Protecting America's agriculture and food infrastructure has been our commitment since 1863.

Back in 1999 with encouragement from the Chairman of this Committee, K-State developed a 100-page "Homeland Defense Food Safety, Security, and Emergency Preparedness Program"⁶ — often referred to as "The Big Purple Book" — that detailed how to protect America's food crops, food animals, and food supply from biothreats. Later that year, K-State's President Jon Wefald testified before the U.S. Senate's Emerging Threats Subcommittee regarding the "Agricultural Biological Weapons Threat"⁷ facing America. That subcommittee was also chaired by Kansas Senator Pat Roberts.

Both the 100-page program and the testimony highlighted the need for a biocontainment facility capable of conducting research on biothreats to food crops, food animals, and the food supply. However, prior to September 11th and the anthrax attacks in 2001, little interest was shown for building it. Afterwards, state and federal funding was obtained and the BRI/PRH became a reality.

The BRI/PRH includes five BSL-3Ag rooms that can be configured for research with cattle, pigs, sheep, goats and poultry; up to 30 head of cattle can be accommodated at one time. Work has been done on numerous species to date, including white-tailed deer in 2017 to determine their susceptibility to Rift Valley fever virus (RVFV). In addition to BSL-3Ag labs, the BRI/PRH has dedicated BSL-3 space for conducting research on crop and food pathogens.

Wheat Blast research and development (R&D) has been ongoing since 2009 and food safety research began soon thereafter. The latter included studies for the Army whereby eight 1-ton grinds of hamburger were done in October 2011 to validate whether food pathogens could be detected and identified at the end of a commercial process. The breadth of food-related biocontainment R&D conducted under one roof makes the BRI/PRH unique-in-the-world.

The National Agricultural Biosecurity Center (NABC) - Established at K-State in 2003, and co-located with the BRI at PRH since 2018, has supported essential research on food-borne pathogens, including studies on threats to U.S. military, has developed pathogen-specific information resources and conducted pathway analysis on several pathogens. With Department of Homeland Security (DHS) support, NABC staff are now leading efforts on threat assessment, disease response strategic planning and training, to combat foreign threats to U.S. agriculture. Efforts to review and collate data related to foreign threats to U.S. agriculture and implementation of a communication system for strategic dissemination to improve preparedness are in progress.

⁶ *Homeland Defense Food Safety, Security, and Emergency Preparedness Program*, March 22, 1999. See: <http://www.k-state.edu/nbaf/documents/1999-Homeland-Defense-Program.pdf>

⁷ *Agricultural Biological Weapons Threat*, October 27, 1999. See: <http://www.k-state.edu/nbaf/documents/1999-US-Senate-Testimony.pdf>

National Bio and Agro-defense Facility Site Selection in 2009: Manhattan, KS — The nationwide site selection process for the National Bio and Agro-defense Facility (NBAF) from 2006 to 2009 resulted in Manhattan, Kansas be chosen. The 46.828 acres identified for the \$1.25 billion laboratory were on the K-State campus immediately adjacent to the BRI/PRH. The co-location was not by accident; the R&D capabilities within the BRI/PRH contributed greatly.

NBAF-related Research at K-State’s BRI/PRH — K-State independently and as collaborators with federal agencies and other partners, initiated research on several NBAF-priority pathogens in the BRI/PRH; RVFV since 2013, Japanese encephalitis virus (JEV) since 2014, classical swine fever virus (CSFV) since 2015, and ASF since 2016. We were able to do this because the State of Kansas agreed to fund \$35 million for NBAF-related research in the BRI/PRH as part of our “best and final offer” for NBAF during the site selection competition. R&D continues on all four of these FADs, but the Kansas funding commitment ended in FY2019 when the last \$5 million was appropriated. The majority of the research is conducted by K-State faculty, staff and students, but collaborators from the USDA’s Center for Grain and Animal Health Research (CGAHR) in Manhattan participate on some of the NBAF-related FAD projects. Moreover, CGAHR conducts other USDA BSL-3/3Ag biocontainment research in K-State’s BRI/PRH as well. Going forward, federal support is needed for R&D on RVFV, JEV, CSFV, and ASFV to help mitigate these threats to the U.S. The number of research publications to date on NBAF diseases by BRI/PRH scientists are: RVF = 44; JE = 10; CSF = 18; and ASF = 46.

Until NBAF is fully operational in 2022/23, USDA has no biocontainment facilities where R&D can be conducted on zoonotic FADs. The Plum Island Animal Disease Center (PIADC) is an antiquated facility with limited capabilities for work with zoonotic threats. Consequently, training the NBAF R&D workforce is highly reliant on faculty and staff working at the BRI/PRH until the new facility becomes operational.

SARS-CoV-2 Research at K-State’s BRI/PRH — When K-State wrote the “Homeland Defense Food Safety, Security, and Emergency Preparedness Program” in 1999, we committed that in a national emergency the biocontainment facility it was proposing would refocus quickly to confront the threat facing America. That commitment was honored in 2020 when SARS-CoV-2 hit the U.S.; the BRI/PRH stepped up immediately and began performing research on the new biothreat.

The Kansas State Veterinary Diagnostic Laboratory (KSVDL) in the College of Veterinary Medicine (CVM) set up a human and animal diagnostic test processing lab in the BRI/PRH. It met both Clinical Laboratory Improvement Amendments (CLIA) and Health Insurance Portability and Accountability Act (HIPAA) compliance conditions.

Multiple K-State investigators launched BRI/PRH research projects on SARS-CoV-2 to gain as much knowledge and understanding of this rapidly spreading threat as quickly as possible. Multiple animal species were assessed for infectivity and susceptibility including: cats, hamsters,

and pigs. Potential disease vectors were studied and mosquitoes were proven not to be capable of transmitting the virus.

Additional work has focused on the validation of disinfectants and various technologies to inactivate SARS-CoV-2.

Most recently, a \$1 million USDA SARS-CoV-2 grant was awarded to K-State researchers focused on safeguarding meat processing and food service. Work has just begun in the BRI/PRH. The importance is obvious based on the dire consequences SARS-CoV-2 has had on meat processing plants across the nation.

A summary of these and other SARS-CoV-2 R&D efforts at K-State can be found in *Seek 2020*.⁸

FEDERAL BIO/AGRODEFENSE EFFORTS

Homeland Security Presidential Directive/HSPD-9 — Delineating the federal role in bio/agro-defense post-09/11, President Bush issued HSPD-9, on January 30, 2004 to establish: *“a national policy to defend the agriculture and food system against terrorist attacks, major disasters, and other emergencies.”*⁹

This is still the federal basis for protecting America against biothreats to agriculture and food, whether naturally occurring or terrorist delivered. The components are all sound; the implementation by the federal government has been less than sound as documented below.

Federal Assessment of HSPD-9 Compliance — Establishing requirements for protecting the nation from global biothreats and actually implementing those requirements are completely different matters. Evaluations to date have not shown great results in meeting the obligations.

❑ ***“The Department of Homeland Security’s Role in Food Defense and Critical Infrastructure Protection,” DHS OIG-07-33, February 2007.***¹⁰

- The DHS performance in food defense and critical infrastructure protection failed in not collaborating with USDA and HHS on developing integrated budget plans:
 - ✓ Noncompliant for 3-years with HSPD-9 mandates;
 - ✓ Failed to develop an implementation plan; but
 - ✓ Agreed to comply in FY2009; it’s unclear if they did.
- The DHS performance in food defense and critical infrastructure protection failed in not conducting food sector vulnerability assessments:
 - ✓ Failed to develop standards or guidance; and
 - ✓ HSPD-7 critical infrastructure mandates were unmet.

⁸ <https://www.k-state.edu/seek/2020/a-pandemic-battle/index.html>

⁹ Homeland Security Presidential Directive/HSPD-9 – *Defense of United States Agriculture and Food*; Jan. 30, 2004

¹⁰ https://www.oig.dhs.gov/assets/Mgmt/OIG_07-33_Feb07.pdf

- The DHS performance in food defense and critical infrastructure protection failed in not showing consolidated DHS leadership in food and agriculture.

The early evaluation of HSPD-9 compliance by DHS documented a total failure. As will be shown below, the findings of a DHS OIG audit published in 2020 are no better.

❑ ***“Agroterrorism Prevention, Detection, and Response,” USDA OIG Audit Report 91701-0001-21, March 2017.***¹¹

- The USDA Office of Homeland Security and Emergency Coordination (OHSEC) failed to provide oversight of USDA’s agroterrorism preparedness:
 - ✓ No documented process in place;
 - ✓ No assessments of agriculture vulnerability; and
 - ✓ No effort made to assemble response plans.
- The USDA OHSEC lacked evidence of compliance with HSPD-9:
 - ✓ Agency responses were not evaluated or validated; and
 - ✓ Performance measures were never implemented.
- The USDA OHSEC demonstrated no quantifiable progress in protecting agriculture and food.

According to their own OIG, USDA failed to meet their responsibilities under HSPD-9. Rigorous congressional oversight is needed going forward and serious consideration should be given to placing the requirements of HSPD-9 into federal statute.

Securing our Agriculture and Food Act — Efforts by this committee and the Senate Homeland Security Committee led to the enactment of Securing our Agriculture and Food Act (SAFA) August 17, 2017. Its purpose: *“to amend the Homeland Security Act of 2002 to make the Assistant Secretary of Homeland Security for Health Affairs (now Countering Weapons of Mass Destruction) responsible for coordinating the efforts of the Department of Homeland Security related to food, agriculture, and veterinary defense against terrorism, and for other purposes.”*¹²

The recognition of non-compliance with HSPD-9 undoubtedly contributed to the enactment of SAFA in 2017. When executive action had failed to get federal agency compliance with HSPD-9 an obvious next step was congressional action.

Federal Assessment of SAFA Compliance — After 3-years for the implementation of the SAFA requirements, the DHS OIG undertook an analysis of the success or failure. DHS failed.

¹¹ <https://www.hsdil.org/?view&did=801888>

¹² Securing our Agriculture and Food Act: <https://www.govinfo.gov/app/details/COMPS-13642>

❑ ***“DHS is Not Coordinating the Department’s Efforts to Defend the Nation’s Food, Agriculture, and Veterinary Systems against Terrorism,” DHS OIG-20-53, July 16, 2020.***¹³

- The DHS Countering Weapons of Mass Destruction (CWMD) Office has not carried out a program to oversee or manage DHS HSPD-9 responsibilities:
 - ✓ No documentation of HSPD-9 activities;
 - ✓ No HSPD-9 implementation plan; and
 - ✓ No mechanism to track HSPD-9 activities.
- The CWMD Office has failed to lead DHS SAFA policy requirements:
 - ✓ Has not developed policies or led initiatives; and
 - ✓ Has not coordinated with Federal partners.
- The CWMD Office has made no quantifiable process protecting food and agriculture.

Remarkably, 16-years after HSPD-9 was put forth to protect American agriculture and food, essentially no progress has been made. SAFA was intended to add statutory requirement to the original executive order, and to date (3-years later), it still hasn’t accomplished that goal. *Congressional oversight is imperative.*

PATH FORWARD: WHAT’S NEEDED

Funding of the Farm Bill’s Agriculture Advanced Research and Development Authority — The Agriculture Advanced Research and Development Authority (AgARDA) Pilot (Sec. 1473H) in the most recent Farm Bill put forth by this Committee clearly foresaw the threats to agriculture and the need for novel R&D approaches going forward. Particularly insightful from a bio/agrodefense perspective were the sections on qualified products or projects for: (1) *“plant disease or plant pest countermeasures to intentional or unintentional biological threats (including naturally occurring threats);”* and (2) *“veterinary countermeasures to intentional or unintentional biological threats (including naturally occurring threats).”* R&D in these two areas is critical to protecting America’s food supply and to U.S. homeland security. Of critical importance is that funding is strategic and goal-oriented to get the information, knowledge, understanding, technologies and trained people that we need. Furthermore, the funding must be sustained in order to maintain and build upon our resources and capabilities so that we can respond quickly to new threats. Allowing these to decline because of short-term or intermittent funding and then having to recreate the capabilities is a poor strategic plan to combat threats that can emerge quickly and with little if any warning.

- ❑ ***Plant disease or plant pest countermeasures:*** Food crops are likely the most overlooked area when it comes food vulnerability and bio/agrodefense. The UN FAO assessment was

¹³ <https://www.oig.dhs.gov/sites/default/files/assets/2020-07/OIG-20-53-Jul20.pdf>

mentioned earlier that “just 15 crop plants provide 90 percent of the world's food energy intake, with three — wheat, maize and rice — making up two-thirds of this.”¹⁴ Plant pathogens are disseminating around the planet at such a pace that geographic distinctions are no longer relevant. The pathogens of all major food, feed, fiber and fuel crops are being introduced into new production areas daily facilitated by trade and travel. Plant pathogens are emerging or re-emerging due to climate change and land-use change; trade and travel ensure their rapid dissemination around the planet. The impacts have been and will continue to be substantial to the economy, food security, and ultimately to national security.

- **Wheat** — Wheat Blast disease, *Magnaporthe oryzae* Triticum, has been mentioned already, but it is a continuing threat that could destroy a crop vital to feeding the world. From its original location in Brazil, it has now spread to two continents, Asia (Bangladesh and India) and Africa (Mozambique). Wheat productivity has dropped 90% in some locations and poor farmers are falling deeper into poverty. Trade restrictions are required or the pathogen will continue to spread.

Other imminent threats to wheat are: Stem and Yellow Rust diseases, *Puccinia graminis* f.sp. tritici and *Puccinia striiformis* f.sp. tritici; and Scab or Head Blight disease, *Fusarium graminearum* and other *Fusarium* species. Mycotoxins produced by *Fusarium* are threats to human health and livestock health.

- **Maize/Corn** — Late Wilt disease, *Acremonium maydis* (syn. *Harpophora maydis*), was first reported in Egypt in 1960. This pathogen is now reported to be present in India, Israel, Hungary, Portugal, Spain and perhaps Kenya. If it gets to the U.S., the outcomes could be disastrous economically.

A corn-related issue that CDC considers a significant public health concern involves the development of fungicide-resistant populations of *Aspergillus maydis* that have arisen globally over the last 5-10 years. *A. maydis* is a plant and human pathogen most noted for production of aflatoxins that cause chronic and acute lethal toxicities in humans and livestock. The widespread use of fungicides for plant disease control has led to the development of resistance in *A. flavus* as well as the more common human pathogen *A. fumigatus*.

- **Rice** — Bacterial Blight disease, *Xanthomonas oryzae* pv. *oryzae*, is a significant threat to rice production in all regions where rice is a primary staple crop (Africa and Asia). Annual losses in India to Bacterial Blight exceed \$3 billion USD.
- **Ryegrass** — Obviously, ryegrass is not a human food crop, but it serves as a food crop for livestock people eat. *Raythayibacter toxicus* causes ryegrass toxicity, killing significant numbers of sheep, cattle, and horses in Australia. The initial outbreak was in 1956 in South Australia, but it has since been reported New South Wales, Western Australia, and

¹⁴ See United Nations Food and Agriculture Organization: <http://www.fao.org/3/u8480e/u8480e07.htm>

South Africa as well. How it got to South Africa is unknown, but ryegrass, a primary host of *R. toxicus*, is exported from Australia annually, thus increasing the potential for spread to other countries including the U.S. Nematodes serve as the vector delivering the bacterium to the plant host and there is a concern that delivery to wheat is not out of the realm of possibility. Regardless, the arrival of *R. toxicus* in the U.S. could be disastrous.

As a result, *R. toxicus* is now a BRI/PRH priority pathogen. Using genetic and genomic analytical tools, research is being initiated to better understand the emergence of new *R. toxicus* genotypes (e.g., the recently-emerged RT-I population in South Australia) as well as to determine the geographic origin of the recent outbreak strain in the Bunbury dairy region of Western Australia. Understanding these issues may allow the development of countermeasures to help prevent entry into U.S. livestock production areas.

- ❑ **Veterinary countermeasures:** While not as overlooked as food crops, food animals also tend to get little attention when biothreats to national security are considered. That will change when NBAF becomes operational, but full operations won't begin until 2023; America remains highly vulnerable until then. Moreover, NBAF is still projected to work on only seven or eight FAD threats when it becomes fully operational and there are many more non-zoonotic and zoonotic infectious diseases circulating worldwide. And that does not account for emerging diseases yet undiscovered. Thus, increased federal funding is desperately needed.
- **Non-zoonotic disease R&D** — The federal government should be funding R&D at the nation's land-grant universities to develop FAD and non-FAD countermeasures, but that is being done on an exceedingly limited scale. The vast majority of the BRI/PRH research on ASF and CSF to date has been done with State of Kansas funding, and with animal industry not-for-profits contributing recently, particularly with ASF R&D. To date, there have been 46 ASF publications emanating from the work and 18 CSF publications. Kansas and producers are concerned with biothreats; the federal government should be as well.
- **Zoonotic disease R&D** — Essentially almost every potential pandemic threat facing the world is a zoonotic disease that can be transmitted from animals to humans. This has been the global consensus for years. With that agreement as to where the greatest threat exists, it's mindboggling that there is not a major focus on confronting these diseases in the animal host where they reside. In some cases, the primary host is unknown, but in many cases they are known. Regardless, stopping the disease in the animal host prior to a human pandemic makes great sense.

The U.S. should have learned from West Nile, chikungunya, and Zika viruses in the past. Although that did not happen, the lessons are still valid nonetheless.

In recent decades, many federal agencies have collaborated to co-fund projects that cross agency-specific mission areas. Perhaps this is an area where the USDA and the Department of Health and Human Services (HHS) should partner. HHS funds research

employing small animal models, but they aren't going to fund research employing livestock. USDA may solve portions of that problem in NBAF when it comes online adjacent to the BRI/PRH in Manhattan. However, livestock are not the host for many of the potential pandemic threats.

Enhanced Funding Government-wide on Biothreats to Agriculture and Food — USDA is an obvious lead agency funding these studies, but other agencies — DOD, DHS, HHS, NSF, EPA — should be involved as well. Agriculture — crops, livestock — and food cross all sectors and, thus, all funding agencies should have a role.

❑ **Pandemic and All-Hazards Preparedness and Advancing Innovation Act**¹⁵ — Although this is under the purview of HHS, significant efforts were put forth in 2019 to expand the coverage by adding “Zoonotic Disease, Food, and Agriculture.” The Senate led that effort and it must be continued going forward.

❑ **Other Legislation** — The Senate Committee on Agriculture, Nutrition, and Forestry should pursue every opportunity possible to insert “Zoonotic Disease, Food, and Agriculture.” language into bills championed by other committees wherever and whenever appropriate.

CONCLUSION

K-State BRI/PRH Contributions

K-State and the BRI/PRH have been proud to contribute to America's bio/agrodefense efforts over the years and we look forward to continuing these efforts for many years to come. The BRI/PRH contributions have included:

- (1) The evaluation of technologies to detect and identify highly pathogenic organisms that threaten deployed servicemen via addition to their food supply;
- (2) Development of wheat varieties resistant to the Wheat Blast pathogen;
- (3) Technology to distinguish between foreign pathogens infectious to swine;
- (4) An oral vaccine to protect swine from CSFV, a.k.a., hog cholera;
- (5) Vaccines for avian influenza, a pathogen that resulted in the loss of over 50 million poultry in a one-year period following the introduction into the U.S.;
- (6) Rapid diagnostics to detect ASFV — a pathogen that could devastate U.S. pork production — that BRI/PRH research has demonstrated can survive in animal feed products that may be imported from ASFV endemic areas.
- (7) Research on JEV has demonstrated susceptibility of North American mosquitoes and of both domestic and feral-like swine.

¹⁵ <https://www.congress.gov/116/bills/s1379/BILLS-116s1379enr.pdf>

- (8) Collaborative research on RVFV with USDA scientists have evaluated diagnostics and studied the disease in sheep, cattle, and white-tailed deer.
- (9) Pathway analysis by researchers and staff of the National Agricultural Biosecurity Center (NABC) at the BRI/PRH have identified routes by which foreign pathogens, including ASFV and Wheat Blast, might be introduced into the U.S.
- (10) In March, soon after the introduction of SARS-CoV-2 into the U.S., research at BRI/PRH was quickly refocused to study this new pathogen. To date:
 - a. Research has proven for the first time that the virus neither infects nor is transmitted by mosquitoes, and cannot infect swine.
 - b. Research has evaluated cats as hosts and hamsters as small animal models.
 - c. Vaccine candidates will be evaluated in the coming months.
- (11) Complementing the research, the BRI/PRH has developed courses and training programs related to foreign threats to agriculture, several configured for online delivery.

All of these activities that add to our knowledge and understanding of global threats to agriculture are critical in order to anticipate and prepare for introductions and then to respond and eliminate the pathogens in the event of introduction to prevent spread and reduce impacts.

Vital U.S. Bio/Agrodefense Needs Going Forward

- (1) Funding of the AgARDA pilot program in the Farm Bill:
 - a. Plant disease or plant pest countermeasures;
 - i. Food crops are by far the most overlooked area when it comes food vulnerability and bio/agrodefense.
 - ii. The U.N. FAO assessment is that “just 15 crop plants provide 90 percent of the world's food energy intake, with three — wheat, maize and rice — making up two-thirds of this.”¹⁶
 - iii. For America, a pathogen taking out wheat or corn would be disastrous.
 - b. Veterinary countermeasures;
 - i. The federal government should be funding R&D at the nation’s land-grant universities to develop FAD and non-FAD countermeasures, but that is being done on an exceedingly limited scale.
 - ii. Essentially every potential pandemic threat facing the world is a zoonotic disease that can be transmitted from animals to humans. This has been the global consensus for years, yet very little federal funding has been available to confront these diseases in the animal host. That must be addressed.

¹⁶ See United Nations Food and Agriculture Organization: <http://www.fao.org/docrep/u8480e/u8480e07.htm>

(2) Enhanced bio/agrodefense IC capacity as stressed by President Myers, Dec. 17, 2017;

- a. The American Association for the Advancement of Science put out an alert last week highlighting the “areas where the next pandemic could emerge;¹⁷ IC monitoring of these areas should be ongoing.
- b. Increased IC biothreat expertise at the federal level.
- c. More cleared USDA personnel centrally and within each state and territory.
- d. Increased number of state-level fusion centers with agriculture and food SMEs.

(3) Bio/agrodefense legislation and enhance congressional oversight;

- a. Executive actions like HSPD-9 are important to mobilize executive agencies into action. Long term, federal statutes and congressional oversight are needed to protect the nation adequately.
- b. In 2017, SAFA was a great first step focused on DHS, but the DHS OIG confirmed earlier this year that DHS is not complying with SAFA. Thus, greater congressional oversight is needed.
- c. Additionally, U.S. bio/agrodefense should be based in federal statute. This Senate Committee should lead that effort to ensure U.S. agriculture and food are, in fact, protected from natural and intentional biothreats from around the world.

Thank you for your attention to these urgent matters.

¹⁷ [Areas where the next pandemic could emerge are revealed | EurekAlert! Science News](#)