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SAFEGUARDING AMERICAN AGRICULTURE IN A GLOBALIZED WORLD

HEARING

BEFORE THE

COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY UNITED STATES SENATE

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SAFEGUARDING AMERICAN AGRICULTURE IN A GLOBALIZED WORLD

Wednesday, December 13, 2017

UNITED STATES SENATE,
COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY,
Washington, DC

The Committee met, pursuant to notice, at 9:35 a.m., in 328A, Russell Senate Office Building, Hon. Pat Roberts, Chairman of the Committee, presiding.

Present: Senators Roberts, Boozman, Ernst, Grassley, Daines, Stabenow, Brown, Bennet, Gillibrand, Donnelly, Heitkamp, Casey, and Van Hollen.

STATEMENT OF HON. PAT ROBERTS, U.S. SENATOR FROM THE STATE OF KANSAS, CHAIRMAN, U.S. COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY

Chairman ROBERTS. Good morning. I call this meeting of the Senate Committee on Agriculture, Nutrition, and Forestry to order.

I welcome my colleagues and the witnesses before us today as we hear about an issue I have long felt is of the utmost importance not only to farmers, ranchers, and the agriculture value chain, but also to consumers, the American economy, and the safety of our country.

Agriculture security is a broad-reaching issue. It involves many Government agencies beyond the Department of Agriculture. In 1999, as Chairman of the newly formed Emerging Threats Subcommittee of the Senate Armed Services Committee, I became aware of the threat our Nation faced against intentionally introduced pathogens to be weaponized and aimed at destroying plant and animal populations.

I was invited to Obelinsk, one of Russia's secret cities, back when we had access to secret cities under the Nunn-Lugar Program, where I saw warehouses of anthrax, foot-and-mouth, Newcastle disease, and African swine fever. Over the next several years, with a great deal of leadership from then K–State president, Dr. Jon Wefald, the National Bio and Agro-Defense Facility, or NBAF, began to become a reality. This facility in Manhattan, Kansas, will be a critical part of keeping U.S. agriculture, our food supply, the economy, and, most importantly, our people safe.

Biological threats, whether naturally occurring like the avian influenza outbreak of 2015 or intentionally introduced, could pose great harm to our food supply and the economy. The 2015 avian influenza outbreak was unprecedented, and while the USDA managed through the situation as well as can be expected, it illumi-

nated just how vulnerable the agriculture sector is to such an event and it has made everyone involved begin to think about ways in which we can improve. Whether that be communication or coordination or preparedness or response, there is always room to gather feedback, reassess, and consider if our current approach is the best approach. Further, today's hearing is an opportunity to take stock of where we have come since the early 2000s when the issue of agriculture security was first visited and discuss where we need to go from here.

The Agriculture Committee last held a hearing on this subject over a decade ago, but since that time, the significance of this issue has only grown. Today we will commit to the record updated information regarding agriculture security. We will begin to examine any needed changes in this arena and continue to work on these evolving challenges.

There are several key questions for us to explore: What does risk management look like in this sector? Where are resources most appropriately directed? How should a multi-jurisdictional system best function?

Before us today is an esteemed panel of experts and public servants who have dedicated much of their careers to protecting agriculture and the country from biological threats. In October, the Blue Ribbon Study Panel on Biodefense released a bipartisan report, "Defense of Animal Agriculture," which assesses many of the issues we will hear about today. I ask unanimous consent to enter that report into the record. Without objection.

[The report can be found on page 72 in the appendix.]

Chairman ROBERTS. I am very much looking forward to our witnesses' testimony and the discussion today, and I now recognize my colleague, Senator Stabenow, for any opening remarks that she may have.

STATEMENT OF HON. DEBBIE STABENOW, U.S. SENATOR FROM THE STATE OF MICHIGAN

Senator STABENOW. Well, thank you very much, Mr. Chairman, and we are so pleased to have everyone with us today, including our former Senate colleague, Senator Lieberman. It is always wonderful to see you.

Before my comments, Mr. Chairman, at the request of Senator McCaskill, I ask that her statement supporting these issues be put in the record. I know you are working with her on these important issues, and she wanted it to be a part of the record today.

Chairman ROBERTS. Without objection.

Senator STABENOW. Thank you very much.

[The prepared statement of Senator McCaskill can be found on page 134 in the appendix.]

Senator STABENOW. I know, Mr. Chairman, you have long been a champion for a strong agrodefense system, and we are all grateful for your vigilance and for the hearing today.

I have always said that food security is national security. Everyone in this room knows just how important food and agriculture are to the well-being of our Nation. We certainly understand that in Michigan, where agriculture is our second largest industry, supporting one of every four jobs. I am so pleased that we have Dr.

Hammerschmidt with us today speaking on behalf of these issues from Michigan and Michigan State.

Threats to our agriculture industry would not only decimate our economy, but also change, frankly, our way of life. Our country is blessed to have a rich and diverse agriculture sector. However, it also means that agriculture faces a multitude of threats, both accidental and intentional. We cannot allow our food system to be weaponized against us, which is why I am glad, Mr. Chairman, that you have been working on these issues in a bipartisan manner.

I would like to also recognize again the important work that you are doing with Senator McCaskill, who serves as the Ranking Member of the Homeland Security Committee. Yet some of the gravest threats to our food system can occur without malicious intent.

In 2015, we witnessed one of the worst outbreaks of animal disease in our history. Avian influenza devastated poultry farmers across the country, claiming nearly 50 million birds and increasing egg prices for consumers. While our producers experienced unimaginable losses during the crisis, USDA and scientists across the country responded quickly to put a stop to the damage. Now we are more prepared than ever for the next outbreak.

In Michigan, we have experienced similar scares in our fruit and vegetable industry. Michigan's $72 million cherry industry was almost wiped out by an insect smaller than a dime. An exotic pest called the spotted wing drosophila has become a cherry grower's worst nightmare. Yet thanks to rapid response research investments, scientists at universities like Michigan State University are developing tools and techniques to keep this destructive pest at bay.

We need preparation, coordination, and research so we can protect our farms and crops from not only pests and disease but from the emerging threats of climate change. From hurricanes and floods to wildfires and droughts, we have seen how extreme weather can cause mass devastation to agriculture in the blink of an eye.

Earlier this year, the GAO released a report that estimated climate change would result in crop losses that could cost up to $53 billion a year by the end of the century. This would also have grave consequences for food security in the global fight against hunger. It is time for us to acknowledge that the changing climate is a contributing factor to the unprecedented natural disasters that we are seeing. It is time for us to take action together to curb the damage that has already been done and will be done on agriculture.

That is why we need real resources to detect threats and pests to keep our food and farms safe—in addition to meaningful risk management tools like crop insurance, which I know the Chairman knows a little bit about.

Mr. Chairman, in the last farm bill, you and I worked together to create the Foundation for Food and Agriculture Research, to match public investments with private funds for innovative agricultural research. As a result, the world-class researchers at both Michigan State and K–State are participating in foundation-funded projects to address emergent threats to agriculture. This is an example of a practical investment we need to continue and to

strengthen in the next farm bill if we want to keep our food and our farms safe.

As this Committee considers the 2018 farm bill in the near future, I look forward to working together to keep our commitments to protect our farmers and our food system.

Thank you, Mr. Chairman.

Chairman ROBERTS. I thank the Senator.

We want to issue a welcome to our panel of witnesses before the Committee this morning.

First, to my left and everybody else in the audience's right, the distinguished Senator Joe Lieberman, who served in the United States Senate representing the State of Connecticut for 24 years. During his time in the Senate, he was the Chairman of the Homeland Security and Governmental Affairs Committee where he introduced legislation to create the Department of Homeland Security.

Senator Lieberman is now senior counsel at the law firm of Kasowitz, Benson & Torres in New York. He currently serves as co-chair of the Blue Ribbon Study Panel on Biodefense, along with our former Secretary of Homeland Security Tom Ridge.

Now, Joe, welcome back to the Senate, and I look forward to your testimony. The reason I paused is that the Senator and I had a rather unusual sense of humor that sort of fitted together.

Senator LIEBERMAN. Yes.

Chairman ROBERTS. Which we truly enjoy, and so we are going to look forward to your testimony, but let me get on with the rest of the ——

Senator LIEBERMAN. Well, if I may, I do not want to interrupt, but I just want to say, "Good morning, Mr. Benny."

Chairman ROBERTS. "Now, Joe, cut that out."

[Laughter.]

Chairman ROBERTS. How many times did we say that on the subway? About a hundred, I think.

Our next witness is General Richard Myers or, as he is known at Kansas State University, "Mr. President." General Myers, always nice to know a president you can get along with. Mr. President or, pardon me, General Myers is a native son of Kansas—you might want to strike that.

[Laughter.]

Chairman ROBERTS.—born in Merriam and a graduate of Kansas State with a degree in mechanical engineering. He served in the United States Air Force beginning in K–State's ROTC program and retiring as a four-star general. When General Myers was the 15th Chairman of the Joint Chiefs of Staff between 2001 and 2005, I had the privilege of working very closely with him in my capacity as Chairman of the Senate Intelligence Committee. He is indeed a great friend and an expert on the matters we are discussing today. I am so proud to welcome General Myers and look forward to hearing his testimony.

I now turn to Senator Stabenow to introduce our next distinguished witness.

Senator STABENOW. Thank you very much, Mr. Chairman, and I, too, want to welcome General Myers. It was great to be at K–State with you and Senator Roberts. I was wearing purple in Kansas,

and when Senator Roberts came to Michigan State, he was wearing green. So that is a good thing.

General MYERS. Well, Senator Stabenow, we appreciated having you there. Thanks for making the effort to be there.

Senator STABENOW. Absolutely. I am very pleased to introduce Dr. Raymond Hammerschmidt, a plant pathology professor at Michigan State University's Department of Plant, Soil, and Microbial Sciences. Dr. Hammerschmidt serves as director of the North Central Plant Diagnostic Network and faculty coordinator of MSU Diagnostic Services. His research and professional activities have generated over 200 publications, including a U.S. patent for a method of protecting plants from a variety of pathogens. Dr. Hammerschmidt is a native of Illinois. He received his Bachelor's and Master's in Science from Purdue University and his Ph.D. from the University of Kentucky.

We are so appreciative that you are here, and it is always wonderful for me to welcome a fellow Spartan.

Mr. HAMMERSCHMIDT. Thank you, Senator. Pleased to be here.

Chairman ROBERTS. It is nice to have you, Doctor.

Our next witness is Dr. Douglas Meckes, who is the State veterinarian in North Carolina, serving as the lead subject matter expert on all animal health issues since 2014. Prior to his time as State veterinarian, Dr. Meckes was the Chief of the Food, Agriculture, and Veterinary Defense Branch at the Department of Homeland Security, where he oversaw implementation of Homeland Security Presidential Directive-9. Dr. Meckes began his career as a veterinarian in Apex, North Carolina, and worked for the American Veterinary Medical Association as a congressional fellow for Senator Chuck Hagel and then as the Assistant Director of Government Relations. Dr. Meckes, we welcome you and we look forward to your testimony.

We will start with Senator Lieberman.

STATEMENT OF HON. JOSEPH I. LIEBERMAN, CO–CHAIR, BLUE RIBBON STUDY PANEL ON BIODEFENSE, WASHINGTON, DC

Senator LIEBERMAN. Thanks very much, Mr. Chairman, Ranking Member Stabenow, and members of the Committee. It is a great pleasure to be back in the Senate. It is a great pleasure to be before this Committee. I thank you for focusing on this subject, and I thank you for inviting me to be here on behalf of the bipartisan Blue Ribbon Study Panel on Biodefense, which I am privileged to co-chair with Tom Ridge. Tom has had some health problems, as I am sure you have heard, but actually he is on his way home today, and he is really recovering very well. So we are all thrilled to say that.

This is a panel that operates out of the Hudson Institute, small but high quality. Besides Tom and me, it is former Secretary of Health and Human Services Donna Shalala, former Congressman Jim Greenwood, former Homeland Security Adviser Ken Wainstein, and most especially former Senate Majority Leader Tom Daschle, who, as you know, Mr. Chairman, traveled out to Manhattan, Kansas, on a cold January day earlier this year to convene some of the best minds on this topic at Kansas State University, and his work that day really informs my testimony this morning.

This Panel was formed in 2014. A year later we issued our first report about the general state of our biodefenses, which we found were lacking leadership, focus, and adequate funding. After that we decided to take segments and dig deeper into them, and the first we have done is the security of our agriculture sector. We did that, one, because of its importance to our country. As both of you said, agriculture accounts for at least 5.5 percent of our gross domestic product. More than 11 percent of workers in America are involved in agriculture. Second, some people say, "Is this really a problem, the security of our agriculture?" Well, it is. The most visible, tangible examples we have had are the avian flu outbreak, which you both talked about, which was dramatic and cost the economy—obviously, killed a lot of birds, but also cost the economy, by the best estimates I have seen, well over $3 billion. That all started, as far as we can tell, with migration of wild birds that basically conveyed this influenza to poultry in the U.S. and then it spread.

The great fear is that this will happen and it will spread from the birds to people, which is actually what is happening with a strain of avian influenza now in China called "H7N9," which has caused a disproportionate number of deaths there and is of concern. So this is a real problem.

The other thing to say, as you know, is that in 2002, when the SEAL team made its way into a cave in Afghanistan where Osama bin Laden had been hanging out, they found among the various documents a list of pathogens that were clearly focused on biological terrorism. Ten targeted agriculture, six, livestock and poultry, and four, crops. So this is a real problem, and that is why we have focused on it.

The biological connection between people, animals, their environments, and the pathogens that can infect them has unfortunately not meant the kind of focused leadership response and adequate policy connections at the Federal, State, and local level that we need. I really appreciate the fact that as you begin to work on a new Farm Bill, this is a moment of opportunity to really build on what the previous Farm Bill did when it comes to agricultural security.

Inadequate attention and funding is more severe in the animal health sector than in public health generally. In Fiscal Year 2017, according to OMB, the agriculture protection function represented about 0.76 percent of the total governmentwide homeland security budget request.

So our panel set out over the last year resulting in a report that came out a short while ago to identify what the challenges were in agricultural security and proposes some responses. Let me briefly give you three primary findings of the report and three recommendations.

The first was there was an insufficient mission ownership by any department of the Federal Government, inadequate leadership. Because agrodefense is so broad and complex a mission space, significant involvement of most Federal departments and agencies, or a lot of them, is required. White House-level leadership is critical to minimize the inevitable overlap, to identify mission gaps, and coordinate interagency cooperation.

Many departments undertake agro and food defense activities of some kind, especially the Department of Homeland Security, the Department of Agriculture, obviously, and the Food and Drug Administration. Some of these are clearly effective programs, but overall, we have found that there is a real absence of the kind of leadership to coordinate them and get our money's worth out of what we are investing.

Second, support given to some of the most important agrodefense programs in areas such as biosurveillance and medical countermeasures is just not enough to meet the threat. In fact, the Department of Homeland Security requested no budget for agrodefense research and development for Fiscal Year 2018.

Our panel heard understandable concerns about where the money to actually do the research in the billion dollar National Bio and Agro-Defense Facility, NBAF, will come from, and we share those concerns as a panel and hope this Committee can lead the way on making sure that this remarkable and really critically needed facility being built in Manhattan, Kansas, is adequate funded to do what we want it to do.

Third, there is insufficient promotion of innovation in agrodefense. The technological status quo cannot really be tolerated anywhere because of the enormous technological advances occurring in our world today, and it is certainly inadequate to protect the food and agriculture sector from a major outbreak. The Nation needs new ideas, and scientific solutions to drive agrodefense approaches beyond their current borders.

Now three responses that we recommended. One, the Panel really focused on the White House here and urges the White House to exert leadership across departments beginning with the promulgation of a National Biodefense Strategy, which was called for in our report and also mandated by the National Defense Authorization Act last year that will meaningfully address threats to food and agriculture.

OMB should incorporate detailed agrodefense expenditures into a cross-cutting biodefense budget analysis. Mr. Chairman, Senator Stabenow, I will tell you that one of the unsettling facts that the committee learned when we did our first report is that nobody in the Government could actually tell us how much we were spending on biodefense. We actually got an estimate from the University of Pittsburgh, which has a great center of study in this area. But nobody could tell us how much is being spent, and you cannot figure out if you are spending it wisely if you do not know what you are spending.

Second, we can and should mitigate threats to livestock when they appear with effective medical countermeasures. Despite some gains, the availability of adequate medical countermeasures for animals lags way behind what is needed and does not meet the Government's own requirement to deploy sufficient high-consequence animal disease medical countermeasures within 24 hours of an outbreak. If Congress were to formally authorize something that exists now, the National Veterinary Stockpile, that would send a strong message that this is a necessary national asset.

Third, we recommended the establishment of a prevention fund for animal health, much like that created in the 2008 Farm Bill for

plant health because we think that would create a real legislative basis for prevention activity. Such a fund could encompass programs like the National Wildlife Disease Surveillance Program, which operates really on a shoestring. When you think about the fact that the avian flu outbreak started with migrating wild birds, I think you can get the significance of that.

Okay. I am going to come quickly to a close and close with a little bit of good news, which is that our panel has really been encouraged by the way in which Tom Bossert, who is the Homeland Security Adviser in charge of this area at the National Security Council at the White House, has taken this mandate for a National Biodefense Strategy quite seriously and is working very hard on delivering a strategy soon. He has got many other departments around the table drafting it with him, including the U.S. Department of Agriculture. We hope that the White House will maintain the momentum generated by this process and lead the relevant agencies to a new level of planning and operating with respect to agricultural security, and then the obvious and necessary and really important follow-on is what this Committee does in the Farm Bill.

Mr. Chairman, I thank you very much for focusing on the problem, for giving me a chance to testify on behalf of this panel, and, of course, I look forward to answering any questions you have.

[The prepared statement of Senator Lieberman can be found on page 41 in the appendix.]

Chairman ROBERTS. Senator, I cannot emphasize enough how much we appreciate your leadership and taking time from your busy schedule to serve on this Blue Ribbon Panel and to provide the leadership, along with Tom Ridge, who is a great friend. I used to try to set blind side picks on Tom when I made the mistake of trying to play basketball over in the House.

Senator LIEBERMAN. Not smart.

Chairman ROBERTS. That is not a good idea.

Senator LIEBERMAN. Not smart, right.

Chairman ROBERTS. It is just not. But thank you, two good friends on the Panel.

Senator LIEBERMAN. I will tell him you said that.

Chairman ROBERTS. Yeah, you can give that message.

Senator LIEBERMAN. Okay.

Chairman ROBERTS. Thank you for a very comprehensive statement and specifically outlining what I think that this Committee should consider. I would just say that taking part in several exercises—and I think we should have more—back in the day, and going to Obelinsk and seeing those warehouses full of pathogens that were meant to basically destroy a country's capability to feed their people, that was quite an eye-opener. I wonder where the pathogens are now. I do not know if they have the capability to dispose of them in a safe way, and I do know that is an opportunity for several rogue states to latch onto those. So it is a real matter of national security.

Senator LIEBERMAN. Mr. Chairman, if I may, perhaps you saw over the weekend in the Washington Post there was an article about the evidence that the North Koreans, Kim Jong-un has an active pathogen development program. So there is another contemporary source of worry, to say the obvious.

Chairman ROBERTS. I appreciate that very much, and thank you for bringing it up.

Mr. President, General Myers.

STATEMENT OF GENERAL RICHARD B. MYERS, PRESIDENT, KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS

General MYERS. Chairman Roberts and Ranking Member Stabenow and distinguished members of the Committee, I am absolutely honored to appear before you today on behalf of Kansas State University for this hearing that is entitled, "Safeguarding American Agriculture in a Globalized World."

You know, life has interesting twists and turns, and I never thought when I was still in uniform that I would be sitting at a witness table with Senator Lieberman. We had a much different relationship, although I would say a very professional and pleasant relationship—at least my memory is such.

Senator LIEBERMAN. That is my memory, and it is good to be sitting at a witness table that is not in a criminal proceeding.

[Laughter.]

General MYERS. We could be thankful for that. So thank you. It is an honor and a privilege to be with all of you.

Food insecurity is an ever increasing global problem as delineated in a 2015 assessment by our intelligence community, and as people say, hungry people are not happy people. America still feeds the world, so there is an urgent need to protect America's food crops, food animals, and food supply from naturally occurring and intentionally developed and delivered biological threats. Either could be devastating, either economically or to our health.

As Senator Lieberman mentioned, one of those early discoveries going into Afghanistan in 2002 was that list of 16 pathogens that al Qaeda was planning to use as bioweapons. I think it is worth noting that only six of them were targeted against people. Another six were pathogens of livestock and poultry, and four were crop pathogens. So al Qaeda was not just planning to attack people with biological weapons; they were going after agriculture and food as well. So that idea is out there.

I would say also when al Qaeda was driven—some of them were driven from Afghanistan, a few of them pooled up in northeast Iraq, and we saw them conducting experiments on animals, dogs and I think there were some sheep or goats as well. What we could tell from the intelligence at the time was that they were trying some of these bioweapons on these animals. So this goes on. Al Qaeda may be down, but they are not out, and that notion of hurting us economically is one that is pretty prevalent among those that want to cause us harm. Natural outbreaks, of course, can have the same impact.

If you consider the UN Food and Agriculture Organization assessment that "just 15 crop plants provide 90 percent of the world's food energy intake, with three—wheat, rice, and maize—making up two-thirds of this," 90 percent makes the protection of food crops rather significant.

If wheat, rice, or corn 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 will be in big trouble. Kansas, the Wheat State, takes such matters very seriously.

The U.S. must worry about innumerable foreign animal disease threats today. The top-line concerns are those currently projected to be worked on at the U.S. Department of Homeland Security's $1.25 billion National Bio and Agro-Defense Facility, hereafter called "NBAF," under construction on the K–State campus. These include the livestock-only threats—African swine fever, classical swine fever, and foot-and-mouth disease—along with zoonotic diseases—Rift Valley fever, Japanese encephalitis, Nipah virus and Ebola virus. Any of these and innumerable other foreign animal diseases could ravage America's agricultural infrastructure, the food supply, and economy if they hit the U.S. Zoonotic diseases could devastate public health as well.

There have been some foundational efforts to try to address that. I know the Committee is fully aware of the Homeland Security Presidential Directive/HSPD–9, a national policy to defend the agriculture and food systems against terrorist attacks, major disasters, and other emergencies. As a result, I will not go through the parameters detailed in my written testimony. Nonetheless, I would note that all six of the key requirements in HSPD–9 are essential to safeguarding American agriculture in a globalized world.

Just to remind, number one is awareness and warning; number two is vulnerability assessments; number three is mitigation strategies; number four is response planning and recovery; five is outreach and professional development; and six, research and development. When I go through my path forward here in just a minute, I will come back to those.

As the Committee knows, protecting U.S. agriculture is a mission of America's land-grant universities, among others, a mission that began in 1862 when President Lincoln signed the Morrill Act. As someone relatively new to land-grant administration, but someone with a lifelong commitment to national defense, I am convinced that the Nation's land-grant universities can and should play a significant role in U.S. bio/agrodefense. These institutions participate in protecting agriculture and food in their States and region each and every day. I would say not only in their States but around the world, and I am sure that is true for Michigan State. I know it is true for Kansas State that when something happens in the world, some of our research specialists, they are on the road being called out to try to help.

Thus, we would encourage the Committee to integrate the land-grant universities into whatever solutions are developed. K–State stands ready to participate on the national team and lead when applicable. Protecting America's agriculture and food infrastructure is too important not to be a part of it.

For K–State, this is not a new realm. 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." We called this the "Big Purple Book" because, A, that is our color, so it is purple, and it is relatively big, actually. That was put together in March or published in March of 1999 before there was a lot of attention on some of this, especially the bioterror piece of it. It still pertains today. What

is in the book is still pertinent. But it documented the need for a biocontainment facility capable of conducting research and development on biothreats to food crops, food animals, and the food supply.

Post 9/11/2001, funding was obtained for such a facility, and the Biosecurity Research Institute, the BRI, at Pat Roberts Hall at K–State became a reality. The BRI at Pat Roberts——

[Laughter.]

General MYERS. I did not hear the comment. Was there applause for that one?

[Laughter.]

Chairman ROBERTS. That was back in the day where we had constitutionally driven subjects.

[Laughter.]

Chairman ROBERTS. Note all these comments are coming from the minority side.

Senator HEITKAMP. That is the only side that is here.

[Laughter.]

Chairman ROBERTS. I was going to say I appreciate that very much.

General MYERS. I think I am sorry I paused, actually.

Chairman ROBERTS. Right. I should say, "Now, Heidi, cut that out."

[Laughter.]

Chairman ROBERTS. We just did that with Joe, so it is all right. Please proceed, General.

General MYERS. Thank you, Mr. Chairman.

The BRI at Pat Roberts Hall is located immediately adjacent to the National Bio and Agro-Defense Facility site, and it includes five BSL–3Ag rooms that can be configured for research with cattle, pigs, sheep, goats, and poultry.

K–State has jump-started NBAF research in the BRI on Rift Valley fever, Japanese encephalitis, classical swine fever, and African swine fever. We were able to do so because the State of Kansas agreed to fund $35 million for NBAF research in the BRI at Pat Roberts Hall as part of our "best and final offer" in trying to attract NBAF to Manhattan, Kansas.

R&D continues on all four of these foreign animal diseases today, but the Kansas funding commitment will end in 2019 when the last $5 million is appropriated by the State legislature. The majority of the research is conducted at the BRI by the K–State faculty, staff, and students, but collaborators from the USDA's Center for Grain and Animal Health Research in Manhattan participate on some of the NBAF-related foreign animal disease projects. Moreover, this Center for Grain and Animal Health USDA Center conducts other USDA BSL–3/3Ag biocontainment research in the BRI as well.

Going forward, Federal support is needed for research and development on Rift Valley fever, Japanese encephalitis, classical swine fever, and African swine fever to help mitigate these threats to animal health and to public health.

So a proposed path going forward and the things that I would focus on: K–State believes that statutory authorization of the key provisions of HSPD–9 with clearly delineated and enforceable accountability, along with the appropriation of funds to support the key provisions, is required to safeguard American agriculture in a

globalized world. I will only touch on the first 5 of the 13 recommendations that are in my written testimony.

Number 1 is, and consistent with the HSPD, enhance intelligence operations and analysis capabilities, awareness and warning are essential. But today there are insufficient numbers of bio/agrodefense subject matter experts, veterinarians, animal scientists, crop scientists, plant pathologists, et cetera, with security clearances to assess classified intelligence. It is vital to increase the number of food crop, food animal, food safety subject matter experts with high-level security clearances—TS–SCI—to monitor global threats.

Also increase the number of Sensitive Compartmented Information Facilities, or SCIFs, with secure communications that have agriculture/food subject matter expert analysts and/or cleared SME advisers with top secret SCI clearances.

Also important to increase the number of USDA's subject matter experts with security clearances. Discussions in 2016 with USDA's chief scientist and a USDA intelligence analyst confirmed their frustrations with an inability to convey critical classified information within USDA to make it actionable.

Then it is also important, I think, to increase State Intelligence Fusion Centers with agricultural and food subject matter experts with clearances, with security clearances. The Kansas Intelligence Fusion Center appears to be the only fusion center of over 70 nationwide that has a biothreat team with TS–SCI-cleared subject matter experts capable of assessing the full range of biohazards to food crops, food animals, the food supply, and people. These include a doctor of veterinary medicine, three Ph.D. scientists and researchers from Kansas State, medical doctors from the University of Kansas Medical Center, and subject matter experts from multiple State agencies. This permits the Kansas Fusion Center to assess global intelligence for the purpose of preventing bioterrorism and preparing for natural infectious disease events that are emerging globally and coming to the United States.

So what the Kansas Intelligence Fusion Center really focuses on is "left of the event." We like to prevent the event, not just react. We are always going to have to be able to react, but they really work on preventing.

So if you have that intelligence, if you have the right intelligence, then you can do vulnerability assessments, mitigation strategies, and response planning and recovery. Without it, you cannot take those steps that are outlined in the HSPD.

Under emerging foreign animal diseases, exploit "awareness and warning" intelligence regarding newly emerging biothreats to establish mitigation strategies at USDA's Center for Grain and Animal Health Research and K–State prior to NBAF becoming operational and fund R&D to confront these threats. We cannot wait for the NBAF to come online with its funding to do that.

Under zoonotic animal disease research, establish zoonotic foreign animal disease mitigation strategies at the USDA's Center for Grain and Animal Health Research and for Rift Valley fever and Japanese encephalitis, and fund Rift Valley fever and Japanese encephalitis R&D in the BRI at Pat Roberts Hall. That funding, again, goes away in Fiscal Year 2019, and there is a big gap be-

tween that time and when NBAF will come online, which is, I think, programmed to be or planned to be now somewhere 2022 to 2023.

For the non-zoonotic foreign animal disease research, expedite threat mitigation strategies for these foreign animal diseases by moving the research portfolios for African swine fever and classical swine fever from Plum Island to USDA's Center for Grain and Animal Health Research and funding African swine fever and classical swine fever R&D in the BRI/Pat Roberts Hall until NBAF becomes operational. So if we do not do this, there will be a gap in that research, and some, of course, will probably lose ground in those areas.

Then private sector outreach, another part of HSPD–9. Enhance outreach and professional development by leveraging the Nation's land-grant universities that interact routinely with private sector agriculture producers and food processors, and by funding education and training programs.

So those are 5 of the 13 points, and I thought I would mention them here in my oral statement.

To sum up, I think HSPD–9 was very well conceived, but it has not gotten the job done since it was written. Key components of American critical infrastructure—agriculture and food—and, by the way, I think agriculture and food are critical components of our infrastructure and often not looked at that way. We focus on other components of the infrastructure, but agriculture and food clearly are right up there in my estimation—are vulnerable to terrorist attacks with bioweapons and undeliberate infectious disease outbreaks, and I think the U.S. is unprepared to confront these threats. So my recommendation is that Congress enact enforceable statutes before it becomes too late.

Thank you, Mr. Chairman.

[The prepared statement of Gen. Richard B. Myers can be found on page 59 in the appendix.]

Chairman ROBERTS. Thank you, General.

Dr. Hammerschmidt, before I recognize you, I would be remiss if I did not indicate that over General Myers' right shoulder or right behind his shoulder, where he usually is, is Dr. Ron Trewyn, who knows as much or more about this entire topic than anybody. I thank him for his advice and counsel and friendship down through the years. To Dr. Trewyn's right is Dr. Sue Peterson, who is in charge of everything good that is happening at Kansas State University.

[Laughter.]

Chairman ROBERTS. Dr. Hammerschmidt.

General MYERS. Absolutely right. Thank you.

STATEMENT OF RAYMOND HAMMERSCHMIDT, PH.D., PROFESSOR, DEPARTMENT OF PLANT, SOIL, AND MICROBIAL SCIENCES, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN

Mr. HAMMERSCHMIDT. Chairman Roberts, Ranking Member Stabenow, and distinguished members of the Committee, thank you for this opportunity to speak with you today not only on behalf of

Michigan State University, but also all the very hard working plant and disease pest diagnosticians across the land-grant system.

As a plant pathologist and also Director of the USDA-NIFA-supported North Central Plant Diagnostic Network, and former Executive Director of the entire network, I have become very familiar with the threats that plant agriculture in particular faces from both introduced and endemic pests and pathogens.

I would like to start essentially by saying I think we are relatively ill prepared to combat many of these pathogens and pests, both in our food supply and plant agriculture. There is a set of plant pathogens that are on the select agent list, and we must be on guard for these, but there are many other pests and pathogens that threaten plant agriculture and plant production.

Pathogens and pests do not recognize borders or regulations and this should give us pause in this global economy. In some plant systems, we are now seeing increased potential for pathogens and pests to jump from one host species to another, and the effects of climate change cannot be discounted in some of the changes we are seeing in these pest outbreaks.

Although not a food crop, pathogens and pests also threaten greenhouse and nursery industries. In Michigan alone, there are over 700 greenhouses producing $472 million worth of ornamentals. I bring this up in part because of the economic value, but also in 2003, a select agent, Ralstonia solanacearum, which is a devastating disease on potato and tomato, was accidentally introduced in geraniums. This was devastating to the Michigan geranium industry, the greenhouse industry, but we were able to stop this before it became a threat. But, again, pathogens can come in all sorts of interesting ways.

There is also a potential impact on our forests. Plant pathogens and pests also pose threats to the livestock industry because of the feed that is produced through plants, and some plant pathogens produce mycotoxins that can contaminate grain.

There are three major factors that we think about when considering whether an endemic or a deliberately introduced pathogen can cause significant damage: one is obviously the pathogen; second is the susceptibility of the host plant; and, third, whether or not we have an environment that is conducive to disease.

Probably the most classic example of how these three factors work together was the late blight potato epidemic in Northern Europe and Ireland in the 1840s where the crop was literally wiped out, causing both social and economic problems for that part of the world, as well as large immigrations out of Europe.

Resistance was eventually bred into the potato, but pathogens, being rather clever, were able to overcome this resistance shortly after the resistance was introduced. We have fungicides that are effective, but not unlike the situations we see in animal and human health, these pathogens overcome these chemistries rapidly as well. So we have scenarios like this which, unfortunately, are being replicated with many plant diseases and also plant pests.

Early and rapid detection and diagnostics, therefore, are vital. The MSU Plant Diagnostics Laboratory is one of the major contributors to early detection and accurate diagnoses. We have specialists that cover all four pest types, and we conduct tests in samples rep-

resenting over 100 plant species each year. We continue, as we do across the country, to try to introduce new diagnostic tools and serve not only the general public but also work with agencies in protecting plant agriculture.

The MSU Lab is one of the land-grant laboratories that collectively form the National Plant Diagnostic Network. This network is involved in rapidly detecting and diagnosing plant pathogens and pests. We are also involved in recording this information at the appropriate entities, whether it is back to the grower or to regulatory agencies, so we can have mitigation.

The NPDN has five hub labs: Michigan State, Kansas State University, University of Florida, Cornell University, and the University of California-Davis. As I mentioned, it is supported by NIFA through the Food and Agriculture Defense Initiative, which also supports the National Animal Health Lab Network and the Extension Disaster Education Network.

We work closely with APHIS PPQ to complement their regulatory roles by serving as triage for pathogens of regulatory concern and assisting in surge diagnostics. All the labs in the land-grant system and the NPDN can really be thought of as sentinels and, thus, a first line of defense for diseases and pests of plants.

Even with the ongoing local and national efforts, there is still a need for research to develop better detection and diagnostic tools. More sophisticated surveillance is needed to survey large acreage crops and natural resources.

We also must continue to educate and prepare what we call "first detectors." These are individuals who are trained to detect unusual events and know how to take a sample and ship samples in for diagnosis. Extension educators and crop consultants are two of the audiences for this type of education, and through the NPDN we have developed programming for this type of activity.

Equally important is raising public awareness of these issues, both on the animal and plant side. This is something which, as I think has been mentioned already, sort of flies under the radar. Most folks do not understand where their food comes from and the importance of managing these pests and diseases.

There is an added pressure of climate change, and the probability of potentially devastating pathogens and/or pest infestations has become much more complex by this change. Temperature and weather play a key role in determining the ability of diseases to spread and even survive, and we are seeing pathogens in Michigan which used to be unable to overwinter, but now are able to survive through the winter months.

Disease and pests can also cause significant economic losses across the agricultural spectrum. In Michigan, we have all kinds of examples of new and even reemerging pathogens, from cucumber downy mildew, soybean sudden death, fire blight of apple, spotted wing drosophila that Senator Stabenow mentioned, stink bugs, stripe rust, oak wilt, and the list goes on and on. I guess the curse and the blessing of having many, many commodities is you get many, many pests and pathogens. In many of these cases, unfortunately, disease resistance may not be available, and this is confounded by the development of resistance to effective pesticides. There is also a risk for pathogens and pests to make their way to

Michigan via the busy port of Detroit Metro Airport and the port of Detroit.

To summarize, pathogens and pests of plants will continue to evolve in ways to overcome host resistance and the chemical control tools making introduced, endemic, and reemerging pests more dangerous. Some of these may even find new hosts or expand their host ranges. Environmental stresses on plants can also lead to more extensive pathogen and pest damage.

Because of global trade, we are at risk of introducing new pests and pathogens as well as variants of endemic species, which make them more difficult to detect against the background noise. Thus, the threat to plant systems can come from many different directions, and the need for proactive detection, diagnostic technologies, and enhanced coordinated preparedness at all levels is more important than ever before.

As I have told many groups that I have spoken to about this topic, we know that it is not whether one of these major events occur but when it is coming and what we need to do to become better prepared.

Thank you.

[The prepared statement of Mr. Hammerschmidt can be found on page 32 in the appendix.]

Chairman ROBERTS. We thank you for your testimony.

Dr. Meckes, please.

STATEMENT OF R.D. MECKES, D.V.M., STATE VETERINARIAN, NORTH CAROLINA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES, RALEIGH, NORTH CAROLINA

Mr. MECKES. Chairman Roberts, Ranking Member Stabenow, and distinguished members, I am Dr. Doug Meckes. I serve as the State veterinarian and the director of the North Carolina Department of Agriculture's Veterinary Division. The division includes 150 employees that serve our poultry and livestock industries and manage and operate our four diagnostic laboratories. Thank you for the opportunity today to speak about matters of concern in North Carolina's ongoing efforts to prepare for and respond to agricultural emergencies.

North Carolina enjoys a robust agribusiness industry which contributes nearly $84 billion on an annual basis to North Carolina's economy. That is 17 percent of the State's gross domestic product and 17 percent of our State employees. North Carolina's animal agriculture industry, livestock, dairy, and poultry, accounts for 68 percent of farm cash receipts, and North Carolina ranks second in hog production and third in poultry production in the Nation.

As was mentioned, prior to accepting this position, I spent 7 years in the Department of Homeland Security as the Branch Chief of the Food, Agriculture, and Veterinary Defense Branch where we were charged with implementing the Department's responsibilities in Homeland Security Presidential Directive 9. That document served as the foundation for all of the efforts that were undertaken by our branch.

Today, as we consider our topic, safeguarding American agriculture in a globalized world, a revisit of HSPD–9 is worth the effort. The directive's 18 line items provided guidance in 2004 to ad-

dress then-identified gaps in the Nation's ability to defend agriculture and food. Thirteen years later, progress has been made in addressing some of the gaps, not the least of which as I referred to as a "star in the crown," the National Bio and Agro-Defense Facility in Manhattan, Kansas, which brings to reality Line Item 24, "a safe, secure, state-of-the-art agriculture biocontainment laboratory." This achievement notwithstanding, other gaps in HSPD–9 have not been sufficiently addressed. Allow me to speak to three of those quickly, which are of concern not only to North Carolina but to my colleagues and State animal health officials all around the country.

First is the absence of needed vaccines for the use in the introduction of a foreign animal disease, certainly a worry in North Carolina with 9 million pigs east of I–95.

Line Item 18 called for a National Veterinary Stockpile containing sufficient vaccines to respond to the most damaging animal diseases capable of deployment within 24 hours. We have not achieved this goal.

Particularly concerning is foot-and-mouth disease. In the event of a foot-and-mouth disease outbreak in the U.S., the North American Vaccine Bank would be triggered, and vaccine produced from that bank would be shared by the U.S., Canada, and Mexico. The bank contains types or subtypes of virus that are a threat to the U.S., but the quantities of antigen available would produce only enough vaccine for a small, confined outbreak, 2.5 million doses for each of the stored antigens' types and subtypes.

An FMD outbreak in a livestock-dense area of the U.S. cannot be controlled without immediate access to millions of doses of vaccines, and in the absence of sufficient vaccine, the economic losses associated with an uncontrolled outbreak would cost the Nation $200 billion over 10 years.

Next, Line Item 14 of HSPD–9 directs participating departments and agencies to ensure that the combined Federal, State, and local response capabilities are adequate to respond quickly and effectively to a terrorist attack, a major disease outbreak, or other disaster affecting our food and ag sector. We are fortunate in North Carolina, for even before HSPD–9, members of the North Carolina Department of Ag recognized the need for such a capability. In 2002, the Emergency Programs Division within the department was created. Its mission: to reduce the vulnerability and minimize the impact from any natural or man-made disaster, disease outbreak, or terrorist attack for the department, for the people of North Carolina, and the agriculture interests of the State.

The continued refinement of preparedness and response capabilities over the years has resulted in a team of agricultural and emergency management personnel ready to respond to any incident, fully engaged at the Federal, the State, and the local level.

Today the EP Division has reached maturity, and its sphere of influence is considered All-Hazards. The development of that capability has been funded by the State and through various Federal grants, some $7.3 million in Federal money, $18 million in State money. A relatively small investment over the years has brought the vision of HSPD–9's Line Item 14 fully to fruition in North

Carolina. With additional funding targeted for such programs, similar capability could be developed in other States.

Finally, I will address the veterinary diagnostic laboratory capacity in North Carolina and across the Nation. Line Item 8 of HSPD–9 speaks to the need to develop nationwide networks that integrate existing Federal and State laboratory resources. The National Animal Health Lab Network, the NAHLN, was developed as a result of this directive and is now part of a nationwide strategy to coordinate the work of all organizations providing animal disease surveillance and testing. As one of the 12 original NAHLN labs, North Carolina's Rollins Veterinary Diagnostic Lab in Raleigh receives significant infrastructure support from USDA. That funding enables Rollins and other NAHLN laboratories to be fully committed to the NAHLN mission and able to respond to domestic or foreign animal disease emergencies on a 24/7 basis. In addition, the North Carolina laboratories receive State-appropriated funds for salaries and expenses, operations, and maintenance.

In closing, let me say that while I have addressed only three of the line items in HSPD–9, several others are worthy of another look. But in speaking with my State animal health official colleagues, particularly those in animal-dense states, I believe the issues addressed above to be of immediate concern and worthy of attention. As I am certain you all are aware, numerous animal agriculture groups, animal science organizations, and veterinarians support a new Animal Disease and Disaster Prevention Program for inclusion in the 2018 Farm Bill. This program speaks specifically to ensuring fully trained, appropriately equipped, response-ready teams at the State level—not unlike the Emergency Programs Division here in North Carolina—and increased support for the NAHLN laboratory system to enhance the Nation's animal disease prevention efforts. Additionally, a proposal for establishing and funding a robust U.S. Foot-and-Mouth Disease Vaccine Bank for inclusion in the Farm Bill is considered a top priority by many in the animal agriculture industry.

Thank you for the opportunity to speak today on behalf of North Carolina and my colleagues around the country about issues concerning agriculture and food.

[The prepared statement of Mr. Meckes can be found on page 47 in the appendix.]

Chairman ROBERTS. I thank you, Doctor.

Senator Stabenow?

Senator STABENOW. Well, thank you, Mr. Chairman. I want to thank all of you for coming and for this very important testimony. I am attempting to be two places at once and am going to have to step away, and so I want to thank the Chairman again.

I do have questions, but I will follow up with all of you regarding that. I am hopeful that there will be some discussion on one of the additional threats, which is our changing climate, which I know for us in Michigan with all of our diversity of crops is certainly an additional challenge as well.

Thank you, Mr. Chairman.

Chairman ROBERTS. Senator Heitkamp.

Senator HEITKAMP. Thank you, Mr. Chairman. You know, I think about this, and I think that we have so narrowly defined our na-

tional security interests that this is such important testimony and such an important topic that we really should have a roomful of people listening to the concerns that you are expressing and some of the planning.

One of the challenges—and I think this is to Senator Lieberman. One of the challenges I think we are experiencing is the sense of complacency, and you see it in a Presidential budget that basically zeroes out research, zeroes out coordination, ignores, in my opinion, the land-grant colleges where we have had this incredible history of flexibility and response. I am wondering, how can we do a better job to educate the rest of the public, Senator, on what this threat is and how we need to be better prepared? You all have outlined some great preparations. I still do not walk away from here with a sense of comfort that we are as prepared as what we should be.

Senator LIEBERMAN. Thanks for the question, Senator Heitkamp. I totally agree with you. This is a real—agrodefense is a real national security problem, not only the material that was talked about before that was found in al Qaeda's possession and now the latest stories about Kim Jong-un having an active pathogen development program.

If you were an enemy of the United States and wanted to strike us, we talk about cybersecurity—nuclear weapons always get the most attention because they are so terrifying to everybody. But when you think about the damage that could be done to our economy, to our country, to our people, create real terror, a sense of terror, if somebody successfully attacked with a pathogen our agriculture sector, and when you think about the fact that it is relatively easier to do than to launch a nuclear attack, thank God, against our country.

So how do you get attention for it? Unfortunately, it is very hard, particularly in the context of everything happening in our political system, the media focus on the day-to-day ups and downs of what is happening in the White House and what people respond to.

The media has a responsibility here—but that is up to them under the First Amendment still—to focus on this, and to the extent we can encourage them and sort of give them material to do it, that is why I thought the article—I think it was Joby Warrick who wrote it—in the Washington Post over the weekend about the North Korean pathogen program was so important.

But it is also a role for congressional leadership, and I do not expect this hearing to make the evening news, but it should.

Senator HEITKAMP. Yeah.

Senator LIEBERMAN. So there is a really important leadership role for Congress here and, of course, the executive branch, but it may be one of those things that—I remember people would say this to me, my senior colleagues when I was here, "You know, you are going to do some things here that will be probably the most important things you do for the country, and very few people will know you did them." This may be one of those, so I appreciate the leadership that the Committee is showing, because this really is a threat to our country. That is part of why the various things that have come my way since I left the Senate, that I grabbed onto this one because I feel it is something that, working with Tom Ridge, we can make a difference on.

Senator HEITKAMP. I think when we look, Mr. Chairman, at people, if an event happens, people say, "Well, who could have anticipated that?" Most of this is anticipate-able.

Senator LIEBERMAN. Right.

Senator HEITKAMP. But there needs to be a coordinated response, and I have many more questions, but I want to thank the Chairman for bringing this very important national security issue to this Committee. I think it has not gotten the attention that it should. When you look at kind of long term what should terrify us, with all the horrors out there, pandemics and this kind of pathogen invasion—and that is the way we should think about it—and what is our resilience, what is our resistance, and what is our plan, and how are we funding it, and it should be right up there with all of the other threats that we are talking about. So I applaud the Chairman for bringing this issue. I think it is something that we should be talking about in your former Committee, which I also serve on, Homeland Security, and I promise to raise that issue with the Committee as well.

Senator LIEBERMAN. That is really important, Senator. I am sorry. I will yield to you in a minute, General. But just to say very briefly I served on Armed Services and on Homeland Security, was privileged to be the Chair of Homeland Security, and it is not natural—this topic of agro-security is not naturally the first topic to come up, certainly not in the Armed Services Committee, where it should, and also in Homeland Security. But this is the Agriculture Committee, and I think the Farm Bill for next year really can play an important leadership role here.

Excuse me, General.

General MYERS. Mr. Chairman, could I make a remark?

Chairman ROBERTS. Yes, sir.

General MYERS. Senator, I totally agree, and it struck me when I got to Kansas State a year and a half ago and became familiar with some of these issues that I was familiar with from a different perspective when I was still in uniform. I think part of it is just the intelligence piece, and that is why I mentioned the intelligence piece. If we do not know there is a threat out there, then we tend to dismiss it. But there is no threat, so what are we worried about?

I do not think we are—some of the things that we discover at the Kansas Intelligence Fusion Center are things that the national intelligence folks say, "Ah, look, that is really good stuff. We did not see that." That has happened more than once. We have had the former Secretary of Homeland Security out there who was sort of amazed by what you can do with a relatively small group of national or subject matter experts, scientists, researchers, that when they put their minds to it and they look at all the intelligence at the top-secret level, SCI level, they can find things there that others, if they are not looking for them, will never find. So I think that is one. I think the intelligence has to be there, and then you get people's attention.

Two, not to put too fine a point on it, but the Washington Post article on the North Korean work with pathogens, if you are uninformed—everybody in this room would understand it, but if you are uninformed, you would say, "Well, that is North Korea. That is not a worry." Well, it is a worry because they proliferate. They pro-

liferated fissile material. They can proliferate a lot of things and missile technology and that sort of thing. So pathogens, if they can get some hard cash for that or get some return, they will proliferate that. That is not good for us to have somebody that is working that.

So these are important issues that we need to—but I think it all starts with the intelligence, frankly. We have got to do a better job there.

Senator LIEBERMAN. Mr. Chairman, just briefly, in terms of public attention, next year will be the 100th anniversary of the influenza outbreak of 1918. They estimate that at least 50 million and maybe as many as 100 million people died from that flu in 1 year globally. That was before we were traveling as much as we are now and before commerce was moving worldwide. So as you go along in this area, it may be that there will be more public attention on this threat because people will go back and look at what happened 100 years ago.

Chairman ROBERTS. I thank the Senator.

Senator Casey, if you will permit me to just reflect on this just a moment, I think it is extremely important to note the intelligence component here, and I have been to the fusion center on several occasions, as I know you do on a regular basis, General, and I appreciate that. If you asked the CIA, "What keeps you up at night?"—which I regularly did when I was Chairman of the Intelligence Committee, but also you can do it as Chairman of the Agriculture Committee and, for that matter, the Ranking Member as well, and we would certainly work together on that—agroterrorism does not make the top ten. But if you look and you have an exercise, which we did some years back, even before the Department of Homeland Security was credited, and you look at what happens if you have a foot-and-mouth disease outbreak from South Dakota down to Texas—that was the primary entry point—every Governor stopped the movement of livestock, but it was too late, and we lost thousands and thousands of head of cattle.

Now, that is bad enough, and it is very difficult to try to terminate all of those animals. But all of our exports stopped, boom, just like that. About the mad cow situation and any other frightful thing that would happen to a nation's food supply. People panicked. They finally understood that our food does not come from grocery stores. But they were in the grocery stores, and, boy, everybody bought up everything they possibly could.

This did not last just 1 year. This was about a 3-year shot to even get back to the basics. You basically see a situation where you are destroying the Nation's food supply, and the utter chaos that happens as a result with regards to our entire economic picture.

So I think probably another exercise like that just to alert people as to what is going on would be very helpful, and thank you for trying to focus on this. It has been a big-time concern for me, obviously, for many, many years, and, Senator Lieberman, I do want to thank you for alerting me to the Blue Ribbon Panel. Basically you said, "Will you have a hearing?" I said, "You bet." So I appreciate that very much.

Senator Casey?

Senator CASEY. Mr. Chairman, thanks very much for having the hearing and for this great panel. I apologize. We are juggling between hearings. I am on the Health, Education, Labor, and Pensions Committee. We are doing a hearing today on the broader issue of mental health, and a lot to work on there as well. So I am sorry I missed some of your testimony.

I wanted to start with an analogy or comparison between the subject of this hearing and the great work that each of you have done and continue to do for your country, and the work that another part of the HELP Committee has been focused on for a number of years. Senator Burr and I have been working on the so-called PAHPA reauthorization, Pandemic All-Hazards Preparedness, so all of the issues that encompass the focus on the security to human health with regard to chemical, biological, radiological, and nuclear threats. As each of the panelists in one way or another today have said, this HELP legislation we are working on and the pandemic hazards fits under Homeland Security Presidential Directive 10, which is technically separate from the defense of agriculture, which is the Presidential Directive 9. But as your report says, the Blue Ribbon report details, so many of the threats to humans are so-called zoonotic, meaning they can move between animals and humans, so it is appropriate that the Committee is looking at agrodefense.

I want to direct this question to both Senator Lieberman as well as Dr. Meckes about both the authorization and funding of the so-called National Veterinary Stockpile, NVS. As I mentioned, the work we are doing in the pandemic legislation with Senator Burr, that particular legislation authorizes the Strategic National Stockpile, so-called SNS, as opposed to the National Veterinary Stockpile, NVS.

As you might know, the Strategic Stockpile is the human counterpart to the National Veterinary Stockpile, and I guess the first thing I wanted to ask both you, Doctor, as well as Senator Lieberman, and certainly, General and Dr. Hammerschmidt, you can weigh in on this. Can you compare the two? I guess in particular, I would present this question: If you had a threat to avian influenza emerging in the U.S. today, just by way of a hypothetical example, that threatened both animals as well as humans, how would the various sectors that deal with these issues, but especially these stockpiles, work together to mitigate that threat? I know it is kind of a broad question, but do you have any sense of that?

Senator LIEBERMAN. Dr. Meckes, go ahead. Why don't you start?

Mr. MECKES. Yes. Well, obviously the most keen distinction between the Strategic National Stockpile and—the greatest distinction between the two stockpiles, National Veterinary Stockpile and Strategic National Stockpile, is funding: billions of dollars for the Strategic National Stockpile, less than $5 million typically for the National Veterinary Stockpile. Currently, most of those resources are committed to protective equipment for response, materials to mobilize teams to go to farms and do whatever is needed, whether it is depopulation in the event of an avian influenza or other activities.

But there has been some effort over the years to integrate the activities of the Strategic National Stockpile and the National Veterinary Stockpile, but their missions are so totally different that, frankly, it has not been very successful.

Then the other piece, as we mentioned, of the foot-and-mouth disease vaccine, we have that antigen stored for 12 or 13 different types and subtypes. As I mentioned, it is shared between Mexico, Canada, and the U.S. in that North American bank. So, again, a very small investment in vaccine for foot-and-mouth disease. I mentioned 9 million pigs east of I–95, millions of cattle in Kansas and throughout the Midwest, sheep and goats, dairy cows in California. How will the decision be made to distribute 2.5 million doses of vaccine when we have got 90 million head of cattle and 60 million swine in the country? Difficult proposition.

Senator CASEY. Thank you.

Senator LIEBERMAN. Senator, I will just add that we think this is an important area because the National Veterinary Stockpile was created pursuant to Homeland Security Presidential Directive 9, and it has never been funded. Actually, that directive created some, I think, important requirements, which can never be fulfilled because it has not been funded, which is that within 24 hours of an event, the outbreak of something, which hopefully we would find out about because we have adequate intelligence, surveillance, reporting, we have to be prepared to act to get medical countermeasures out there and vaccines, and there is no way—I mean, this gets us, as Dr. Meckes said, just a little over $4 million a year. You just cannot do it.

So it would be a real sign of a recognition that something is needed here—and, again, avian influenza, the foot-and-mouth is separate, has some funding. It would show that this is not fantasy, that this is real. But at least for Congress to take the step of authorizing the Veterinary Stockpile, to put it in a law is a first step. I understand all the competition for funding and the rest, but however high, once it is authorized, before it can go, it should be easy to put more than $4 million in, because when there is an outbreak, boy, people are going to be screaming for vaccines or other medical countermeasures to stop the spread. There is nothing there right now. It is empty, effectively. So, please, make it real and fill it up.

Senator CASEY. Thank you.

General or Doctor? I know I am over.

General MYERS. I have just got two short comments.

One is when you have two HSPDs, 9 and 10, one for people and one for threats to agriculture, right there you have problems because they both concern living things, whether plant, animals, or people. I think because we have two and because some protect things better than the other one might in agriculture, we do not have a good focus in the executive side of Government. From a policy standpoint, I think that is problematic.

Then, second, I was reminded by Dr. Trewyn that pandemic threats essentially are all zoonotic. They usually start in animals. So focusing on an effort to stop the disease in animals is the way you stop from losing 50 to 100 million or who knows how many today, and there is little effort to do that. So they are not separate. They are together.

Senator CASEY. Just one comment. Appropriations are always, as Senator Lieberman said, an area of—I am putting words in his mouth, but it is a lot of competition for dollars, obviously.

Chairman Roberts is focused on this issue, and his standing as a Chairman means that he will have on most days more persuasive powers than some of the rest of us. I might even argue, though, that this panel might have even greater persuasive powers with the appropriators, even greater powers than Senator Roberts.

[Laughter.]

Senator CASEY. I just got myself in real trouble. But I would just urge you to keep making that point because we can write letters to the appropriators, we can buttonhole them and talk to them about it, and all that is discharging our duty. But your voices on this will be more powerful, and it should not just be a few million.

Thank you.

Chairman ROBERTS. Thank you, Senator.

Senator Daines?

Senator DAINES. Thank you, Chairman Roberts, Ranking Member Stabenow. Thank you to this very distinguished panel today. Thanks for spending the time here with us.

Everyone knows that protecting the integrity and security of our food and ag infrastructure is of the utmost importance. It is important to a guy like me from a State like Montana, where it is our number one industry.

As we look at the face of threats to agriculture and human health, I applaud your insights, your testimony, and the ability to discuss this. Assets towards this end across the Federal Government, including the Rocky Mountain Research Lab, a little-known research lab perhaps nationally but well known within those who engage in this fight every day—it is a state-of-the-art facility, a biomedical research facility in Hamilton, Montana, just south of Missoula. In fact, a fascinating history dating back to 1928 when research went out looking for the cause of the Rocky Mountain spotted fever, and that was the genesis of this laboratory. They have played a critical role in protecting our Nation from fighting zoonotic diseases to conducting essential research on the Ebola vaccine as well.

I know the Chairman asked a really great question: What keeps you up at night? That is always a good question for a panel like this. To build on that, I will start with General Myers. First, I want to thank you for your service to our Nation. In your view, what do you see as the greatest threats and the vulnerabilities to our ag infrastructure and food systems that terrorists or bad actors might exploit?

General MYERS. I think when it comes to our critical agriculture infrastructure, it is exactly that. If somebody wanted to—it is bad enough dealing with the naturally occurring pathogens. It is another thing if it were to be deliberate. What is interesting to me, dealing with groups like al Qaeda and ISIS and others when I was still in uniform, is that here you could wreak havoc on our agriculture infrastructure, and you could be continents away before the consequences were known or felt. So an ease with which it is the ability to infect with pathogens either plants or animals.

Wheat blast was introduced in Bangladesh I think last year and the year before, 2 years in a row—maybe it was this year—it was 2017, I guess—through a shipping container, inadvertently I think people think. So that is a fungus, as I understand, that you could transmit other ways. There is no—you could probably easily bring it into any country and infect crops. Once it gets started, it goes pretty fast.

Foot-and-mouth disease, which we all fear for many reasons, is easy to transport. It is not detectable necessarily, and the pathogen can last for a long time without any special care. Then you just drive around any of our big ag States and look at our ag infrastructure and production facilities, they are not well protected. So it is easy to introduce.

So I guess what keeps me up at night is somebody seizing on some of this and trying to hurt our economy. In the State of Kansas, agriculture is over 40 percent of the economy. That is just the ag piece. That is not the retail and the restaurants and all the rest of the food chain. it is just pure ag. Some of the other States, in Montana it is obviously pretty a serious business.

Senator DAINES. Yeah, number one.

General MYERS. Number one, so this is important stuff. If you take the economy down, you create—agroterrorism, bio-agroterrorism would do the same thing that terrorists today try to do, which is create fear in people's minds, which gives them less confidence in their government and their political processes. It could have devastating effects. You could just go right down the list of things that we worried about right after 9/11.

Senator DAINES. So what mechanism or tool, General, a follow-up question, is the USDA or the Federal Government most lacking in order to be able to effectively gather intelligence or mitigate the risk of potential foreign animal diseases in advance of the new bio-defense facility that is coming online in Kansas?

General MYERS. Well, there are several. I think first is just the intelligence piece of it, knowing what is out there, knowing what is likely to come this way, having people focused on that that have the knowledge about these pathogens, about agriculture, that they can identify the threat before it gets there. We would like to stop these threats before they come inside our boundaries, and our friends' and allies' as well. So like I have mentioned earlier, I think it all starts with intelligence. We do not have the number of subject matter experts with the right clearances at the right places to focus on this. But as the Chairman said, the intel agencies, this is not something that keeps them up at night. I think if we had the right number of analysts with the expertise like my two colleagues here have, properly cleared, that they could identify these well before they came to the United States, or at least get us ready for that particular threat. So I think it starts there. So that is kind of left of the event.

Right of the event, we have got to have the things that were talked about here, which is the research that is going on to try to find vaccines or other ways to deal with the pathogens, and that is kind of a sporadic effort, as we have heard, I think. Maybe "sporadic" is too—no, that is about right—a sporadic effort to deal with those. So it is across the board. I think HSPD–9 is a pretty good

road map, but there are not statutes that back it up, and I would opine and offer that it is my belief we need statutes to back up HSPD–9 and then hold people accountable when you give them funding for certain things, hold them accountable for the output.

Senator DAINES. Thank you. I am out of time here, but I will just conclude with one statement. We are looking at the possible—the risk here to the food supply and the safety of it and what that might mean to our Nation. But, arguably, even a very small incident could have just significant implications for the global food supply chain directly affecting our farmers and ranchers. We date back to one mad cow disease hit, most likely from outside our country, but we were associated with it and it banned beef exports for 14 years in China as an example. So, again, it is the economic risk to the ag industry in this country that concerns so many of us for what was a very, very small incident.

General MYERS. Senator, I would say my two colleagues here to the left, maybe it is not the correct analogy, but we have got our finger in the dike. As things break out, we deal with them. Up to now most of them I think we think are naturally occurring, although some of them have been suspicious, but naturally occurring. They have stayed ahead of it thanks to their research, thanks to their medical knowledge, and their work in this field. It is thanks to people like that, that have kept it where it is. But intentional would be a whole different ball game. You would have to assume that would be a much more dangerous game.

Senator DAINES. Thank you.

Chairman ROBERTS. Senator Boozman.

Senator BOOZMAN. Thank you, Mr. Chairman. I apologize for being late. We had an Air Force fellow that graduated today, and so we were over celebrating that very quickly, and just——

Chairman ROBERTS. I know General Myers will be most appreciative of that.

Senator BOOZMAN. Well, I think all of us are most appreciative. That is a big deal for this young lady.

So I thank all of you all for being here. We really do appreciate your insight. Certainly, the security of our food and fiber is so very important.

I know that many of you have expressed concern regarding proposed funding reductions for the research activities. I want to let you know that as DHS Appropriations Subcommittee Chair, we fully funded all of these line items in Fiscal Year 2018. Now, we are going to work hard to keep that together, but right now they are in the Senate bill as we go forward. So, again, we do appreciate the fact, though, that you are concerned about it and have voiced the importance of it. That helps us in securing those funds. So thank you very much for that.

Dr. Meckes, North Carolina has led the way with the creation of the Emergency Programs Division within the State's Agriculture Department to safeguard our food and fiber supply. It really will take an all-of-the-above approach, Federal, State, local, private levels. In your opinion, what role can States play in this very important mission? Additionally, how do you think DHS and other Federal agencies could best coordinate across State lines to work with State agencies such as yours in North Carolina?

Mr. MECKES. Well, I will say that in the early days of the creation of the Emergency Programs Division, DHS was integral to the funding of that effort, and I mentioned $7 million of DHS funds from USDA grants actually helped us create that program. As it has come to fruition, it is recognized at the Federal level we have got a close working relationship with USDA not only at the State level with our assistant district directors but at the national level as well.

In 2015, when Minnesota broke with avian influenza in the largest turkey farm in the world, they picked up the phone and called North Carolina and asked us to come and help them depopulate birds. This is certainly not anything that I have done. This all precedes me. But it is a remarkable asset for a State.

We deployed to Texas. After the hurricanes, we deployed to Puerto Rico and the U.S. Virgin Islands in the last 3 months to assist them in animal agriculture. We worked closely with FEMA in anticipation of Hurricane Matthew's arrival to the State of North Carolina in 2016, and for the first time ever, we were able to secure funds to purchase carbon source to compost all of the birds that died during the flooding in North Carolina.

So the marks on the wall by our Emergency Programs Division, we are well recognized and respected throughout our State colleagues and by the feds, and that success brings more success, and that is where we are with this effort.

Senator BOOZMAN. Good story to tell.

Mr. MECKES. Yes, it is.

Senator BOOZMAN. Senator Lieberman, it is so good to have you around.

Senator LIEBERMAN. Thanks, Senator Boozman.

Senator BOOZMAN. We miss you.

Senator LIEBERMAN. Great to see you.

Senator BOOZMAN. As you noted in your testimony, much of the critical infrastructure in ag is privately owned. Could you elaborate on some of the challenges that presents?

Senator LIEBERMAN. I would be happy to. I have thought about that in the question that Senator Daines asked General Myers.

Part of the problem there has been—and this goes to early warning and intelligence—how do you stop an outbreak, of either a bioterrorist attack or naturally occurring, from spreading, and there is a natural tendency—it is not just in agriculture, of course. It is in other areas of human activity—for the private sector—this happened particularly in cybersecurity over the years—where a company, an agricultural company, a farm, an individual farm, do not want to report the problem because they fear creating a panic that will affect business. That is just—you cannot do that because they have got to report early, and that is the way to stop it and really secure the agricultural sector of our economy. So that is one thing I think of.

I think the reality of this threat to agricultural security has quite naturally now hit the people in the industry more than people outside, and I think there is a growing cooperation going on, so that is good news.

Senator BOOZMAN. Very good.

General Myers and Dr. Hammerschmidt, in your testimony you both line out roles that you think the land-grant universities could play in ensuring food security. Could you elaborate on this? Specifically, how can the Federal Government better partner with the agricultural universities?

Mr. HAMMERSCHMIDT. I think I will start, being the only sort of non-animal person up here.

[Laughter.]

Mr. HAMMERSCHMIDT. Although I think humans are still animals.

One of the things which obviously the Federal Government has been helping us with are the diagnostic networks funded through the USDA, NIFA, FADI line, and this has been, from the plant side, one of the best investments that has been made in plant disease and pest diagnostics over the last 15 years.

Like many other things, the funding has declined dramatically, so in my region, as in other region such as the region directed by Dr. Jim Stack that General Myers' university heads up, we are down to little more than half a million a year per region to support the States around us. But having this kind of support still enables us to enhance our detection and diagnostic techniques. We also have invested in the past and we would like to do more training of what we call "first detectors." These are individuals, whether they are extension agents, crop consultants, master gardeners, the general public, anyone who comes into contact with plants would be able to recognize when something unusual is happening and know where to send a sample. We are not looking broadly enough for pest and pathogens, and this shows a need for awareness training. This is part, I think, of the issues that we have of the public not really being very appreciative of some of these problems that we face. These are programs which can generate a great deal of benefit in early detection of pests and diseases.

When I think about acreages of wheat, for example, in Kansas, which is far more extensive than in Michigan, although we do have a little bit, scouting or surveillance of those fields is very difficult by an individual. But we have better potential technologies now. Can we use drones, for example? Can we use volatile organic chemistries which are emitted by certain pest-plant pathogen interactions to detect these events It does not remove the need for people to get out there to take samples, but it could enable us to find these diseases or pests much more quickly.

The other area which really I am quite concerned about--and this really is an issue that faces both animal and human health—is the occurrence and development of more and more resistance to the chemistries we rely on for plant pathogen and insect control. As the chemicals have become much more specific and much more environmentally safe, they are actually much more readily, easily overcome by the pathogens by mutations. Couple that with what I think is not speedy enough breeding for host resistance to both pests and pathogens, we have sort of this double-edged sword working at us.

General Myers mentioned the outbreak of wheat blast in Bangladesh, and part of that in part may be due to the fact that the wheat lines there were not resistant to this pathogen.

I would contend that because of the openness of our research, both in the United States and other parts of the world, that folks know what varieties of crops are being planted, what their vulnerabilities are, what they are resistant to, what they are susceptible to, and, equally importantly, what pesticides they are resistant to. With the knowledge of which genes are being mutated to confer disease resistance and the ability to actually genetically modify microbes quite easily, you can envision a scenario that if you wanted to introduce a pathogen into a crop, you would first determine what varieties are being grown to know what the susceptibility is, what fungicides are being used and modify your organism to basically come in there and defeat the tools that are readily available for crop control, things you would not expect.

So detection involves not only finding it, but also determining genotypes of the pathogens. So partnering with programs to ensure we have the right kind of chemistries coming down the pipeline, that we have disease and pest resistance being incorporated into our most important—or all of our crops is very, very important.

Senator BOOZMAN. Good. Thank you, Mr. Chairman.

Senator LIEBERMAN. Mr. Chairman, if I may, Senator Boozman, I apologize. There is one more thing I want to add for the record——

Senator BOOZMAN. You always may.

Senator LIEBERMAN. Thank you. My answer to your question about private industry, the agricultural industry. The Department of Agriculture I gather is in the final stages and close to issuing a rule on reportable animal disease, and that hopefully will clarify the responsibility of the private sector here to report quickly to avoid the spread of disease among animals and to create a certain incentive to do that because that information is critically important.

Thank you.

Senator BOOZMAN. Thank you.

General MYERS. Could I add a comment?

Chairman ROBERTS. Sure.

General MYERS. Thank you, Mr. Chairman. I agree completely that I think the land-grant universities are particularly well positioned with their research and extension efforts to help with the private sector outreach that you covered so well, so I will not go into that. But that is part of what they do, and sometimes it comes down to funding, of course. That is something to consider.

Plus as I mentioned in my testimony, we are going to have a gap with certain diseases that are going to be covered eventually by the National Bio and Agro-Defense Facility, but in the meantime are being handled by the BRI/Pat Roberts Hall there at K–State, that State funding runs out in 2019, so we are going to have a 3-or 4- or 5-year gap before that picks up at NBAF. Somebody ought to be doing that, or we are going to have a gap in research.

Then, third, just to answer your question, it is research that is the key here, and so the work that Dr. Hammerschmidt does, the work that is done at many of our land-grant institutions is really critical to this, and I think we could target funding for specific research that would really move us forward.

Senator BOOZMAN. Very good. Thank you, sir.

General MYERS. Thank you.

Chairman ROBERTS. Thank you, Senator. Thank you to all of the witnesses. In making notes here, I would note the resistance on the part of Senators and Members of Congress to fully appreciate what we are facing here with the lack of awareness.

This is a difficult issue because if you really come out and say what is on your mind, you scare the dickens out of people. I remember when I first became interested in this by the circumstance of that trip to Russia, and then the follow-up with President Wefald at K–State, I kept telling our various farm organizations and our commodity groups we have got to step up on this, our veterinarians, everybody else. They said, "Will, you quit talking about this because nobody wants to talk about this. It is affecting prices if the Chairman of the Ag Committee comes out and says we are about to face something very dreadful." Mainly because a former Senator and a dear friend of mine came and said that Kim Jong-un has pathogens now, so look out. Well, we should look out.

So I can promise you that every member of this Committee is aware of this threat, and it is true that with regards to—I just made notes: lack of vaccines, lack of coordination, lack of response capability, obviously lack of funding, and lack of awareness and lack of intelligence capability, and lack of building out HSPD–9 to where the full intent was. Other than that, we are in pretty good shape.

[Laughter.]

Chairman ROBERTS. We do have awareness, these things are set in place. They were not set in place 10, 15 years ago. We have good people working on them, and I want to thank everybody, especially the Panel, for being certainly on point—quite a few times, as a matter of fact, as I recall here, with regards to the timing.

So thank you for your testimony, and to my fellow members, we would ask that any additional questions you may have for the record be submitted to the Committee clerk 5 business days from today or by 5:00 p.m. next Wednesday, December 20th.

The Committee stands adjourned.

Senator LIEBERMAN. Thank you.

[Whereupon, at 11:15 a.m., the Committee was adjourned.]

A P P E N D I X

DECEMBER 13, 2017

College of Agriculture
and Natural Resources
MICHIGAN STATE UNIVERSITY

Raymond Hammerschmidt, PhD, Professor
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Testimony before the United State Senate
Committee on Agriculture, Nutrition and Forestry
"Safeguarding American Agriculture in a Globalized World"

December 13, 2017

Chairman Roberts, Ranking Member Stabenow, and distinguished members of the Committee, thank you for the opportunity to speak with you today.

I am Ray Hammerschmidt, a professor of plant pathology at Michigan State University (MSU) for the past 37 years. I am also the founding and current director of the North Central Plant Diagnostic Network, (NCPDN, one of the regions of the USDA National Institute for Food and Agriculture-supported National Plant Diagnostic Network, or NPDN[1],[2]) faculty coordinator of MSU Diagnostic Services, and have served twice as executive director of the NPDN. Through these activities, I have become very interested in looking at the current and potential threat situations, and how we need to be proactive in safeguarding plant agriculture and natural resources from pathogens and pests.

I'll start by saying that we are ill-prepared to combat pathogens and pests that threaten our food supply and many other important economic drivers. There is a defined set of plant pathogen select agents for which we must be on guard, but there are many other pests and pathogens that can threaten our plant production. There appears to be a lack of urgency across many different levels to address this critical issue, even as it impacts our global food system. Pathogens and pests do not recognize state or intercontinental borders and regulations, and this should give us pause. In some plant systems we are seeing increasing potential for plant pathogens and pests to

[1] Stack, JS, Bostock RM, Hammerschmidt R, Jones JB, Luke E. 2014. The National Plant Diagnostic Network: Partnering to protect plant systems. Plant Disease 98: 708-715.

[2] The National Plant Diagnostics Network, https://www.npdn.org/home. This site has several fact sheets on the impact of the NPDN and links to all labs associated with the NPDN.

jump from one host species to another, as well as the effects of a changing climate. We need to pay more attention and raise public awareness of these important plant disease and pest issues.

Pathogens and pests pose harm not only to plant and animal agriculture, but they also threaten non-edible industries such as the greenhouse and nursery industries. In Michigan alone, there are over 700 greenhouses producing $472 million worth of ornamental and vegetable crops that are susceptible to various threats.

There are also implications on the natural resources side, such as impacts on forestry – including the logging industry – and our planet in general. Movement of a pathogen from one woody host species to another has recently been identified in Michigan. In fact, some pathogens may have a host range that is broader than one or two plant species, resulting in possible introductions to other plants.

Furthermore, pathogens and pests also pose secondary threats to the livestock industry since many crops serve as forage for cattle and other animal agriculture industries and some pathogens produce mycotoxins that contaminate grain and thus harm both livestock and human health.

We know that it is not *whether* a major event will occur, but *when*. It's coming and we need to do more to be better prepared to defend our food supply, our economic vitality and our planet. Before discussing this issue, a little background might be useful.

Development of plant diseases and pests

The most important factors to determine whether an endemic pathogen or one deliberately introduced will cause significant damage are:

- Presence of a pathogen
- Susceptibility of the plant
- Environment conducive to disease

A classic example of how these three factors work together is late blight disease of potato – the cause of major potato losses in Ireland and Northern Europe in the 1840s and one we still battle to this day. This pathogen likely originated in what is now central Mexico and was transported via plants to Europe. The pathogen was severe and spread very quickly because of a favorable environment and lack of resistance in the potato plant.

Resistance was eventually bred into the potato, but this was quickly overcome through mutation and selection of the pathogen. Simultaneously, specific fungicides have lost efficacy as the pathogen, through mutation, has developed resistance to these chemicals.

This scenario has been replicated with many plant diseases, representing risks even with pathogens we have dealt with for years.

Pathogens can also evolve greater virulence or aggressiveness. As early as the 1970s, the U.S. saw a major loss in corn production due to the presence of a newly-evolved strain of the southern corn leaf blight epidemic. In another example, the breeding for rust resistance in oats led to varieties that are very susceptible to what has been a very minor pathogen. Thus, changes in pathogen genotypes can lead to the development of new strains that are even more destructive that the original strain.

Diagnostics laboratories

Early and rapid detection and diagnostics are vital, and preparedness is paramount.

The MSU Plant Diagnostics Laboratory is a major contributor to early detection and accurate diagnoses. The lab conducts tests on about 8,000 samples annually, representing over 100 plant species. The lab has introduced new diagnostic tools for many important diseases. While samples come mostly from agriculture organizations, industry groups and growers, the general public is also served by the lab. On an annual basis, samples from almost every county in Michigan are analyzed, as are samples from several other states.

A one-stop diagnostic destination, MSU Diagnostic Services formed in 1999 when Project GREEEN (Generating Research and Extension to meet Economic and Environmental Needs) united the Arthropod/Insect Diagnostic Lab, the Nematode Diagnostic Service Lab and the Plant Disease Clinic under one roof. This is truly a unique multi-disciplinary lab.

Diagnosticians address insect, nematode, plant pathogen, herbicide/weed problems and combinations of those issues. This is critically important as most plants are susceptible to more than one of these issues. This integrated approach has resulted in greater efficiency and the ability to investigate several thousand more samples per year than similar programs around the country.

With four diagnosticians, each of whom specialize in one of the four major plant pest groups, and two technical support staff members, the lab is one of the largest among the Land Grant University laboratories that collectively form the National Plant Diagnostic Network (NPDN). NPDN laboratories immediately report their findings to appropriate clients, responders and decision makers, resulting in rapid detection, diagnostics, and information needed for mitigation. The NPDN also provide training through education and outreach, and enhanced communication among public agencies and stakeholders responsible for responding to and mitigating new outbreaks.

The NPDN has five hub labs (MSU, Kansas State University, University of Florida, Cornell University and the University of California-Davis) and is financially supported by NIFA through the Food and Agriculture Defense Initiative or FADI. The sister networks supported by FADI are NAHLN (National Animal Health Laboratory Network) and Extension Disaster Education

Network. The NPDN labs work closely with USDA APHIS PPQ to complement their regulatory roles in activities by serving as triage for pathogens of regulatory concern, such as those that cause plum pox and ramorum blight, and assisting in surge diagnostics. Along those lines, all of the labs in the NPDN can be thought of as sentinels, and thus a first line of defense for new and emerging diseases and pests

Accreditation for specific high-consequence pathogens comes through the National Plant Pathogen Laboratory Accreditation Program and is administered through USDA's Animal and Plant Health Inspection Service (APHIS) – which only a few labs, including MSU, have.

Because it is unlikely that we could ever prevent all pathogens or pests from entering the U.S., and similarly unlikely that we can prevent all new outbreaks of endemic pathogens, we must be prepared at many levels to stop these threats before they become an epidemic. First, we must be able to detect new and potentially destructive pathogens and pests. Because of the distributed nature of agricultural and forestry systems, detecting new pathogen development can be difficult. However, this can be assisted through a cadre of "first detectors" who are trained to identify when something new or unusual has occurred.

The MSU diagnostic lab and many others have tools to quickly determine the type of pathogen and then use this information to identify the specific organism by one of several means. Because of the NPDN, we can rapidly and securely communicate about new, emerging and re-emerging pathogens with other laboratories at both the state and federal levels. We need to be prepared to detect all new pests and pathogens rapidly and accurately so that small problems do not escalate into large, devastating problems.

MSU continues to adopt new diagnostic tools and capabilities to ensure that samples can be quickly and accurately diagnosed. A few of the new molecular diagnostic tools to diagnose some of the more devastating diseases such as soybean sudden death, oak wilt, and a new disease – potato soft rot caused by the bacterium Dickeya – have been implemented in the lab. In addition, the capacity to screen for unknowns has also increased so that potential pathogens - even those that are new - can be identified more rapidly.

The NPDN has benefitted from diagnostic trainings on pathogens of regulatory concern that are provided by USDA APHIS Plant Protection and Quarantine (PPQ). In addition, MSU – as the hub lab for the North Central region – and other NPDN hubs have coordinated and hosted diagnostics trainings and provided support for implementing new approaches. The NPDN has also provided a mechanism to support communication among diagnosticians at land-grant universities, State Departments of Agriculture and USDA. The MSU lab also coordinates closely with the Michigan Department of Agriculture and Rural Development lab in diagnostics and exchange of information. Together, they stepped in to rapidly examine around 70,000 samples when Plum Pox was first detected in Michigan.

Needs in Michigan and beyond

Even with ongoing local and national efforts, there is still a need for better detection tools. More sophisticated surveillance equipment, such as drones and detecting other early warning signs of disease and pests such as volatile organic compounds, are needed to survey large acreage crops and natural resource.

We also need to continue to educate and prepare first detectors – individuals who are trained to detect an unusual event and know how to sample and ship samples for diagnosis. Providing this information to outreach programs, Extension educators and crop consultants needs to expand. We also need to arm more members of the general public with educational materials from the NDPN.

Better diagnostic tools and improved diagnostic infrastructure are high on our want list. We will also continue to partner with researchers at the land-grant universities as well as those at USDA APHIS PPQ and USDA ARS to help develop new tools.

Equally important is the need to raise the public awareness about the importance of this issue. This becomes even more complex as we face the challenge of having to double our food supply by 2050, with fewer natural resources and the same amount of land. We need to be more proactive when it comes to both endemic and introduced pathogens and pests. Early detection and diagnosis is critical to reducing the risk. Working with Extension to deliver training and education to first detectors and the general public is one of several strategies that can be used.

Resistance is a constant challenge

Resistance to pest management chemicals is a battle we continue to wage. Research efforts must also focus on developing new varieties that have durable host resistance.

On the herbicide, fungicide and insecticide front, we are working to address decreased efficiency due to resistance. This is only complicated by the fact that the pipeline of new chemistries is drying up. Programs like IR-4 (Interregional Research Project No. 4 – which ensures that pesticides are registered for use on crops) are becoming much more important as we address risks of endemic and re-emerging pathogens and pest.

There is a continual need to develop new and more rapid diagnostic tools for pesticide resistance. With advances in molecular biology and more information available on the genomes of pathogens and other pests, this type of development is occurring. Early detection of pesticide resistance is critical when deploying disease management approaches.

There is also a need to work toward the development of plant varieties that have durable resistance to diseases and pests and find new ways of preventing the onset of pathogen and pest resistance to fungicides, antibiotics, insecticide and herbicides. Changes in host genotypes in relation to pathogen virulence and potential for development of resistance to chemical controls must be taken into account as broader plant protection plans are developed for the future.

The added pressure of climate change

The situation of potentially devastating pathogen and/or pest infestations has become even more complicated by climate change. Temperature and weather play a key role in determining the susceptibility for certain diseases to spread and survive throughout winters, even those in Michigan.

The change in climate may also impact the expression of disease in a positive or negative way. Drier or even wetter conditions may increase the threat of some disease, but these stresses may render them more susceptible. Changing climate may also change cropping systems and with it, growing plants that have different disease susceptibilities. Some pathogens that are less cold tolerant may have expanded northern ranges as overwintering temperatures warm.

In Michigan, potato growers are provided with early season risk assessments for late blight by informing them of the likelihood of tubers left in the field surviving the winter. The blight pathogen can only survive in living tubers, and over the last few years the risk of tuber survival in the field has increased and thus the risk of late blight as well.

At MSU, plant breeders and plant pathologists have teamed up to examine how potatoes will respond to the climate of the future. Using historical weather data dating back to 1980 and climate change projections from the North American Regional Climate Change Assessment Program, they've developed three potential climate models – each for Michigan between the years 2040 and 2070. This range was selected because the models would retain a high degree of accuracy and would give enough time to develop entirely new potato cultivars.

It takes between 10 and 15 years to create a new potato variety from start to finish, so we need to be proactive about identifying the challenges the future could bring. Farmers can't simply change their varieties year-to-year to react to last season's issues. They must look ahead as best they can.

The impact of climate change also varies depending on the potato cultivar. Most potatoes harvested in Michigan are ultimately moved into long-term storage, where they can be preserved for months and provide processors and retailers with product nearly year-round. Examining the impact of climate change on the potatoes' ability to retain their quality in storage is of importance as well.

The climate models and experiments are telling us that we're going to see new stresses on potatoes, and that means we need to develop new varieties that can withstand that type of

environment. And this goes beyond Michigan – it's going to affect all potato-growing states across the northern U.S., which together feed a lot of our country.

Few crops are as important to Michigan as the potato, the top vegetable crop. Michigan farmers have 50,000 acres of potato production, which, along with processing and marketing, generates over $1.24 billion annually and contributes more than 3,200 jobs to the state's workforce.

Climate change is also impacting the apple industry, as apple trees break dormancy earlier every year, running the risk of damage from frost. Higher temperatures and wetter conditions exacerbate major diseases like fire blight and apple scab. For example, a fire blight epidemic in 2000 wiped out nearly 400,000 apple trees in southwestern Michigan and caused over $42 million in losses. To combat rising instances of both diseases, new cultural practices and monitoring for fungicide and antibiotic resistance in the pathogens are being provided to growers for removing fire blight cankers and hastening the decomposition of dead leaves (in which the apple scab fungus overwinters) with fertilizers.

Some Additional Michigan threats

Disease and pests can cause significant economic losses. In Michigan, there are many examples of the spread of new and even re-emerging pathogens. Examples include downy mildew of cucumber, *Phytophthora* fruit and vine rot of cucurbits, sudden death of soybean, fire blight of apple, spotted wing drosophila, stripe rust of wheat and oak wilt. In many of these cases, disease resistance may not be available and this is confounded by the development of resistance to effective pesticides by the pathogens. There is also a risk for pathogens and pests to make their way to Michigan via the busy port of Detroit and Metro Detroit Airport.

To address these issues, forward thinking applied and fundamental research on these and other problems is ongoing at MSU to find sustainable solutions.

Downy mildew: Michigan is the No. 1 producer of pickling cucumbers in the nation. *Pseudoperonospora cubensis* is a fungal-like organism that causes downy mildew disease and can infect a variety of cucurbit crops including cantaloupe, cucumber, gourd, honeydew, muskmelon, pumpkin, squash, watermelon and zucchini. Downy mildew reemerged as a problem on cucumbers in Michigan in August 2005 when the disease spread across the eastern region of the United States and has recurred every year since then.

Spotted Wing Drosophila: This tiny invasive fly has caused fruit growers, including cherries, raspberries and blueberries, great concern. While researchers are feverishly studying this insect, they have yet to find any good controls other than spraying, but we lack the chemicals to treat the pest. Females can deposit up to 100 eggs per day by puncturing the soft skin of the fruit. It arrived from Asia in 2008.

Leaf spot: In 2017, sugar beet growers were on heightened alert for the increased risk for leaf spot. Fungicide resistance has developed in some fungicides and is increasing in the other chemistries. Until new leaf spot-tolerant varieties enter the market, the majority of the highest yield potential varieties are fairly susceptible to leaf spot disease. With sugar prices relatively low and nitrogen cost fairly high, economics will change the most cost-effective rates.

Brown marmorated stink bug: First detected in the United States in 1998, this invasive pest has now spread to 43 states and four Canadian provinces. It is known to prey on over 300 different host plants, including over 100 agricultural crops and ornamental plants. In 2010 alone, the brown marmorated stink bug is estimated to have caused over $37 million in damage to the apple industry across the mid- Atlantic, with some growers losing up to 60 percent of their crop. Current efforts to control the pest include developing an online reporting system to track the population and introducing natural predator wasps from its native range.

Removing pathogens from greenhouse water: a new approach to disease management

Addressing these issues takes a multidisciplinary approach and that research is underway at MSU. Consider this example: a soil physicist has teamed up with a plant pathologist to better understand and prevent the transportation of plant pathogens in greenhouse systems. They are focused on removing *Phytophthora* and *Pythium*, water molds that wreak havoc on a wide range of crops, from nursery and greenhouse waste water so it can be reused. Spores from these molds called zoospores can travel through water and infect neighboring plants, a chain reaction that can quickly devastate a grower's operation.

They focused on methods to retain *Phytophthora* zoospores in the filtration process, analyzing the retention ability of porous media such as iron-oxide-coated sand and uncoated sand in a range of solutions at different pH levels. The filters function similarly to household units attached to faucets, but the media in those filters is typically activated carbon. The group found that the iron-oxide-coated sand retained zoospores at a greater rate in higher-pH solutions. Both the coated and uncoated sand performed well in low-pH solutions.

These findings indicate that filtering the pathogen can be effective and is optimized when the environment is better controlled — an encouraging sign for greenhouse systems. The team has most recently constructed a water-recycling unit using the same filters. In trials with squash and poinsettias, iron-oxide-coated sand filtration again proved effective, outperforming both activated carbon and a fungicide treatment with no filter. The results bode well for implementing recycled-water systems, which require less water, fungicides and pesticides.

In summary

Pathogens and pests will continue to evolve in ways that overcome host resistance and chemical control tools thus making endemic and re-emerging pests more dangerous. Some may even find new hosts. Environmental stresses on plant growth can also lead to more extensive damage caused by pests and pathogens. Because of global trade, we are at risk of introducing new pests and pathogens as well as variants of endemic species. Thus, the threat to plant systems can come from many different directions, and the need for proactive detection and diagnostic technologies, and enhanced preparedness at all levels is more important than ever before.

Thank you again for the opportunity to speak with you today and I look forward to addressing your questions.

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December 13, 2017

Hearing of the Senate Committee on Agriculture, Nutrition, and Forestry
"Safeguarding American Agriculture in a Globalized World"

Statement for the Record

Chairman Roberts, Ranking Member Stabenow, and Members of the Committee: Thank you very much for inviting me here to provide my perspective on safeguarding animal agriculture, which I offer you on behalf of the bipartisan Blue Ribbon Study Panel on Biodefense, an initiative I co-chair with former Governor Tom Ridge. We spent the last year evaluating challenges in agrodefense and developing recommendations, and I am glad to bring those to you today.

I would like to thank all of the Study Panel Members whose input into the report informed this testimony: Governor Ridge, former Secretary of Health and Human Services Donna Shalala, former Representative Jim Greenwood, former Homeland Security Advisor Ken Wainstein, and most especially former Senate Majority Leader Tom Daschle, who led the Panel to take up this important issue. Senator Daschle trekked out to Manhattan, Kansas on a cold January day earlier this year to convene many of the brightest minds on this topic at Kansas State University. That visit informed much of the Panel's work that followed.

Animal agriculture is central to the health and well-being of the American people and the U.S. economy. Our Panel wanted to better understand the continued risks at the nexus between animal agriculture and national security. We looked at both direct threats to agriculture and indirect threats to human health. Zoonoses – those pathogens that can infect both animals and people – comprise the vast majority of emerging infectious disease threats faced by humans. They are also the pathogens our intelligence community is most concerned about terrorists acquiring. The increasing rate of emerging and reemerging animal diseases, along with threats and attempts by those with the intent to attack food and agriculture, mean there is an urgent need to reduce the biological risk to America's food and agricultural sector.

The federal government's proud history in protecting American agriculture goes back a long way. The Department of Agriculture (USDA) was established in 1862 in the days preceding post-industrial scientific advances we now take for granted. In 1884, it led a successful effort to eradicate contagious bovine pleuropneumonia, in just eight years. It also worked to understand, control, and eradicate Texas cattle fever, a major pest of early American livestock operations. Through these and many other efforts, the USDA protected American farmers' livelihood, their animals, and the domestic and international commerce that depended on them.

These roots are important. They demonstrate the government's proper place in the protection of livestock, as well as human and economic health. They also remind us that, given the complex layering of public and private systems today, agricultural protection is a complicated project that requires significant cross-sectoral coordination and a commitment to public-private partnerships. Like many critical infrastructure sectors, agriculture is primarily privately owned. In 2015, it contributed to 5.5% of our gross domestic product.

A century-and-a-half after the early trials and successes in livestock disease management, the December 2014 emergence of a highly pathogenic strain of avian influenza in the United States resulted in the largest animal health disaster ever experienced on U.S. soil. The total cost to the U.S. economy was estimated as high as $3.3 billion. Experts are extremely concerned about the potential for a mutated avian influenza virus to race through the human population, a view echoed by the White House Senior Director for Global Health Security and Biothreats, Rear Admiral Tim Ziemer, before the Study Panel just last month.[1]

Yet this close biological connection between people, animals, their environments, and the pathogens that can infect them has not always meant close policy connections. Policy approaches to biodefense (see Homeland Security Presidential Directive 10, HSPD -10) and agricultural security (see HSPD-9) have often been described as separated from one another. Despite the enormity of agriculture as a component of our economy, and despite the realistic concern of zoonoses arising, inadequate attention and funding is more severe in the animal and environmental health sectors than in public health. In FY 2017, the agriculture protection function represented a mere 0.76% of the total federal homeland security budget request.[2]

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[1] Comments of Rear Admiral Tim Ziemer before the Blue Ribbon Study Panel on Biodefense, November 2, 2017. Public meeting, "National Biodefense Strategy: Implementation and Implications." Video archive available at https://www.youtube.com/playlist?list=PLr5tk1Hf6CeNa7H9-UxSX61Re9NuCdmdx

[2] Office of Management and Budget. (2017) *Analytical Perspectives: Budget of the U.S. Government, Fiscal Year 2017*. Washington, DC: U.S. Government Printing Office.

Our Panel believes that agricultural defense, while it has unique elements, should not be walled off from other biodefense efforts: agriculture is a critical element of our biological existence and threats to it must be viewed through the same lens as threats to or from other biological entities. In recognition of the critical nexus between human and animal health, we evaluated this matter over the last year, and discuss our detailed findings and recommendations in our 2017 report, *Defense of Animal Agriculture.*

We found both significant achievements and serious gaps in our capacity and capability to defend against major biological events. The key challenges we identified are:

1. **Lack of policy and fiscal ownership.** Agricultural defense is a broad and complex mission space that necessitates the significant involvement of most federal departments and agencies. The reality of the immediate ownership of food and agriculture assets by the private sector, and the sector's significant contribution to territorial, tribal, local, state, and federal economies, necessitates substantial federal collaboration with non-federal stakeholders. White House-level leadership is, therefore, critical to minimize overlap, identify mission gaps, and coordinate effort. Department-level leadership is also necessary. Department of Homeland Security (DHS) investments in the development of the National Bio- and Agrodefense Facility (NBAF), and USDA commitment to funding response activities, demonstrate their acknowledgement of the threat. However, current funding levels in areas such as biosurveillance and medical countermeasures (MCM) are insufficient to address mission needs. Experts have expressed concern to us that the NBAF itself may not receive sufficient operational support once it is open for business. Agrodefense appears to be an orphan, with long-view funding and policy priority finding a home in neither DHS nor USDA.

2. **Insufficient fiscal support for key programs.** Aside from the notable (and expensive) NBAF construction effort, agriculture security is a tiny portion of the federal budget. Indeed, the President's Budget Request for FY 2018 would eliminate agriculture research and development from the DHS budget entirely. Although Congress and the Administration have supported a variety of programs designed to prevent and respond to outbreaks of animal diseases, the level of support has not always been commensurate with the threat or risk. Suboptimal investment in MCM, diagnosis, and integrated biosurveillance means we are less prepared than we ought to be. Further, the worse the outbreak, the less prepared we are for it. Detection and surveillance have been hampered by insufficient focus on rapid pen-side diagnostics, and insufficient investment to develop new wildlife disease detection technologies and validate existing tests. Although improving, federally integrated biosurveillance remains perpetually challenged by

information sharing problems. Some areas of potential risk, particularly with respect to companion and urban animals, are minimally addressed at all.

3. **Insufficient promotion of innovation.** On balance, the status quo is inadequate to protect the food and agriculture sector from a major attack or outbreak. The nation needs new ideas and scientific solutions to drive agrodefense approaches beyond their current limitations. The National Veterinary Stockpile (NVS) has essentially become a minimally-funded vehicle for MCM distribution, rather than an end-use driver for federal identification, procurement, and stockpiling of priority MCM. To meet the requirements of HSPD-9, far greater investments in advanced research and development are also necessary. Focused investment in pen-side, innovative diagnostic technology, and in better laboratory-based technology to enable rapid assessment for state, local, tribal, and territorial animal health officials, will enable earlier decision-making.

Our Blue Ribbon Study Panel on Biodefense developed a series of proposals that, if implemented, would help manage these challenges. I refer the Committee to our full report, *Defense of Animal Agriculture*, for our complete proposed solutions. Here I highlight three areas of focus for the Committee's consideration:

1. **Leadership, management, and budgeting.** High-level leadership is needed to drive federal activity toward a level commensurate with the threat. The first way the White House can exert this leadership is by ensuring that the National Biodefense Strategy meaningfully addresses threats to food and agriculture. The second way is to ensure that detailed agrodefense expenditures are incorporated into a cross-cutting biodefense budget analysis. Congressional oversight would benefit significantly from a detailed budgetary cross-cut that outlines how much each agency is spending toward agrodefense and for what projects, programs, and activities. The Panel has previously stated that, due to myriad departments and agencies involved in biodefense, a far more integrated approach to budgeting their activities is needed. Agrodefense should be part of this reformed approach, which ultimately should take the form of a comprehensive biodefense budget request summary that collates and justifies all individual department and agency requests in the context of the overall national strategy. In their annual requests, departments and agencies should provide outcome-based evidence of program effectiveness in meeting requirements, and propose requirement areas that would benefit from new investment. For major projects, the White House and Congress should require departments and agencies to develop business plans, which should emphasize interagency coordination and public-private partnerships; the National Bio- and Agrodefense Facility should have such a plan.

2. **The national veterinary medical countermeasure posture.** We can, in part, mitigate the threat to livestock with MCM. Despite gains, the availability of MCM for animals lags far behind what is needed, and does not meet the requirement from HSPD-9 to deploy sufficient high-consequence animal disease MCM within 24 hours. The NVS $4 million annual budget appears based on historical precedent, rather than present-day risk-informed resource allocation. While the NVS does maintain supplies like personal protective equipment and depopulation equipment, which have been distributed and used successfully in recent outbreaks, from an MCM standpoint it is entirely inadequate. A commitment by Congress to authorize the NVS would send a strong message that the Stockpile is a necessary national asset. Of course, any stockpile is only as strong as its inventory. We echo the evaluations of many experts who have testified here and before other committees that we must establish a foot-and-mouth disease (FMD) antigen bank, one tied to a vaccine usage policy that would rescue the United States in an FMD emergency. We must also ensure that any stockpile is well equipped with diagnostics. The NVS should maintain diagnostic test kits for all diseases for which vaccines are stockpiled, with an emphasis on point-of-use diagnostics.

3. **The state of animal-based biosurveillance.** Improving capacity for rapid detection of dispersed or circulating biological agents is pivotal. Biosurveillance and biodetection enable prevention. The establishment of a prevention fund for animal health, much as was created by the Food, Conservation and Energy Act of 2008 for plant health, would create a legislative basis for prevention activities. Such a fund could encompass programs like the National Wildlife Disease Surveillance Program, which operates on a shoestring. The Committee should evaluate and determine the full need and funding requirements for a sustained capability to detect, validate, and warn of threats impacting and transmitting through wildlife within the United States. Finite funding may necessitate a risk-based approach, but this is far preferable to a reactionary approach. The National Animal Health Diagnostic Laboratory Network (NAHLN) can help support such an effort. The NAHLN works to detect biological threats to food animals. The Committee should assess whether authorized levels of funding are sufficient to accomplish its mission on a daily basis, and to meet diagnostic surge demand in the event of an outbreak. Finally, although USDA has published an interim rule establishing a National List of Reportable Animal Diseases (NLRAD), it has yet to be finalized. The Committee should consider language expressing the Committee's support for the NLRAD Framework, urging its finalization, and encouraging swift efforts to execute a corresponding reporting regimen.

I also wish to recognize the growing partnership between the agriculture and law enforcement sectors, both locally and at the federal level. This is evidenced, for instance, by the long-term joint development by the USDA, Federal Bureau of Investigation, and Food and Drug Administration of the *Criminal Investigation Handbook for Agroterrorism,* and through a more recent process to update the *Food and Agriculture Incident Annex* in a manner that recognizes that agriculture can be the target of terrorism. We hope to see more of this kind of coordination among federal departments and agencies.

One last element I wish to emphasize is that while animal agriculture is a major consideration for the Committee as it considers the Farm Bill, we cannot attain complete situational awareness or prevention and response capacity if we ignore wildlife (rural and urban) or companion animals. The latter in particular are embedded into our lives and culture, but associated zoonotic disease risk is not well considered. We lack sufficient biosurveillance efforts to detect spillover events, and have not developed guidance for localities on how to manage such an event if it were to happen.

The good news is that the White House is now completing the National Biodefense Strategy, and the USDA and many other departments are seated at the table in drafting it. We have reason to believe that the drafters comprehend that human, animal, and environmental health are inextricably linked, and that the Strategy and its implementation plan will be grounded in that understanding. The White House should seize the momentum generated by this process and lead all relevant agencies to a new level of planning and operating with respect to biodefense that treats animal, human, and environmental health efforts as mutual contributors to our national, economic, and health security.

In closing, I would like to thank the numerous organizations that support the Study Panel's work through their generous financial donations. I would further like to state my gratitude to Hudson Institute for serving as the Panel's fiscal sponsor.

TESTIMONY SUBMITTED TO

THE US SENATE

United States Senate Committee on
Agriculture, Nutrition, and Forestry

Washington, DC

Safeguarding American Agriculture in a Globalized World

Promoting Agrosecurity and Ensuring Preparedness and Response Capability to Animal Disease at the State and Local Level

Submitted By
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Chairman Roberts, Ranking Member Stabenow, and Members of the Committee on Agriculture, Nutrition, and Forestry, I am Dr. Doug Meckes, and I serve as the State Veterinarian and the Director of the North Carolina's Department of Agriculture and Consumer Services' (NCDA&CS) Veterinary Division. The division includes 150 employees that serve the poultry livestock industries, manage and operate the state's four veterinary diagnostic laboratories, and are charged with implementation of the Animal Welfare Act in kennels and shelters caring for companion animals in North Carolina. Thank you for the opportunity to speak about matters of concern in North Carolina's ongoing efforts to prepare for, respond to, and communicate with stakeholders during agricultural emergencies.

North Carolina enjoys a robust agriculture and agribusiness industry which contributes nearly $84 billion annually to North Carolina's economy, more than 17% of the state's gross domestic product, and accounts for 17% of the state's employees. North Carolina's agriculture/agribusiness industry is part of the greater Food and Agriculture Sector (FA Sector), designated a critical infrastructure sector in 2003 by the Department of Homeland Security (DHS) thus recognizing its significant contribution to national security and the economy. This sector is composed of complex production, processing, and delivery systems, and has the capacity to feed people and animals both within and beyond the boundaries of the United States. These food and agriculture systems are almost entirely under private ownership, operate in highly competitive global markets, strive to operate in harmony with the environment, and provide economic opportunities and an improved quality of life for American citizens and others worldwide. The FA Sector accounts for roughly one-fifth of the nation's economic activity.

North Carolina's animal agriculture industry, comprised of livestock, dairy, and poultry, accounts for 68% of farm cash receipts. North Carolina ranks second in hog production and third in overall poultry production in the nation. Maintaining production at these levels is dependent upon ongoing access to export markets. In any given year the pork industry exports 26-28% of product, the poultry industry exports 18%, the beef industry 14-16%, and the dairy industry 14% of production. Raising healthy animals, free of disease, ensures competitiveness of North Carolina's animal agriculture products in the international marketplace. The Veterinary Division stands in support of efforts by the animal agriculture industry to achieve that end through the implementation of appropriate agrosecurity and ongoing efforts to prepare for and respond to animal disease.

Prior to accepting this position in North Carolina in 2014, I spent seven years in Washington, DC, with the Office of Health Affairs (OHA) within DHS. For five and a half of those years, I was fortunate to serve as Branch Chief of the Food, Agriculture and Veterinary Defense Branch. The Assistant Secretary for Health Affairs served as the designated DHS official accountable for implementation of the department's responsibilities for veterinary, food, and agriculture security and also coordinated the department's responsibilities outlined in Homeland Security Presidential Directive 9 (HSPD-9), Defense of United States Agriculture and Food. Both tasks fell to the Food, Agriculture and Veterinary Defense Branch.

Today, as we consider our topic, Safeguarding American Agriculture in a Globalized World, a revisit of HSPD-9 is surely worth the effort. Released in January 2004, HSPD-9 "established a national policy to defend the agriculture system against terrorist attack, major disasters and other emergencies." Included in HSPD-9 were 18 "line items" which provide guidance to address then-identified gaps in the nation's ability to defend agriculture and food. Thirteen years later, progress has been made in addressing some of the gaps, including a star in the crown of agriculture and food defense. Line Item 24 in HSPD-9 called for the design and initiation of construction for "safe, secure, and state-of-the-art agriculture biocontainment laboratories that research and develop diagnostic capabilities for foreign animal and zoonotic diseases," which has become the National Bio and Agro-Defense Facility in Manhattan, Kansas. The success of this project is testament to the dedication and determination of the Office of National Laboratories (ONL) in the Science and Technology Directorate (S&T) of DHS, and their colleagues at the United States Department of Agriculture (USDA). This achievement notwithstanding, other gaps in HSPD-9 have not been sufficiently addressed.

Of greatest concern to state animal health officials is the absence of vaccine for use in response to the introduction of a foreign animal disease. That is certainly the case in North Carolina, home to nine million pigs east of I-95. HSPD-9 Line Item 18(a) called for "a National Veterinary Stockpile (NVS) containing sufficient amounts of animal vaccine, antiviral, or therapeutic products to appropriately respond to the most damaging animal diseases affecting human health and the economy and that will be capable of deployment within 24 hours." We have not yet achieved this goal. Our animal agriculture industry remains as vulnerable to foreign animal diseases today as it was 13 years ago; particularly concerning is Foot-and-Mouth Disease (FMD). In the event of an FMD outbreak in the US, the North American Foot-and-Mouth Disease Vaccine Bank would be "triggered." The vaccine bank is a shared resource among the US, Canada, and Mexico, containing those types or subtypes of virus thought to be a threat to the US. However, the quantities of antigen available would yield only enough vaccine (2.5 million doses of any type/subtype) to respond to a small, confined outbreak.

The size, structure, efficiency, and extensive movement that is inherent to the nation's livestock industry will present unprecedented challenges in the event of an FMD outbreak. No country with a livestock industry comparable to that of the US has had to deal with an outbreak of FMD, and the impact would extend far beyond animal agriculture. On any given day, approximately 400,000 cattle, one million swine, and 25 million poultry are on the road, in movements to other stages of production or processing. Of particular concern to North Carolina are requirements, in modern swine production, for extensive animal movement. The identification of FMD in the United States would bring about an immediate stop-movement of all animals until the extent of the outbreak is better understood. Such a stop-movement could necessitate the euthanasia of animals for welfare reasons because facilities which house animals would quickly become overcrowded.

An FMD outbreak in a livestock-dense area of the US cannot be controlled without immediate access to millions of doses of FMD vaccine. Currently, availability of that amount of vaccine would require weeks to months to produce, depending on type/subtype of virus. The trade implications of such an event are staggering. Trading partners of the US would cease the import of beef, dairy products, and pork the day the virus is identified in the US. In 2011, Dr. Dermot Hayes and colleagues at Iowa State University published "Economy Wide Impacts of a Foreign Animal Disease in the United States." Hayes' group estimated that over 10 years, the cumulative loss due to an uncontrolled FMD outbreak in the United States would be $199.8 billion. It is time to move forward with the development of a more robust US FMD vaccine bank.

Line Item 14 of HSPD-9 directs the participating departments/agencies to ensure "that the combined Federal, State, and local response capabilities are adequate to respond quickly and effectively to a terrorist attack, major disease outbreak, or other disaster affecting the national agriculture or food infrastructure." We are fortunate in North Carolina, for even before HSPD-9, members of the NCDA&CS recognized the need for such a capability in response to several local, national, and international events. In September 1999, Hurricane Floyd made landfall in North Carolina. The hurricane, and associated weather conditions before and after, resulted in the most severe flooding and devastation in North Carolina's history. That flooding resulted in an estimated $813 million in agricultural losses affecting 32,000 farmers. In addition to crop losses, livestock losses – almost three million poultry, 28,000 swine, and 600 cattle – created problems associated with disposal of the carcasses of the animals.

At the national level, the attacks of 9/11 and the subsequent 2001 anthrax attacks, also known as Amerithrax, brought new concerns of attacks to the United States' agricultural economy. The likelihood of

"agroterrorism," the deliberate introduction of an animal or plant disease for the purpose of generating fear, causing economic losses, or undermining social stability, took on new meaning.

And finally, an international example of the vulnerability of our agricultural economy was the February 2001 outbreak of FMD in the United Kingdom. This caused a crisis in British agriculture and tourism. Over 10 million sheep and cattle were depopulated in an eventually successful attempt to halt the disease, but at an incredible cost to the UK agricultural community and overall economy. By the time the disease was controlled, in October 2001, the crisis was estimated to have cost the United Kingdom $16 billion (US$).

In the midst of these events, between 1999 and 2002, NCDA&CS took on the task of developing capabilities to better protect North Carolina's animal health and to formulate a plan to meet the challenges of agriculture and food in the 21st century. The sum of those efforts was the creation of the Emergency Programs Division (EP Division) within the department. The mission of the division is to "reduce the vulnerability and minimize the impact from any natural or man-made disaster, disease outbreak, or terrorist attack for the department, the people and the agricultural interests of the state and to facilitate a rapid return to normalcy." The Emergency Programs Division, which is a unique operating entity in North Carolina (few other states have copied this model), is a vital partner to the Veterinary Division in preparing for and responding to agricultural disasters throughout the State of North Carolina. Additionally, because of its unique mission, NCDA&CS's Emergency Programs Division is fully integrated into the State Emergency Management Division's operational structure (when response at the state level involves agriculture issues). That integration ensures engagement at the local level during incidents as well. At the federal level, North Carolina preparedness and response capabilities are well recognized, and during catastrophic events North Carolina and

our federal emergency response colleagues seamlessly engage to manage incidents of great consequence.

The continued refinement of preparedness and response capabilities over the years has resulted in a team of agricultural and emergency management personnel ready to respond to any incident, fully engaged at the federal, state, and local level. In years past, the EP Division has participated in response to animal disease, food illness outbreaks, wildfires, and, of course, hurricanes. Today's response capabilities stand in sharp contrast to the department's abilities prior to 2002. In October 2016, Hurricane Matthew made land-fall in Eastern North Carolina with flooding greater than what occurred during Hurricane Floyd, and with more livestock on the ground than 1999. However, as a result of the EP and Veterinary divisions' preparedness efforts, the losses were significantly less: 2,800 pigs, 1.9 million poultry, and only a few cattle. All carcasses were properly managed, facilitated by $3 million in Public Assistance Grants from FEMA for the purchase of carbon source for use in composting. This was the first time FEMA supported such an effort in a mass animal mortality incident, and there were no environmental consequences or public health concerns associated with agricultural impacts of the storm. Additionally, members of the EP and Veterinary divisions have deployed in a variety of other incidents around the country to assist our state agriculture colleagues. In the most recent of such activities, depopulation teams went to Minnesota and Iowa during the 2015 Avian Influenza outbreak, emergency planning teams were sent to Texas to assist in Hurricane Harvey response, and emergency planning teams were deployed to Puerto Rico and the US Virgin Islands to assist in Hurricanes Irma and Maria response.

Today, the EP Division has reached maturity and its sphere of operation is considered All-Hazards in nature, and as such, the division is actively engaged in the support of other divisions within the department. EP

collaborates and coordinates with other departments and agencies across local, state, and federal government, as well as with industry and academia. The development of that capability has been funded by the state and through various federal grants– some $7.3 million in federal money and $18 million in state money. This relatively small investment over the years has brought the vision of HSPD-9's Line Item 14 fully to fruition in North Carolina. With additional funding targeted for such programs, similar capability could be developed in other states.

Finally, I will address the issue of veterinary diagnostic laboratory capacity in North Carolina and across the nation. Line Item 8 of HSPD-9 states:

> "the Secretaries of the Interior, Agriculture, Health and Human Services, the Administrator of the Environmental Protection Agency, and the heads of other appropriate Federal departments and agencies shall build upon and expand current monitoring and surveillance programs to:
>
> (c) develop nationwide laboratory networks for food, veterinary, plant health, and water quality that integrate existing Federal and State laboratory resources, are interconnected, and utilize standardized diagnostic protocols and procedures."

The National Animal Health Laboratory Network (NAHLN) was developed as a result of this directive and is now part of a nationwide strategy to coordinate the work of all organizations providing animal disease surveillance and testing services. NAHLN is an early warning system for emerging and foreign animal diseases and provides surge capacity for the necessary testing during disease outbreaks and during the recovery phase. This surveillance and emergency response system provides critical and ongoing resources for lab testing, information management, quality assurance, and the development and validation of new tests. During the recovery phase, testing is necessary to establish a

"disease-free status" which also assures international trading partners of that status.

NAHLN's importance was amply demonstrated during the highly-pathogenic avian influenza outbreaks when thousands of samples were tested within hours to ensure depopulation of infected flocks. NAHLN performed surveillance in surrounding areas to halt disease spread, to test premises to determine freedom of disease before repopulation could occur, and to allow resumption of international trade.

As one of the 12 original NAHLN laboratories, North Carolina's Rollins Veterinary Diagnostic Laboratory in Raleigh is designated as a core laboratory. A core member laboratory receives significant infrastructure support from USDA – USDA-National Institute of Food and Agriculture's (NIFA) Food and Agriculture Defense Initiative, and USDA-Animal and Plant Health Inspection Service (APHIS) – and conducts fee-for-service testing for USDA. Their funding level enables these laboratories to be fully committed to the NAHLN mission and able to respond to domestic or foreign animal disease emergencies on a 24/7 basis. In addition, the Rollins Laboratory receives state-appropriated funds for salaries and expenses, operations, and maintenance.

Safeguarding American agriculture in a globalized world remains as much a concern now as it was in 2004 with the release of HSPD-9. I have spoken here today of three HSPD-9 Line Items that are of importance to North Carolina. The first, Line Item 14 of HSPD-9, directs the participating departments/agencies to ensure "that the combined Federal, State, and local response capabilities are adequate to respond quickly and effectively..." I trust this testimony allows you to appreciate the wisdom of those in North Carolina who had the foresight to develop the capability that has enabled the state to respond to the myriad events that have transpired over the intervening years. Through floods, fires, animal disease, human disease, food contamination,

drought, and hurricanes, our Emergency Programs Division has been on the forefront of them all, and we have been well-served by their efforts. This asset was created for a relatively small investment over the years. Going forward, continued state and federal funding will be necessary to maintain current capability, develop new capability, train and exercise, and replace equipment as needed. Unfortunately, funding for this program continues to decline and places the state's preparedness and response capability at risk.

Of greatest concern for North Carolina is the matter of Line Item 18(a) which speaks to the necessity of developing a National Veterinary Stockpile (NVS) containing sufficient amounts of animal vaccine, antiviral, or therapeutic products to appropriately respond to animal diseases, of which FMD stands alone as the most consequential. The pork industry, the economy, communities, businesses, and families in North Carolina would be devastated by an FMD outbreak. Recovery, if a recovery is even possible, would be years in the making. A cooperative, collaborative effort, which includes all stakeholders – industry, federal, state, and academic partners – must be initiated in short order to develop and implement a plan for establishing the US Foot-and-Mouth Disease Vaccine Bank to protect American animal agriculture.

Finally, Line Item 8(c) of HSPD-9 directs the responsible departments and agencies "to develop nationwide laboratory networks for food, veterinary, plant health, and water quality that integrate existing federal and state laboratory resources, are interconnected, and utilize standardized diagnostic protocols and procedures." North Carolina's Veterinary Diagnostic Laboratory System, as a part of the NAHLN, effectively surveilles for and diagnoses animal and zoonotic diseases. However, state and federal support of, and full funding for, the nation's NAHLN laboratory system are necessary to optimize service to stakeholders and the nation. The absence of full funding was recently noted in the BIPARTISAN REPORT OF THE BLUE RIBBON STUDY PANEL ON BIODEFENSE. The report states:

> "The National Animal Health Laboratory Network (NAHLN), an effort to detect biological threats to the nation's food animals, is necessary for effective biosurveillance. The NAHLN is a public-private cooperative effort between the USDA, the American Association of Veterinary Laboratory Diagnosticians, and publicly funded state veterinary diagnostic laboratories. The collective and integrated work of its members allows for improved detection of emerging and zoonotic diseases, which helps protect animal health, public health, and the food supply. The veterinary diagnostic labs that are members are quite literally on the front lines of disease detection. Established in 2002, the NAHLN is funded through a combination of grants, fee-for-testing services, and administrative support from USDA. It has struggled to maintain even $10 million worth of annual funding, its appropriations cut over the years to pay for other programs. As a result, the laboratories are unable to meet the threat and have at times eliminated positions and testing capacity for foreign animal diseases. Ten million dollars is a very small price to pay to protect one of America's major industries and portals for disease emergence. After the NAHLN struggled for years to obtain sufficient funding, in 2014 Congress authorized a specific funding line at $15 million per year. NAHLN must be funded to this authorized level in order to meet the need."

In closing, let me say that while I have addressed only three Line Items of HSPD-9, several others are worthy of another look. But in speaking with many of my state animal health official colleagues, particularly those in animal agriculture-dense states, I believe the issues addressed above to be of immediate concern and worthy of our attention. As I am certain you all are aware, numerous animal agriculture groups, animal science organizations, and veterinarians support a new Animal Disease and Disaster Prevention Program for inclusion in the 2018 Farm Bill. This program, which speaks specifically to ensuring fully-trained,

appropriately-equipped, response-ready teams at the state level (not unlike the Emergency Programs Division that exists here in North Carolina), and increased support for the NAHLN laboratory system to enhance the nation's animal disease prevention efforts. Additionally, a proposal for establishing and funding a robust US Foot-and-Mouth Disease Vaccine Bank for inclusion in the 2018 Farm Bill is considered a top priority by many in the animal agriculture industry.

Thank you for the opportunity to speak today, on behalf of North Carolina, about issues of concern related to the defense of agriculture and food.

Hearing of the United States Senate Agriculture Committee

December 13, 2017

Statement for the Record

Richard B. Myers[1]
President
Kansas State University

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, "Safeguarding American Agriculture in a Globalized World."

THREATS AND CONSEQUENCES

Food insecurity is an ever increasing global problem as delineated in a 2015 assessment by the intelligence community.[2] Hungry people are not happy people. America still feeds the world, so there is an urgent need to protect America's food crops, food animals, and food supply from naturally occurring and intentionally delivered biological threats. Either could be devastating.

One of the early discoveries when our troops went into Afghanistan in 2002 was a list of 16 pathogens *al-Qaeda* was planning to use as bioweapons. Only 6 of them targeted people. Another 6 were pathogens of livestock and poultry and 4 were crop pathogens. So, *al-Qaeda* wasn't just planning to attack people with biological weapons; they were going after agriculture and food as well.

al-Qaeda has always had a goal of destroying the U.S. economy, so bioweapons targeting crops, livestock and poultry is consistent with that objective. Moreover, natural infectious disease outbreaks could lead to the same outcome.

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, rice, and maize – making up two-thirds of this."[3] Ninety percent makes the protection of food crops rather significant.

If wheat, rice, or corn are targeted successfully by *al Qaeda* or other bioterrorists or if there's a natural disease outbreak that devastates the global supply of any one of the three, the world will be in big trouble. The Wheat State takes such matters seriously.

Although it didn't turn out to be a global disaster, the pathogen Wheat Blast hitting Bangladesh in 2016 certainly wreaked havoc there. Wheat Blast can kill 100% of crops, and it likely got to Bangladesh in a shipment of grain from South America where it's endemic. The outcomes were devastating in areas of the country where it occurred, and even though infected fields were

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[1] U.S. Air Force General (Ret.); 15th Chairman of the Joint Chiefs of Staff; October 01, 2001 – September 30, 2005
[2] *Intelligence Community Assessment: Global Food Security*, ICA 2015-04; September 2015
[3] See United Nations Food and Agriculture Organization: http://www.fao.org/docrep/u8480e/u8480e07.htm

burned, there was a recurrence in 2017; the new outbreak spread to India too. The U.S. should consider restricting grain shipments here from South America to avoid a similar outcome.

With 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 baby pigs dying, and significant financial losses incurred by producers drove up the cost of pork markedly. It's suspected PEDv came to the U.S. in feed products from China, but the FBI still hasn't confirmed whether the virus got here by accident or intentionally. There are reasons to suspect the latter. Either way, the impacts were substantial, and PEDv is now an enduring endemic problem to deal with in the U.S., not a FAD threat.

There are innumerable FAD threats that the U.S. must worry about today, and the top-line FAD concerns are those currently projected to be worked on in the U.S. Department of Homeland Security's (DHS's) $1.25 billion National Bio and Agro-defense Facility (NBAF) under construction on the K-State campus. These include the livestock-only threats, African Swine Fever (ASF), Classical Swine Fever (CSF), and Foot and Mouth Disease (FMD), along with the zoonotic threats, Rift Valley Fever (RVF), Japanese Encephalitis (JE), Nipah virus, and Ebola virus. Any of these and innumerable other FADs could ravage America's agricultural infrastructure, food supply, and economy if they hit the U.S. Furthermore, zoonotic FADs could devastate public health as well, and until NBAF is operational in 2022/23, there's no U.S. laboratory where livestock research can be conducted on Nipah and Ebola.

FOUNDATIONAL EFFORTS

Defense of U.S. Agriculture and Food – Homeland Security Presidential Directive/HSPD-9[4]

Delineating the federal role in bio/agrodefense post-09/11, President Bush issued Homeland Security Presidential Directive/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."*[4] Along with a number of other systems vital to U.S. survival and prosperity, the agriculture and food sector was appropriately noted to be "critical infrastructure."[5]

HSPD-9 Roles and Responsibilities:

A defined chain of command is critical to accomplish any national security mission. That's true for bio/agrodefense – defending the homeland agriculture and food system – just as it is for every other aspect of national defense. The leadership roles per HSPD-9 are as follows:

- **Secretary of Homeland Security** — As established in HSPD-7,[6] the Secretary of the Department of Homeland Security (DHS) "is responsible for coordinating the overall national effort to enhance the protection of critical infrastructure and key resources of the United States."

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[4] Homeland Security Presidential Directive/HSPD-9 – *Defense of United States Agriculture and Food*; Jan. 30, 2004
[5] As delineated in Section 1016(e) of the USA PATRIOT Act of 2001 [42 U.S.C. 5195c(e)]
[6] Homeland Security Presidential Directive/HSPD-7 – *Critical Infrastructure Identification, Prioritization, and Protection*, December 17, 2003

- **Secretaries of Agriculture, Health and Human Services and the Administrator of the Environmental Protection Agency** — The two Secretaries and the Administrator "will perform their responsibilities as Sector-Specific Agencies as delineated in HSPD-7:"[7]
  - For the U.S. Department of Agriculture (USDA), sector-specific responsibilities mean agriculture and food (meat, poultry, and egg products);[7]
  - For the Department of Health and Human Services (DHHS), it means public health, healthcare, and food (other than meat, poultry, and egg products);[7] and
  - For the Environmental Protection Agency, sector-specific means drinking water and water treatment systems.[7]

Thus, DHS was named to lead bio/agrodefense, with USDA, DHHS, and EPA supporting. Other departments and agencies also provide support with the HSPD-9 requirements that follow.

HSPD-9 Requirements:

- **"Awareness and Warning"[8]** — Knowing what's happening over-the-horizon – beyond U.S. borders – is vital if America is to be prepared to confront emerging biological threats; if the U.S. is to respond quickly and decisively to defeat the threat.
  - HSPD-9 required the development of "robust, comprehensive, and fully coordinated surveillance and monitoring systems"[8] for diseases of animals, plants, wildlife and people along with threats to food and water quality. This system was to include nationwide diagnostic networks for "food, veterinary, plant health and water quality."[8] The Department of the Interior (DOI), USDA, DHHS, EPA and other departments and agencies would develop the systems.
  - HSPD-9 required "intelligence operations and analysis capabilities focusing on agriculture, food, and water sectors."[8] This would be led by the Attorney General/ Department of Justice (DOJ), DHS, and the Central Intelligence Agency (CIA) in coordination with USDA, DHHS, and EPA.
  - HSPD-9 required the creation of "a new biological threat awareness capacity that will enhance detection and characterization of an attack."[8] DHS was to coordinate with USDA, DHHS, EPA and other departments and agencies to carry this out.
- **"Vulnerability Assessments"[8]** — HSPD-9 mandated "vulnerability assessments of the agriculture and food sectors"[8] and the identification of "requirements for the National Infrastructure Protection Plan"[8] that was to be updated every 2 years. The assessments would be done by USDA, DHHS, and DHS, with DHS responsible for the plan every 2 years.
- **"Mitigation Strategies"[8]** — HSPD-9 required:
  - The prioritization, development, and implementation of "mitigation strategies to protect vulnerable critical nodes of production or processing from the introduction of

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[7] Homeland Security Presidential Directive/HSPD-7 – *Critical Infrastructure Identification, Prioritization, and Protection*, December 17, 2003

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

diseases, pests, or poisonous agents."[9] This was a responsibility of DHS and DOJ working with USDA, DHHS, EPA, and other departments and agencies.

- The development of "common screening and inspection procedures for agriculture and food items entering the United States"[9] and maximizing "effective domestic inspection activities for food items within the United States."[9] This was a responsibility of USDA, DHHS, and DHS.

- **"Response Planning and Recovery"[9]** — HSPD-9 required:

  - Ensuring "that the combined Federal, State, and local response capabilities are adequate to respond quickly and effectively to a terrorist attack, major disease outbreak, or other disaster affecting the national agriculture or food infrastructure."[9] This was a responsibility of DHS in coordination with USDA, DHHS, DOJ, and EPA.
  - Developing "a coordinated agriculture and food-specific standardized response plan that will be integrated into the National Response Plan."[9] This was a responsibility of DHS in coordination with USDA, DHHS, DOJ and EPA.
  - Enhancing "recovery systems that are able to stabilize agriculture production, the food supply, and the economy, rapidly remove and effectively dispose of contaminated agriculture and food products or infected plants and animals, and decontaminate premises."[9] This was a responsibility of USDA and DHHS in coordination with DHS and EPA.
  - Making "recommendations to the Homeland Security Council, within 120 days of the date of this directive, for the use of existing, and the creation of new, financial risk management tools encouraging self-protection for agriculture and food enterprises vulnerable to losses due to terrorism."[9] This was a responsibility of USDA.
  - Working with State and local governments and the private sector to develop:

    - "A National Veterinary Stockpile (NVS) containing sufficient amounts of animal vaccine, antiviral, or therapeutic products to appropriately respond to the most damaging animal diseases affecting human health and the economy and that will be capable of deployment within 24 hours of an outbreak."[9]
    - "A National Plant Disease Recovery System (NPDRS) capable of responding to a high-consequence plant disease with pest control measures and the use of resistant seed varieties within a single growing season to sustain a reasonable level of production for economically important crops."[9]

    Both were requirements of USDA in coordination with DHS and in consultation with DHHS and EPA.

- **"Outreach and Professional Development"[9]** — HSPD-9 specified that the Secretaries shall:

  - Work "with appropriate private sector entities to establish an effective information sharing and analysis mechanism for agriculture and food."[9] This was a responsibility of DHS in coordination with USDA, DHHS and other appropriate departments and agencies.

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

- Support "the development of and promote higher education programs for the protection of animal, plant, and public health."[10] This was a responsibility of USDA and DHHS in consultation with DHS and the Department of Education (ED).
- Support the development of and promotion of "a higher education program to address protection of the food supply."[10] This was a responsibility of USDA and DHHS in consultation with DHS and ED.
- Establish "opportunities for professional development and specialized training in agriculture and food protection, such as internships, fellowships, and other post-graduate opportunities that provide for homeland security professional workforce needs."[10] This was a responsibility of USDA and DHHS.

❑ **"Research and Development"[10]** — HSPD-9 required:

- Accelerating and expanding "development of current and new countermeasures against the intentional introduction or natural occurrence of catastrophic animal, plant, and zoonotic diseases."[10] This was a responsibility of DHS, USDA, DHHS, EPA and other appropriate departments and agencies in consultation with the Director of the Office of Science and Technology Policy (OSTP), with DHS coordinating the efforts.
- Developing "a plan to provide safe, secure, and state-of-the-art agriculture biocontainment laboratories that research and develop diagnostic capabilities for foreign animal and zoonotic diseases."[10] This was a responsibility of USDA and DHS; *DHS constructing the National Bio and Agro-defense Facility (NBAF) meets this requirement.*
- Establishing "university-based centers of excellence in agriculture and food security."[10] This was a responsibility of DHS in consultation with USDA and DHHS, but *funding for these centers has been terminated by DHS.*

The summary above does not include all the details in HSPD-9, but it does note departments and agencies responsible for each requirement. For almost every task, there were multiple departments and agencies involved which would make every task very complex. Nonetheless, all six requirements are vitally important to protecting U.S. agriculture and food.

Separating HSPD-9 from HSPD-10 – Bioterrorism for the 21st Century[11]

As already noted, HSPD-9 – protecting agriculture and food from bioterrorism – was signed on January 30, 2004, while HSPD-10 – protecting people from bioterrorism – was finalized on April 28, 2004. There were likely sound reasons in 2004 to separate bioweapon threats to people from bioweapon threats to agriculture and food, but the result of that over the past decade and a half is that agriculture and food have received minimal biodefense attention or funding.

That's surprising for at least two reasons: (1) Essentially every country that ever developed an offensive bioweapons program, including the U.S., created weapons targeting agriculture as well as people; and (2) almost every pandemic threat today is a zoonotic disease that can spread from

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[10] Homeland Security Presidential Directive/HSPD-9 – *Defense of United States Agriculture and Food*; Jan. 30, 2004
[11] Homeland Security Presidential Directive/HSPD-10 – *Biodefense for the 21st Century*, April 28, 2004

animals to people. As a result, significant federal funding should be focused on confronting and stopping these threats in the animal host; that's not being done.

The only statement regarding agriculture and food in HSPD-10 referenced "new programs to secure and defend our agriculture and food systems against biological contamination."[12] That's basically delineating a food safety role as a small part of HSPD-10. And, in fact, it was HSPD-7 that outlined homeland security obligations regarding food safety.[13] Responsibilities for meat, poultry, and egg products went to USDA; the agency responsible for inspecting those processing activities. Inspections for everything other than meat, poultry, and egg products is the responsibility of the Food and Drug Administration (FDA); a component within DHHS.

That might actually explain some of the disparities between HSPD-9 and HSPD-10, e.g., why HSPD-10 specifies "increased funding for bioterrorism research within DHHS by thirty-fold"[12] to protect human health, while USDA got nothing for bio/agroterrorism research within HSPD-9 to protect plant and animal health. Food was delineated by food processing responsibilities for USDA and DHHS/FDA, with little focus on safeguarding agriculture pre-harvest activities, i.e., protecting food crops or food animals from infectious diseases or bioweapons. Thus, USDA and DHHS have nearly equal roles in HSPD-9 (with DHS leading), while DHHS has an appropriately dominant role in HSPD-10 (also with DHS leading) with USDA having a minor food safety role.

Infectious diseases and biological weapons target living things — plants, animals, and people; some target more than one. As noted above, bioweapon programs commonly included pathogens of plants and animals, not just people. Why? Because food-deprived – starving – people are less fit to fight, less able or willing to fight, and more likely to surrender.

Evidently, *al Qaeda* knew this, since their bioweapons list included 10 pathogens targeting animals and plants, and only 6 targeting people.

U.S. Bio/Agrodefense Status Today

U.S. biodefense efforts have been lacking for decades as pointed out in multiple reports; first by the Commission on the Prevention of Weapons of Mass Destruction (WMD) Proliferation and Terrorism,[14,15] and then by the bipartisan Blue Ribbon Study Panel on Biodefense.[16,17] The Commission looked at all WMD threats, and in their 2010 report card,[14] biological risks received a failing grade; an "F." All four citations concentrated on biothreats to people, although the Blue

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[12] Homeland Security Presidential Directive/HSPD-10 – *Biodefense for the 21st Century*, April 28, 2004

[13] Homeland Security Presidential Directive/HSPD-7 – *Critical Infrastructure Identification, Prioritization, and Protection*, December 17, 2003

[14] *The Clock is Ticking: A Progress Report on America's Preparedness to Prevent Weapons of Mass Destruction Proliferation and Terrorism;* Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, October 21, 2009

[15] *Prevention of WMD Proliferation and Terrorism Report Card;* Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, January, 2010

[16] *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

[17] *Biodefense Indicators: One Year Later, Events Outpacing Federal Efforts to Defend the Nation;* A Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, December 2016

Ribbon reports referenced threats to animals, primarily from a "One Health" perspective. The 2015 Blue Ribbon[18] report highlighted thirty-three major shortcomings requiring urgent attention by Washington, DC policy makers. The top three most problematic were: (1) no national leader; (2) no strategic plan; and (3) no dedicated budget. Unfortunately, none of these shortcomings have yet been corrected.

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."[19] Since Senator Lieberman will be covering Blue Ribbon reports, the only other issue that should be noted from the hearing at K-State is that defense of plant agriculture was discussed as well. It's our understanding those threats will be addressed in a separate report.

Bio/Agrodefense Focus at K-State

As the Committee knows, protecting U.S. agriculture is a mission of America's land-grant universities; that began in 1862 when President Lincoln signed the Morrill Act. As someone relatively new to land-grant administration – but someone with a lifelong commitment to national defense – I'm convinced that the nation's land-grant universities can and should play a significant role in U.S. bio/agrodefense. These institutions participate in protecting agriculture and food in their states each and every day.

Thus, we would encourage the Committee to integrate the land-grant universities into whatever solutions are developed. K-State stands ready to participate on the national team and lead when asked or when necessary. Protecting America's agriculture and food infrastructure is too important not to.

K-State is not new to this realm. 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"[20] 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"[21] facing America. That Senate subcommitee was also chaired by Kansas Senator Pat Roberts.

The "Big Purple Book,"[20] as the 1999 program became known, documented the need for a biocontainment facility capable of conducting R&D on biothreats to food crops, food animals, and the food supply. Prior to September 11th and the anthrax attacks in 2001, little traction was

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[18] *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

[19] *Special Focus: Defense of Animal Agriculture;* Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, October 2015

[20] *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

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

gained for the need to build it. Post-09/11/2001, state and federal funding was obtained, and the Biosecurity Research Institute (BRI) at Pat Roberts Hall (PRH) became a reality.

The BRI/PRH is located immediately adjacent to the NBAF site and it includes five BSL-3Ag rooms that can be configured for research with cattle, pigs, sheep, goats and poultry. Work has been done on numerous species to date, including white-tailed deer in 2017 to determine their susceptibility to RVF. In addition to BSL-3Ag labs, the BRI/PRH has dedicated BSL-3 space for conducting research on crop and food pathogens. Wheat Blast 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 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.

K-State jump-started NBAF research in the BRI/PRH on RVF in 2013, JE in 2014, CSF in 2015, and ASF in 2016. We were able to do this because the State of Kansas agreed to fund $35 million for NBAF research in the BRI/PRH as part of our "best and final offer" for NBAF during the site selection competition. Research and development (R&D) continues on all four of these FADs, but the Kansas funding commitment will end in FY2019 when the last $5 million is appropriated. The majority of the research is conducted by K-State faculty, staff and students, but collaborators from the U.S. Department of Agriculture's (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 RVF, JE, CSF, and ASF to help mitigate these threats to U.S. animal health and public health.

Until NBAF is fully operational in 2022/23, USDA has no biocontainment facilities where R&D can be conducted on zoonotic FADs. Moreover, DHS stopped funding CSF and ASF research in 2017 at the Plum Island Animal Disease Center (PIADC); an antiquated facility unsafe for work with zoonotic diseases. Consequently, training the NBAF R&D workforce is highly reliant on the BRI/PRH until the new DHS facility becomes operational.

PROPOSED PATH FORWARD

The importance of implementing the requirements outlined in HSPD-9[22] to safeguarding American agriculture in a globalized world cannot be overstated. They are all critically important, but strides made to implement them in the early years have eroded today.

K-State believes that statutory authorization — with clearly delineated and enforceable accountability — along with the appropriation of funds to support the following key provisions in HSPD-9 will advance this crucial humanitarian and economic mission.

1) **Enhance Intelligence Operations and Analysis Capabilities** — Leverage "awareness and warning"[22] intelligence information to conduct federal, state, and local agriculture and food "vulnerability assessments."[22] Advanced warning of over-the-horizon biothreats is vital, but

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

today, the U.S. is often minimally aware and insufficiently warned. One reason appears to be insufficient numbers of bio/agrodefense subject matter experts (SMEs) – veterinarians, animal scientists, crop scientists, plant pathologists, etc. – with high-level security clearances to assess classified intelligence.

a) **Security Clearances** — Increase the number of food crop, food animal, and food supply SMEs with high-level security clearances (TS-SCI) to monitor bio/agrodefense threats worldwide.
b) **Sensitive Compartmented Information Facilities (SCIFs)** — Increase the number of SCIFs with secure communications that have agriculture/food SME analysts and/or cleared SME advisors with TS-SCI clearances.
c) **USDA Clearances** — Increase the number of USDA personnel with TS-SCI clearances. It's unknown how many bio/agrodefense SMEs there are within the intelligence agencies, but there are nowhere near enough within USDA. Conversations in 2016 with the USDA's chief scientist and a USDA intelligence analyst confirmed their frustrations with an inability to convey critical classified information within USDA to make it actionable. This creates huge federal impediments to safeguarding agriculture, particularly when DHS stopped meeting their HSPD-9 responsibilities in 2016/17. Undertaking "vulnerability assessments,"[23] developing "mitigation strategies,"[23] conducting "response planning and recovery,"[23] and defining time-critical "research and development"[23] strategies are virtually impossible when there is limited awareness and no warning. This must be rectified immediately.
d) **Intelligence Fusion Centers (IFCs)** — Increase the number of state IFCs with agriculture and food SMEs with TS-SCI clearances. The Kansas IFC (KIFC) appears to be the only such center of over 70 nationwide that has a biothreat team with cleared SMEs capable of assessing the full range of biohazards to food crops, food animals, the food supply, and people. These include a DVM and PhDs from K-State and MDs from the University of Kansas Medical Center as well as SMEs from multiple 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 planning with regard to "vulnerability assessments, mitigation strategies, and response planning and recovery."[23]

2) **Emerging FAD Threats** — Exploit "awareness and warning"[23] intelligence information regarding newly emerging biothreats to establish bio/agrodefense "mitigation strategies"[23] at USDA CGAHR prior to NBAF becoming operational and fund "research and development"[23] in the BRI/PRH.

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

3) **Zoonotic Animal Disease Research** — Establish federal threat "mitigation strategies"[24] for zoonotic FADs at USDA CGAHR prior to NBAF becoming operational and fund RVF and JE "research and development"[24] in the BRI/PRH.

4) **Non-Zoonotic Foreign Animal Disease Research** — Expedite federal threat "mitigation strategies"[24] for non-zoonotic FADs by moving the research portfolios for ASF and CSF from USDA PIADC to CGAHR and funding ASF and CSF "research and development"[24] in the BRI/PRH until NBAF becomes operational.

5) **Private-Sector Outreach** — Enhance private-sector "outreach and professional development"[24] by leveraging the nation's land-grant universities that interact routinely with private-sector agriculture producers and food processors nationwide.

   An implementation problem for HSPD-9 was the expectation that the federal government would be able "to establish an effective information sharing and analysis mechanism"[24] with private-sector agriculture producers and food processors. Having the federal government show up at the door is likely to be viewed with distrust and skepticism. In some instances, state government might be a somewhat better alternative, but this is an area where the nation's land-grant universities could serve as the facilitators/trusted brokers.

6) **Higher Education Programs** — Support the development of higher education programs as called for in HSPD-9 "outreach and professional development."[24]

   a) **For Capacity Building** — "In veterinary medicine, public health, and agriculture."[24]
   b) **For Protection** — "Of the food supply."[24]

7) **Surveillance Systems** — Increase support for "awareness and warning"[24] surveillance systems to provide early detection of U.S. disease outbreaks.

   a) **For Food Animals** — National Animal Health Laboratory Network (NAHLN)
   b) **For Food Crops** — National Plant Diagnostic Network (NPDN)
   c) **For Wildlife** — National Wildlife Disease Program (NWDP)

8) **Agriculture Response and Recovery** — Support agriculture/food "response planning and recovery"[24] systems for the purpose of reestablishing full operations following infectious disease outbreaks.

   a) **For Food Animals** — By utilizing and expanding the USDA National Veterinary Stockpile (antigen bank) as called for in HSPD-9 "response planning and recovery"[24] and endorsed by livestock producer groups and animal health companies.
   b) **For Food Crops** — By designing a National Plant Disease Recovery System as called for in HSPD-9 "response planning and recovery"[24] and endorsed by crop producer groups and related stakeholders.

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

9) **FAD Advance Development and Manufacturing (ADM)** — Advance "response planning and recovery"[25] by creating a FAD ADM facility for vaccines and other countermeasures against livestock-only and zoonotic FADs similar to ADM capabilities for human infectious diseases. Targeting zoonotic disease host animals could be the key to preventing global pandemics.

10) **Screening/Inspecting Agriculture and Food Items** — Validate existing screening technology "mitigation strategies"[25] and develop new/improved technologies.

11) **National Livestock Readiness Program (NLRP)** — Ensure DHS is standing up the NLRP to help meet the requirements of the FY2017 "Securing Agriculture and Food Act" (Public Law 115-43) in support of HSPD-9 "response planning and recovery."[25]

12) **National Biodefense Strategy (NBS)** — Confirm that the NBS – Section 1086, FY2017 National Defense Authorization Act (Public Law 114-328) – includes agriculture (protecting against plant and animal bioweapons and infectious diseases) and that bio/agrodefense components are adequate and implemented effectively.

13) **Biodefense Leadership** — Support the Blue Ribbon Study Panel on Biodefense's proposal to centralize bio/agrodefense leadership.[26]

BIO/AGRODEFENSE BOTTOM LINE

The bottom line today regarding bio/agrodefense is that "the clock is ticking"[27] as stressed by the WMD Commission back in 2009. Much must be done to safeguard American agriculture in a globalized world — the U.S. agriculture and food critical infrastructure is not well protected from potentially catastrophic biological events.

Bioterrorist attacks on America's food crops and/or food animals could devastate the U.S. economy, and the global economy wouldn't be far behind. America still feeds the world. Natural disease outbreaks could lead to similar outcomes. Food shortages in the U.S. may not occur immediately, or ever, depending on the effectiveness of the attack or the magnitude of the outbreak. However, there could still be hugely problematic outcomes for America and the world.

Well-conceived Presidential Directives have not gotten the job done; neither did the Patriot Act nor the Homeland Security Act that preceded the directives. 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.[28]

Congress must act before it's too late.

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

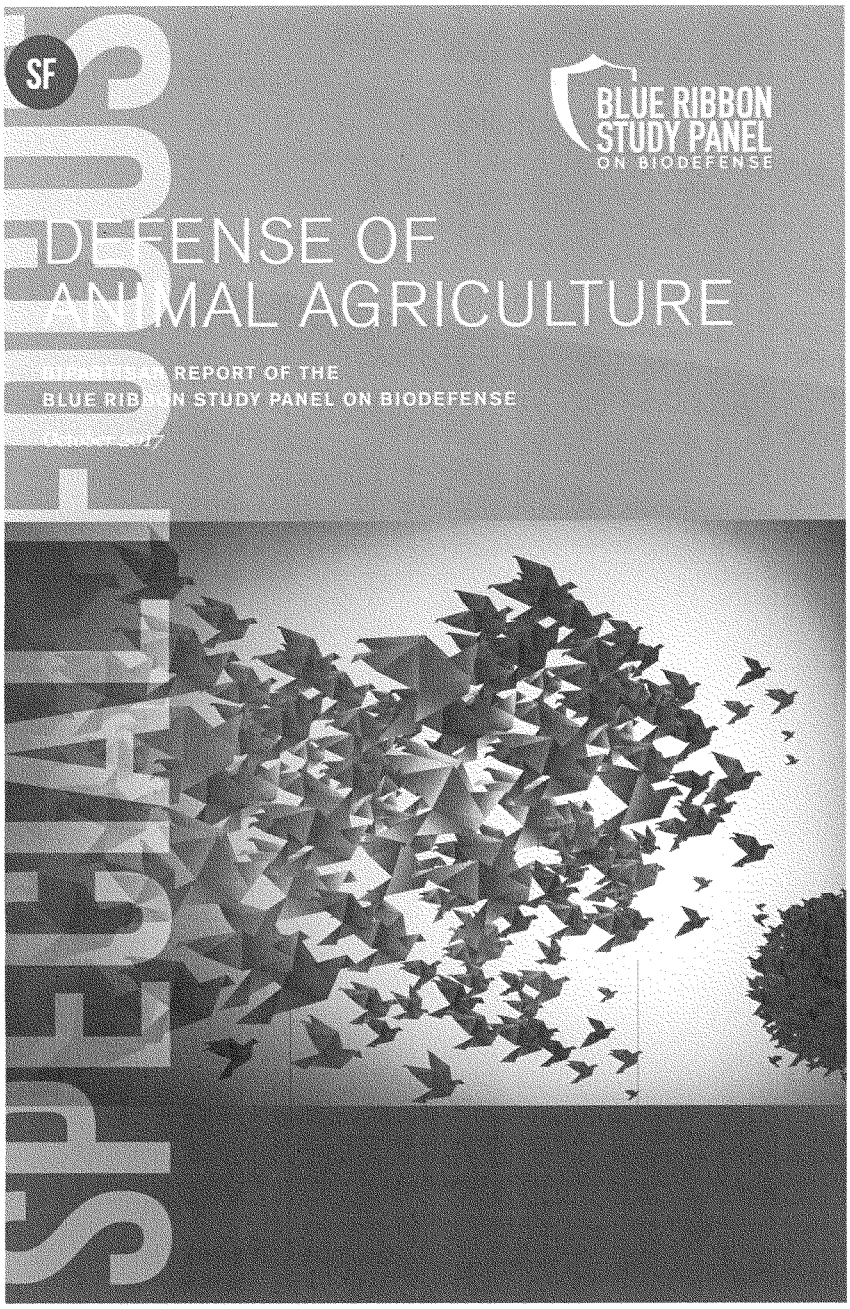
[26] *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts;* A Bipartisan Report of the Blue Ribbon Study Panel on Biodefense, October 2015

[27] *The Clock is Ticking: A Progress Report on America's Preparedness to Prevent Weapons of Mass Destruction Proliferation and Terrorism;* Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, October 21, 2009

[28] Bodin, Madeline; "U.S. Remains Unprepared for Agricultural Disease Outbreaks," *Emergency Management*, November 13, 2017

DOCUMENTS SUBMITTED FOR THE RECORD

DECEMBER 13, 2017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DEFENSE OF ANIMAL AGRICULTURE
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DEFENSE OF ANIMAL AGRICULTURE

BIPARTISAN REPORT OF THE
BLUE RIBBON STUDY PANEL ON BIODEFENSE

October 2017

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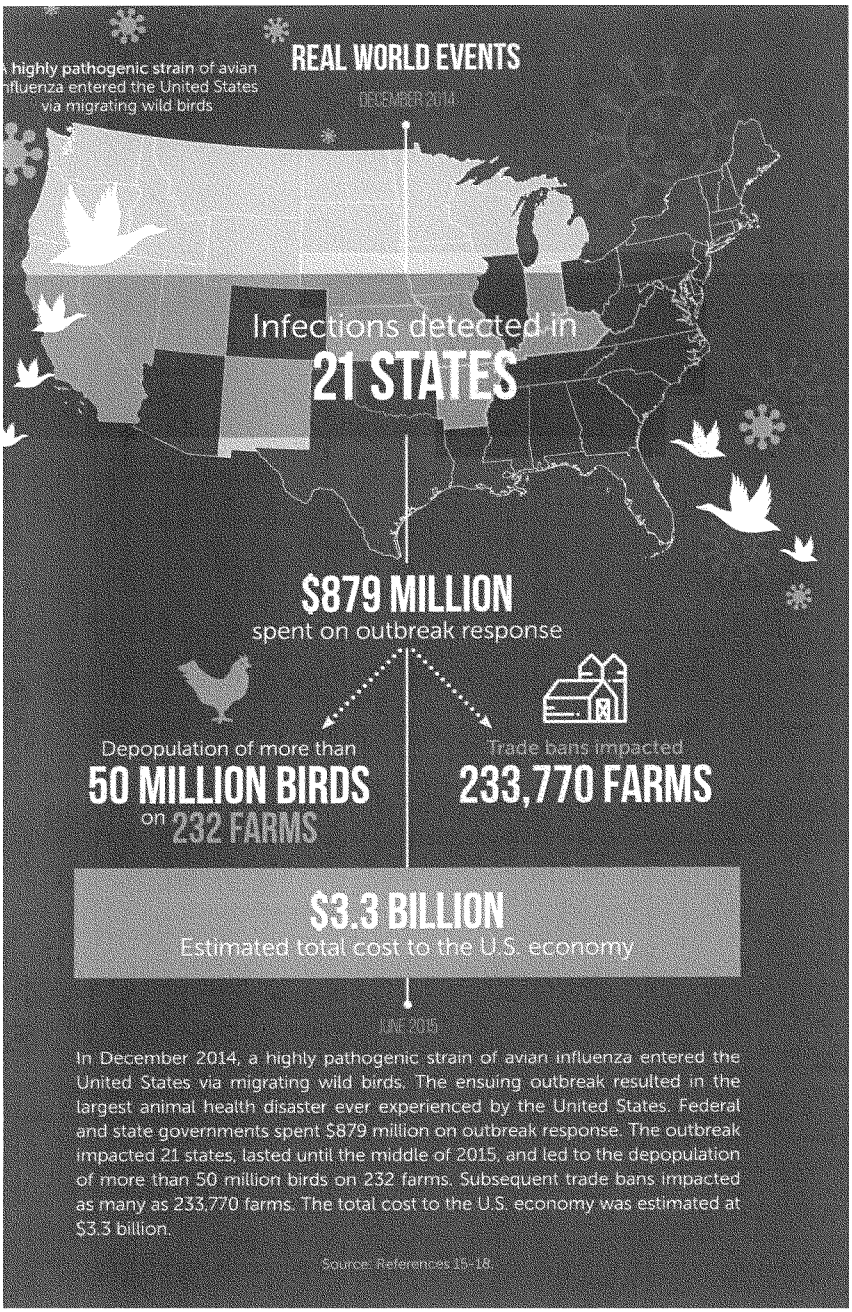

REAL WORLD EVENTS
A highly pathogenic strain of avian influenza entered the United States via migrating wild birds
DECEMBER 2014
Infections detected in
21 STATES
$879 MILLION
spent on outbreak response
Depopulation of more than
50 MILLION BIRDS
on 232 FARMS
Trade bans impacted
233,770 FARMS
$3.3 BILLION
Estimated total cost to the U.S. economy
JUNE 2015
In December 2014, a highly pathogenic strain of avian influenza entered the United States via migrating wild birds. The ensuing outbreak resulted in the largest animal health disaster ever experienced by the United States. Federal and state governments spent $879 million on outbreak response. The outbreak impacted 21 states, lasted until the middle of 2015, and led to the depopulation of more than 50 million birds on 232 farms. Subsequent trade bans impacted as many as 233,770 farms. The total cost to the U.S. economy was estimated at $3.3 billion.
Source: References 15-18.

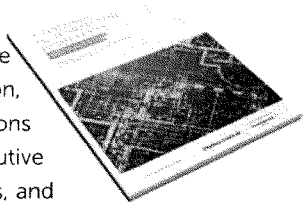
EXECUTIVE SUMMARY

The increasing rate of emerging and reemerging zoonotic disease, along with threats and attempts by those with nefarious intent to attack food and agriculture, point to the need to exert more effort to eliminate vulnerabilities and reduce consequences associated with America's agricultural sector. The Food and Agriculture (F&A) critical infrastructure sector produces, processes, and delivers the systems and commodities that feed billions of people and animals throughout the United States and globally. In 2015, the agriculture, food, and related industries contributed $992 billion (5.5%) to U.S. gross domestic product (GDP), making it one of the largest sectors of the U.S. economy. Given its critical importance to food safety and availability in the United States and around the world, protecting this sector is a matter of national security. Federal agencies; state, local, tribal, and territorial (SLTT) governments; academic institutions; and industry partners all contribute to and are responsible for this vast enterprise. Our lives, culture, economy, and livelihood depend on their efforts.

In its 2015 *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts*, the Blue Ribbon Study Panel on Biodefense determined that national biodefense lacked centralized leadership, interagency coordination and accountability, collaboration with non-federal stakeholders, and incentives for innovation sufficient to achieve needed capabilities and maximize mission effectiveness. With its series of special focus reports, the Panel undertakes in-depth examinations of particular biodefense topics of concern, considers how the recommendations it made in the *Blueprint for Biodefense* apply to these topics, and adds detail and new action items in keeping with its existing recommendations. This special focus report is the first in the series, and reflects the Panel's evaluation of threats to animal agriculture, a critical infrastructure component central to the health and well-being of the population and the security of a major element of the national economy.

The Panel views protection of agriculture – the cultivation and breeding of animals and plants for food, fiber, and other products used to sustain human life – as a critical part of the overall biodefense mission space. While nearly all the Panel's *Blueprint for Biodefense* recommendations apply to agrodefense, some are especially important for the mission and deserve particular attention at this time. The goal of this report is to elucidate a few key, persistent challenges and to propose solutions. This report does not address every challenge in agrodefense. It emphasizes that intersection of issues which reflect the underlying principles of the *Blueprint for Biodefense*, and which have been inadequately evaluated or discussed in other

fora. This report does not directly assess threats to food (including food safety issues) or to plant agriculture, two areas of great import that rightfully deserve their own substantive analyses. Neither does it address food security (access to food), another important topic. These topics were beyond the scope defined for this special focus report. Additional areas for oversight consideration are included at the end as proposed congressional hearings.



The findings and recommendations herein are structured along the same thematic lines as the *Blueprint for Biodefense*: Leadership, Coordination, Collaboration, and Innovation. Recommended actions are listed in the Summary of Proposals for the Executive Branch and the Summary of Proposals for Congress, and are designed to align directly to recommendations in the *Blueprint for Biodefense*.

LEADERSHIP

As assessed in our previous report, White House-level political leadership is necessary to elevate biodefense as a critical national and federal imperative. As recommended, the Vice President, in conjunction with strong congressional champions, could better drive priorities and activity across the large, unwieldy enterprise of agricultural defense.

Agricultural defense is a broad and complex mission space that necessitates the significant involvement of most federal departments and agencies. Presidential Policy Directive 21 places the Department of Agriculture (USDA) and the Department of Health and Human Services (HHS) as the federal leads for the F&A critical infrastructure sector. Roles and responsibilities under the U.S. Code and other authorities are not necessarily coordinated, however, nor are authorities necessarily exercised in a way that has prioritized needed activity.

The ultimate ownership of F&A by the private sector, and its significant contribution to SLTT and international economies, necessitates substantial federal collaboration with non-federal stakeholders. White House-level leadership is critical to minimize overlap, identify mission gaps, and coordinate effort. The White House should ensure that the National Biodefense Strategy addresses threats to food and agriculture. The President and Congress should ensure that detailed agrodefense expenditures are incorporated into a cross-cutting biodefense budget analysis.

COORDINATION

Agricultural outbreaks may result from natural events or from deliberate actions. Coordination between animal health (a USDA mission), and law enforcement (a Federal Bureau of Investigation, or FBI, responsibility), is critical. Sharing information among these and other interagency entities as well as non-federal stakeholders is necessary to focus attention on the most relevant threats and ensure that prevention and response measures are aligned with those threats.

The Panel recommends increased coordination between the USDA and FBI. Further, since the FBI deems all domestic incidents of foreign animal diseases suspicious, law enforcement and health officials should conduct joint investigations of all such outbreaks. The development of an updated Food and Agriculture Incident Annex (FAIA) will be a critical step toward improving preparedness for agricultural outbreaks. Any revision must prioritize planning for both natural and intentional events.

The Federal Emergency Management Agency, the USDA Animal and Plant Health Inspection Service, and the FBI should ensure that any update to the FAIA recognizes and addresses the investigative mission of the FBI, and clearly directs other federal departments and agencies to support inquiries into suspected acts of agricultural crime and terrorism.

COLLABORATION

Effective overall homeland security depends on successful collaboration among federal and non-federal stakeholders. The same is true for agrodefense, especially regarding early detection and surveillance efforts to characterize and prevent further spread of disease. The early detection of infectious disease outbreaks is one of the most important means we have for mitigating their impacts and shortening the duration of response. This detection should occur at the level of livestock production, but also in wildlife.

Although the nation has made great strides, it still falls critically short in rapid biodetection, diagnosis, and integrated biosurveillance of outbreaks. Biodetection is hampered by an insufficient focus on rapid pen-side diagnostics, and insufficient investment to develop new wildlife disease detection technologies and validate existing tests. Although improving, biosurveillance remains perpetually challenged by information sharing problems. Much of the data are owned by the private sector, thus requiring protected information policies that incentivize sharing. Success also depends on the cooperation of federal and state agencies. White House leadership

could provide the basis for the coordination and collaboration necessary to optimize the needed functions of biosurveillance collection, integration, and analysis. The White House should consider the full scope of wildlife surveillance activity that would benefit wildlife, livestock, and human health, and direct relevant departments to develop a commensurate budget request. The National Security Council should direct interagency partners to develop a standard of quality by which the value of investment in biosurveillance can be measured. Congress should fund and facilitate enhanced opportunities for data collection from livestock and wildlife, including through increased appropriations to the USDA National Wildlife Disease Program.

INNOVATION

Ultimately, the current paradigm for disease response is insufficient to protect the sector. The nation needs new ideas and scientific solutions to drive agrodefense approaches beyond their current limitations. One example would be to increase funding to the National Veterinary Stockpile to demonstrate a market commitment to procurement the way the BioShield Special Reserve Fund was designed to do for human medical countermeasures.

To meet the requirements of Homeland Security Presidential Directive 9, far greater investment in advanced research and development is also necessary. The nation requires focused investment in pen-side, innovative diagnostic technology, and in better laboratory-based technology to enable rapid assessment for SLTT animal health officials, enabling earlier decision-making. The USDA should further develop its vaccine use policy for avian influenza and other high-consequence diseases, basing these policies on the use of platform technologies for rapid diagnostics and vaccines in response to outbreaks.

Additionally, DHS and USDA should develop a business plan for the operation of the National Bio- and Agrodefense Facility. This plan 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.

The President's Fiscal Year 2018 budget request would eliminate all agriculture and animal-specific research by the DHS Science and Technology Directorate.

This signals a substantive diminishment of support from the Executive Branch for agriculture and agrodefense research.

The Administration must improve agrodefense efforts to prevent or combat a major agro-disease outbreak. Although accounting for only 5% of GDP, food safety and food access affects 100% of the population. F&A are increasingly vulnerable to large-scale disease outbreaks that could significantly impact the economy, and which could also threaten the security of the population. The Panel believes that current government efforts should be assessed and redirected as outlined in this report per the forthcoming National Biodefense Strategy. Federal investment in agrodefense must focus on prevention and early identification to reduce or prevent the incursion of major costs and losses.

Like homeland security in general and biodefense in particular, the interagency nature of agrodefense means that many congressional committees oversee agrodefense efforts. These committees should both continue and expand previous efforts and increase their direction to the Executive Branch. The Farm Bill provides a significant opportunity every five years to accomplish this legislatively.

PROPOSALS FOR THE **EXECUTIVE BRANCH**

Leadership

- Ensure that the National Biodefense Strategy and its implementation plan address threats to food and agriculture, including any gaps in Homeland Security Presidential Directive 9 implementation;
- Collect detailed agrodefense expenditures and provide them to Congress as part of an annual biodefense data call;

Coordination

- Formalize cooperation between the federal agriculture and law enforcement sectors to ensure that outbreaks are evenly addressed by both, in particular through the next iteration of the *Food and Agriculture Incident Annex (FAIA)*;
- Ensure that the FAIA describes the critical role played by the nation's fusion centers, and is regularly exercised at the state level;
- Develop a standard of quality for biosurveillance;

Collaboration

- Determine the optimal scope of wildlife disease surveillance activity and enhance support for the National Wildlife Disease Program commensurate with that need;
- Enhance collaboration among federal, state, local, tribal, territorial, and private sector entities that collect animal health data;
- Finalize the rule for the National List of Reportable Animal Diseases and incentivize rigorous reporting;

Innovation

- Assess the ability of the National Veterinary Stockpile to meet the mandates of Homeland Security Presidential Directive 9, request budgets commensurate with the threat, and invest in countermeasure development, procurement, and usage policy based on the identified need;
- Devote sufficient resources to diagnostics, including rapid diagnostics, for the National Veterinary Stockpile;
- Establish an antigen bank for foot-and-mouth disease virus; and
- Develop a business plan for the National Bio- and Agrodefense Facility that prioritizes public-private partnerships.

PROPOSALS FOR **CONGRESS**

Leadership

- Require the identification of agrodefense expenditures across the federal government;

Collaboration

- Commit to a more realistic funding plan for federal wildlife surveillance efforts, and facilitate increased data collection from livestock and wildlife populations;
- Assess the authorities of the Department of Homeland Security and the Department of Agriculture to further collaboration with other public and private stakeholders that collect animal health data, and take necessary steps to support those efforts;
- Continue funding the National Animal Health Laboratory Network at no less than current authorized levels, with the possibility of additional funds should they be needed to fulfill the Network's mission;

Innovation

- Establish a prevention fund for animal health disease and disaster programs; and
- Authorize the National Veterinary Stockpile, and require annual progress assessments toward requirements.

INTRODUCTION

THE THREAT TO FOOD AND AGRICULTURE

The Food and Agriculture (F&A) critical infrastructure sector produces, processes, and delivers the systems and commodities that feed billions of people and animals throughout the United States and overseas.[1] In 2015, agriculture, food, and related industries contributed $992 billion (5.5%) to the U.S. gross domestic product (GDP).[2] As one of the largest sectors of the U.S. economy, protecting this infrastructure is a matter of national security.

Agriculture, the cultivation and breeding of animals and plants for food, fiber, and other products, is central to American culture, economy, wellbeing, and livelihood. Because of its importance, agriculture is a target for terrorism, warfare, and criminal activity.[3,4] The geographically dispersed yet industrially-concentrated nature of the sector makes it an especially vulnerable target. Farms dot the landscape in every state; livestock are often concentrated in specific locations; and lethal and contagious biological agents that impact plants and animals are more numerous even than those that directly impact human beings.[5]

As with other critical infrastructure sectors, criminals, terrorists, and enemy combatants may target F&A because disruption of this sector can lead to significant negative effects on the populations it serves. Al Qaeda has stated on numerous occasions that it seeks to impact the economies of those it considers to be its enemies, including with agricultural attacks. Targeted destruction of F&A critical infrastructure is a standard, long-standing, and effective element of warfare, with records of chemical and pathogenic attacks dating back to World War I.[6] An outbreak in 2011 of a rare strain of *E. coli* O104:H4, first identified in northern Germany, spread to 16 countries including the United States, resulting in 4,321 cases of illness and 53 deaths.[7] Although initially assumed to have a natural origin, epidemiological evaluation later concluded that an accidental or intentional introduction of contaminant into fenugreek seeds was plausibly responsible.[8] The use of biological weapons to attack agriculture could result in billions of dollars in losses. Naturally occurring outbreaks in the United Kingdom of foot-and-mouth disease (FMD) in 2001 and bovine spongiform encephalopathy (BSE) in 1996-7 cost the United Kingdom £8.6 billion (about $14 billion)[9] and £2.5 billion (about $3.2 billion), respectively.[10] Bioterrorism could easily do the same.

Criminals also target the F&A sector. Documented criminal activity has included theft of expensive foods, hybrid seeds, and hay; growth of poppies for opium; murder of farmers; rustling of cattle and other animals (e.g., bees); burglary of valuable metals; and stealing fertilizer elements (e.g., anhydrous ammonia, ammonium nitrate) that can be used to produce methamphetamines and explosives.[11]

Naturally occurring disease outbreaks remain a persistent challenge. Outbreaks of highly pathogenic avian influenza (HPAI) have led to the deaths of more than 67 million birds in the United States since 1983.[12] In December 2014, a highly pathogenic strain of avian influenza entered the United States via migrating wild birds. (Wild birds play a key role in spreading these influenza viruses, such as when they move from northeast Asia into the west coast of North America on their long-distance migration routes.[13]) The ensuing outbreak resulted in the largest animal health disaster ever experienced by the United States.[14] The outbreak lasted until the middle of 2015, ultimately affected 21 states, and led to the depopulation of more than 50 million birds on 232 farms.[15] Subsequent trade bans impacted as many as 233,770 farms.[16] The total cost to the U.S. economy was estimated at $3.3 billion, with the turkey sector losing $1.1 billion and the egg sector $2.2 billion.[17] Federal and state governments spent $879 million on outbreak response.[18]

HPAI strains can also place humans at significant risk if the strains develop the capacity to spread from poultry to people. The public health community is concerned about possible mutations that would allow these viruses to spread in this fashion. Each case of animal infection during a large-scale outbreak is another opportunity for such a mutation to occur. Further, all avian influenzas can threaten egg production, thereby endangering the supply of human influenza vaccine and other vaccines that depend predominantly upon egg-based culture methods.

The genetic code of the 2009 H1N1 influenza pandemic arose in part from other influenza strains circulating in wild birds and commercial pigs. Media use of the misnomer "swine flu" created misplaced concern among the public over food safety. While human health was never at risk from pork consumption, the pork industry was negatively impacted: consumption declined, sales dropped, hog prices fell, futures prices on the Chicago Mercantile Exchange plunged, and several countries banned U.S. pork imports.[19] Inaccurate media linkage of H1N1 to swine cost the U.S. pork industry $200 million.[20]

Porcine epidemic diarrhea virus (PEDv) and porcine deltacoronavirus (PDCV) emerged for the first time in the U.S. domestic swine population with lethality and ferocity in 2013 and 2014. These swine enteric coronavirus diseases (SECD) cause acute and rapidly spreading diarrhea that does not affect humans, but which can result in 50-80% mortality in piglets.[21] PEDv, in particular, results in diarrhea,

vomiting, and high morbidity in a herd, and high mortality (90-95%) in piglets. In 2013, PEDv cost the U.S. pork industry returns of $481 to $929 million.[22] Although U.S. Department of Agriculture (USDA) guidelines should have been sufficient to control these outbreaks, the USDA did not take regulatory action against SECD immediately. As a result of this, the USDA cannot conclusively determine where or how either virus entered the United States.[23] The Federal Bureau of Investigation (FBI) was not contacted to conduct an evaluation of the potential for an intentional (criminal or terrorist) origin for the outbreak.

THE THREAT OF ZOONOSES

Among the biological threats for which the U.S. Department of Homeland Security (DHS) has issued a Material Threat Determination, all but one (smallpox) are zoonotic, meaning the disease can move between animals and people. Many major infectious disease outbreaks over the last 10 years (e.g., Ebola, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS)) have originated in animals. Three-quarters of emerging infectious diseases are, in fact, zoonotic in nature. While most of these originate in wildlife, livestock can also act as conduits for infection. The recent U.S. avian influenza outbreaks did not affect humans, but other avian influenza strains in Asia have infected thousands of people; the H7N9 strain alone has infected more than 1,300 people since 2013.[25]

While influenza is the most likely virus to cause a pandemic, myriad other viruses cross over from wild animals into human populations. These viruses will continue to create pandemics. In 2003, the emergence of a previously unknown and virulent coronavirus, termed SARS, caused a rapid outbreak in Asia. It is believed to have jumped from bats to an intermediate animal and then to people. SARS quickly incapacitated tourism and trade as the outbreak spread as far as Canada. The economies of China, Hong Kong, Singapore, and Taiwan lost approximately $13 billion in GDP collectively, despite the relative paucity of cases (7,000) and fatalities (700).[26] Other global economic costs were as high as $40 billion.[27] The cost of patient treatment is not the predominant element in these estimates; the actual costs of SARS were the economic shocks resulting from shifts in human behavior. Ultimately, the infection spread to 29 countries.[28] Authorities were finally able to contain its spread, but the rapidity with which the virus breached hemispheres revealed the extreme interconnectedness of human health in the modern era. The more recent Ebola and Zika outbreaks reinforce this fact. According to Dr. Ali Khan, former director of the Office of Public Health Preparedness and Response at the Centers for Disease Control and Prevention (CDC), the primary threat to the health security of this nation remains a zoonotic disease.[29]

U.S. AGRODEFENSE TODAY

In 2004, Dr. Roger Breeze, former director of the USDA biosafety level 3 laboratory at the Plum Island Animal Disease Center (PIADC) wrote:

> *Our national policy for inadvertent and deliberate foreign animal disease introductions should be simple: we will minimize direct and indirect economic impacts, and we will not engage in mass slaughter. Fortunately, most of the tools and technologies to permit such a policy already exist. We now have rapid, on-farm tests for these diseases; effective vaccination strategies; Internet-based command, control, and communication systems; and the means to track animal products from farm to table, even internationally... If we choose this way forward, there will be little point in deliberate attacks, because the outcomes terrorists want to see will not be possible and inadvertent introductions will be eliminated with scarcely a footprint.*[30]

Thirteen years later, the U.S. government has made some notable commitments to countering the threat to animals. For example, the National Animal Health Laboratory Network (NAHLN) works to detect biological threats to food animals, although its funding is not as robust as its human-health counterpart, the Laboratory Response Network for Bioterrorism. DHS is spending $1.25 billion dollars to build a modern animal disease laboratory in Manhattan, Kansas (to replace PIADC). At the border, U.S. Customs and Border Protection agricultural inspectors work daily to prevent the import of food and agricultural products that could harm human health, animal health, and the economy. USDA inspectors and veterinarians similarly safeguard the food supply through border-based health inspection and quarantine of incoming animals, and the USDA Food Safety and Inspection Service and the U.S. Food and Drug Administration (FDA) safeguard food safety at processing plants throughout the United States and globally. USDA also accredits and trains private-sector veterinarians to detect and respond to disease outbreaks. These and other efforts account for a large portion of the federal investment in defending U.S. food and agriculture.

Yet in context, the F&A sector receives far less attention than many other critical infrastructure sectors. This sector continues to be highly vulnerable, and many of the tools and technologies described by Breeze remain poorly developed and integrated into suitable plans and proper response operations.

Further, many farms are open systems, and biosecurity varies from one farm to the next, a point clearly illustrated during the 2015 HPAI outbreak. As the Government Accountability Office (GAO) found in an analysis of USDA efforts to combat avian

influenza, poultry producers and growers oftentimes did not adhere to basic biosecurity practices before and during the outbreak, which resulted in further infection. The USDA relies on poultry producers and contractors to voluntarily take preventive steps to protect their flocks from disease.[31] In early 2016, USDA took the first steps to address this issue by publishing an interim rule making indemnity payments contingent on poultry and egg producers and growers certifying their adherence to a biosecurity plan. The rule is limited to large-scale operations for certain animals, and is particularly focused on HPAI. Biosecurity provisions have also been added to the National Poultry Improvement Plan, a voluntary program under which producers can be certified as disease-free for trade purposes.

Thus, the production of food presents what amounts to a chain of vulnerabilities. The intentional disruption of any of the goods and services that comprise F&A could occur at myriad nodes along this chain. Weaknesses of these types put human health, animal health, and the entire agricultural-based economy at risk.

According to GAO, the President's Fiscal Year (FY) 2015 $23 billion budget request for USDA included only $287 million for animal health efforts – that is, 1.2%.[32] While this figure does not include use of the Commodity Credit Corporation (CCC) for response efforts, the dollar value of which can be substantial, the annually appropriated level is simply too low to preventively safeguard animal health to optimal levels. This is a department whose earliest and groundbreaking successes in the nineteenth century were for the proactive protection of animal health. Notable priorities for that nascent department, established by President Abraham Lincoln, included funding the study, control, and eradication of infectious diseases like contagious bovine pleuropneumonia and Texas cattle fever. DHS has invested research dollars at PIADC for FMD vaccines, and construction dollars for the new National Bio- and Agrodefense Facility (NBAF). Yet the President's FY 2018 request disregards agriculture research and development funding support at DHS, eliminating all of its research programs at PIADC.

Many of the activities in which DHS, USDA, and interagency partners engage are indispensable elements for the development of effective biosurveillance, medical countermeasures (MCM), response capacity, and all other features of effective agrodefense. It is difficult to account for the ways in which these and other expenditures work together to reduce the threat to agriculture and to determine the areas where resources are most necessary. While the forthcoming National Biodefense Strategy should partially solve this problem, an Office of Management and Budget (OMB) assessment of program productivity and return on investment – and one made publicly available – is still needed.

LEADERSHIP

The ownership of F&A by the private sector and the significant contribution it makes to SLTT economies necessitates significant federal interaction and collaboration with non-federal stakeholders. Presidential Policy Directive 21 designated the USDA and the Department of Health and Human Services (HHS, delegated to the FDA) as the federal agencies to lead the infrastructure protection components of the F&A sector.[33] Like many of its critical infrastructure counterparts, the complexity of facilitating resilience within this sector necessitates significant involvement by other federal departments and agencies, as well as with the non-federal parties that own and operate it. The Panel has previously stated that political-level leadership at the White House is needed to drive priorities for biodefense, and this by extension includes agrodefense, particularly in light of policy and political divisions outlined in this report.

FEDERAL STRUCTURAL ORGANIZATION

The defense of U.S. agriculture is a broad and intricate mission space, its complexity reflected in the biodefense enterprise writ large. USDA and FDA have primary federal responsibility for encouraging the national security of agriculture. The USDA Office of Homeland Security and Emergency Coordination provides the primary means of communication between USDA and other departments at a policy level. Most other federal departments and agencies also help to protect this sector, with DHS serving a leading role in addressing national security related incidents.

The functions necessary to do this include intelligence analysis, law enforcement, animal health, plant health, public health, environmental remediation, and outbreak response and recovery. The 2008 *Food and Agriculture Incident Annex (FAIA)* to the *National Response Framework*, which addresses only the response and recovery element of agrodefense, lists USDA and HHS as Coordinating Agencies, and the Department of Commerce (DOC), the Department of Defense (DOD), the Department of Energy, DHS, the Department of Interior (DOI), the Department of Justice (DOJ), the Department of Labor, the Department of State, the Department of Transportation, the Environmental Protection Agency (EPA), the General Services Administration, the U.S. Agency for International Development (USAID), the U.S. Postal Service, and the American Red Cross as Cooperating Agencies.[34] The forthcoming update to the *FAIA* (expected in 2017) will provide further specificity, naming subordinate agencies and offices within many of these departments, and detailing how agencies should coordinate with one another.

Ultimately, the United States Code (7 USC 8310(e)(2)) designates the USDA as the lead agency with respect to issues related to pests and diseases of livestock; 7 USC 7652 likewise designates the Secretary of Agriculture as the principal federal official responsible for coordinating all federal research and extension activities related to food and agricultural sciences. However, like other areas of biodefense, federal responsibilities for agrodefense are by necessity spread broadly across the interagency. Roles and responsibilities under the U.S. Code and other authorities are not necessarily coordinated, nor are the authorities always exercised in a way that has prioritized needed activity. White House-level leadership is, therefore, critical to minimize overlap, identify mission gaps, and coordinate effort. The Panel has recommended previously that the Vice President serve in this role.

SLTT leadership at the political level is no less fundamental to all phases of protecting animal agriculture. In January 2016, when avian influenza appeared in Indiana, then-Governor Michael R. Pence was the first high-level state official to arrive at the emergency command post in Jasper, Indiana. Governor Pence's appearance motivated both officials and producers to act quickly and prevent this outbreak from spreading as far as it had during the national outbreak in 2015. According to Dr. Bret Marsh, Indiana State Veterinarian:

> *He was there first. And it frustrated some of the press because they didn't know he was coming. But he didn't want to be the event. He wanted the people to complete the event and keep their work moving forward. And I would get these text messages from some guy named Mike... I've worked for several governors, but I've never had text messages... So I think, from the Vice President's office, clearly he has an understanding and understands the importance of these issues, in our state, and, therefore, across the country.*[35]

Dr. Marsh also believes that without local collaboration, the outbreak would have spread farther. Producers, not officials, culled poultry at affected farms, realizing that it was "the right thing to do." Additional SLTT interventions are needed to strengthen government partnerships with industry, build expertise, and develop response plans before outbreaks occur.

While the Panel emphasizes in this and in prior reports that two high levels of leadership are necessary to identify appropriate political direction and policy development and coordination, the Panel also reinforces the need for operational leadership during crises as the third critical piece. Congress should consider evaluating the response planning and recovery elements of Homeland Security Presidential Directive 9 (HSPD-9), particularly those areas that pertain to response capabilities and F&A-specific response plans to ensure that they meet National

Preparedness System requirements. The forthcoming issuance of an updated *National Food and Agricultural Incident Annex* (see Coordination chapter) provides a timely opportunity to do so.

ARTIFICIAL POLICY DIVISIONS HAMPER PROGRESS

A complex web of ecological interactions governs the spread of infectious disease. All efforts to prevent and plan for biological events impacting humans must therefore integrate with animal and environmental health initiatives. Animals can be susceptible to many of the same threats as humans and they can also act as conduits for human infection. Further, animals can be terrorist targets in their own right. All agrodefense efforts must integrate human, animal, plant, and environmental health elements into decision-making, budgeting, and operations.

Assessment and reduction of risk to the F&A sector have been led primarily by DHS, USDA, and FDA. HSPD-9 and the F&A Sector-Specific Plan (part of the National Infrastructure Protection Plan) provide a foundation for the protection of this sector.[36] However, associated efforts to prevent, deter, prepare, detect, attribute, decontaminate, remediate, and mitigate agricultural events are not well integrated. Additionally, medical and other countermeasures to protect animals and plants are unavailable for most emerging pathogens. Further, the Bioterrorism Risk Assessment process conducted by DHS appears to be insufficiently linked to follow-on investments that could mitigate this problem via risk management activities.

Optimal biodefense can only be achieved when grounded in an ecological understanding of the entire health picture. The distributed nature of health-related responsibilities across the federal government creates bureaucratic silos that often fail to recognize the interrelatedness of human, animal, plant, and environmental health. A designated leader at the White House who recognizes this interconnectedness could drive integration across federal efforts.

RECOGNITION OF THE THREAT BY HIGH-LEVEL LEADERSHIP

In 1999, Congress established the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction, also known as the Gilmore Commission. This Commission produced several reports for the President and Congress, the first of which noted that agriculture was a highly vulnerable sector and that the biological threat to it deserved more attention than it was getting at the time.[37]

Since then, White House councils (e.g., Domestic Policy Council (DPC), National Economic Council (NEC), Homeland Security Council (HSC), and the National Security Council (NSC)) and the Office of Science and Technology Policy (OSTP) have taken up the issue of agrodefense in various ways. Under the direction of President George W. Bush, White House staff evaluated the extent to which the nation had secured F&A critical infrastructure sector and related sectors and activities. President Bush's HSC identified agrodefense as a pressing concern, and began developing a presidential directive to address it as a part of biodefense. However, the enormity of the risk to agriculture, as well as the precedence of deep-seated and long-standing turf protection among the departments and agencies, drove the Bush Administration to separate agrodefense from other biodefense efforts. The White House subsequently produced two directives in 2004: HSPD-9, *Defense of United States Agriculture and Food*[38] and HSPD-10, *Biodefense for the 21st Century*.[39] These were written separately, although the staffs were the same, and there was cross-over of ideas and an acknowledgement of the realities of One Health. But there were also deep-rooted turf issues that manifested during the process, reflecting the same territoriality seen throughout the federal government today.

Congress also recognized the threat to the sector and sought to address it through oversight and legislation. Senator Pat Roberts convened the first congressional agroterrorism hearing in 1999.[40] More oversight followed. The decision to build the NBAF resulted in hearings and legislation about the national need for agrodefense research and response capability and capacity. The 2014–15 avian influenza outbreak drew attention to the flaws in agrosecurity, and both the House Committee on Agriculture and the Senate Committee on Agriculture, Nutrition, and Forestry held hearings to identify systemic shortcomings in the response to that outbreak.[41] Both chambers of Congress heard from witnesses who identified biosecurity measures that could be legislated, including a mandatory disease prevention program and an FMD vaccine bank.[42] In addition, the House Committee on Agriculture held a hearing on the FMD threat,[43] and the House Committee on Homeland Security held hearings on agrodefense more broadly.[44] Congress tasked GAO in the first decade of the 2000s to conduct a variety of studies regarding protection of the F&A sector; since 2010, congressional requests have been few and usually in response to – not in advance of – outbreaks affecting agriculture.

As a reflection of federal interest in agrodefense, the NBAF deserves special mention. The NBAF is part of the USDA and DHS "plan to provide safe, secure, and state-of-the-art agricultural biocontainment laboratories that research and develop diagnostic capabilities for foreign animal and zoonotic diseases" called for by HSPD-9.[45] The Executive and Legislative Branches have supported the creation of the NBAF, if haltingly, while working through controversies. The overall trajectory

of support to build this laboratory has demonstrated a federal commitment to agrodefense research and response. DHS, with substantial contributions from the state of Kansas and the city of Manhattan, Kansas, will spend well over $1 billion to develop it.

All of this oversight and commitment, and the areas that have lagged or been omitted from it as described in this report, are occurring in the absence of a national strategy and corresponding implementation plan. As described in the *Blueprint for Biodefense*, the nation requires a comprehensive National Biodefense Strategy that integrates the input of all non-federal stakeholder groups. Congress has acted upon the Panel's recommendation and required the development of this Strategy per Section 1086 of the National Defense Authorization Act for FY 2017 (Public Law 114-328). While the Panel recommended that the Vice President take charge of producing this Strategy, Congress directed four departments, DOD, DHS, HHS, and USDA, to work together to do so. The drafters in the House and Senate Committees on Armed Services included USDA because they recognized the integral role of agriculture in our biological security and the serious threats to this sector.

In accordance with Recommendation 3 of the *Blueprint for Biodefense* to develop, implement, and update a comprehensive National Biodefense Strategy:

The White House must ensure that the National Biodefense Strategy (Strategy) and implementation plan address threats to food and agriculture. As part of this process, the National Security Council, Domestic Policy Council, and National Economic Council, in consultation with the Secretaries of Agriculture, Defense, Health and Human Services, and Homeland Security, should jointly review Homeland Security Presidential Directive 9, *Defense of United States Agriculture and Food*, determine where it falls short in addressing today's agrodefense needs, and incorporate updates into the Strategy and its implementation plan. While leadership and policy coordination of interagency federal activity should be centralized, responsibilities for agrodefense will continue to be distributed nationally. The Strategy must recognize this decentralized nature of the U.S. food and agriculture critical infrastructure sector.

USDA has made some critical investments in agrodefense, such as directing research efforts at PIADC with significant emphasis on FMD vaccine, providing food and agrodefense grants through the National Institute of Food and Agriculture, and working with the FBI, FDA, and other agencies to conduct law enforcement and public health investigations. USDA, with some White House direction, also produced a number of policy documents. In addition to USDA, the DOC, DOI, and various HHS agencies (e.g., CDC, FDA), have generated relevant F&A policy documents. While these departments and agencies all take some responsibility for agrodefense, USDA and FDA are ultimately responsible. In addition to DHS input, USDA leadership and FDA leadership must make National Biodefense Strategy contributions a top priority.

While policies and plans are important, they will mean little without an agency to own them and dollars to implement and exercise them. And yet, a federal fiscal commitment to agrodefense is not entirely apparent. The Homeland Security Act of 2002 (HSA) required that the President's budget request incorporate a homeland security funding analysis – in essence, a kind of budgetary cross-cut. According to the FY 2017 analysis, 29 agency budgets included federal homeland security funding across 17 functional areas. The agriculture function accounted for only 0.76% of the total.[46]

Published not long after the HSA, HSPD-9 also acknowledged the pressing need for budget coordination: "For all future budgets, the Secretaries of Agriculture, Health and Human Services, and Homeland Security shall submit to the Director of the Office of Management and Budget, concurrent with their budget submissions, an integrated budget plan for defense of the United States food system."[47] OMB did collect this information and included it in the annual homeland security analysis in accordance with the HSA, but this analysis was high level and did not provide any detail regarding the expenditures in the functional areas. Furthermore, Congress eliminated the reporting requirement altogether in its FY 2017 appropriations law. The Panel strongly recommends statutory reinstatement of the analysis and continued collection of this information on the part of OMB.

In accordance with Recommendation 4 of the *Blueprint for Biodefense* to develop a unified biodefense budget aligned with the national biodefense strategy, the Panel proposes the following:

The President and congressional appropriators should ensure that detailed agrodefense expenditures are identified and included in the recommended data call for and development of a crosscutting biodefense budget analysis. These requested expenditures should be accompanied by impact evaluations. Any gaps recognized as a result should be addressed in the National Biodefense Strategy.

COORDINATION

Many federal departments and agencies share responsibility for agrodefense. Coordination of these efforts is paramount. Because agricultural outbreaks may result from natural events or from deliberate actions, coordination between animal health and law enforcement is particularly critical. The health mission of the USDA and the investigative mission of the FBI must be jointly acknowledged, exercised, and implemented.

LAW ENFORCEMENT AND ATTRIBUTION OF ATTACKS

According to the FBI, the intentional introduction of disease is difficult to differentiate from accidental or naturally occurring outbreaks.[48] Authorities for animal health, plant health, and law enforcement must work with one another from the earliest stages of an outbreak to attribute its source. Some of the most important elements of this joint cooperation include rapid notification of agreed-upon triggers, early threat reports, and unusual disease events, as well as efficient criminal-epidemiological investigation and response. Yet there has been an inconsistent recognition that agriculture is a target of domestic and international terrorist elements, and that intentional means of introduction should be equally considered when suspicious or unusual animal-plant disease events and other recognized triggers are initially detected. Continued training such as that provided by the FBI through its Criminal and Epidemiological Investigation course will help support better understanding between the agriculture and law enforcement communities, help the investigation of threats to animals and plants, facilitate threat and operational awareness, develop information sharing protocols, and foster SLTT health-law enforcement contact networks. Additionally, broad distribution throughout the food and agricultural community of resources developed jointly by USDA, FBI, and FDA, such as the *Criminal Investigation Handbook for Agroterrorism*, will help increase awareness of the threats to F&A and how these communities can work together to investigate outbreaks in, and suspected acts of terrorism against, this sector.

When this report went to press, federal partners were drafting a revised FAIA that would provide updated and more comprehensive guidance for federal interagency planning efforts involving food and agricultural incidents. The development of an updated annex is a critical step toward improved agricultural event preparedness, and ideally the final version will contain more in-depth detail on the roles and

responsibilities assigned to the federal interagency than the 2008 version. Challenges in developing the revision in a way that prioritizes both natural and intentional events may reflect a central issue about the perception of agricultural terrorism. Law enforcement investigation of terrorism is well within the scope of the FAIA's purpose – interagency planning and coordination for response and recovery. Much as the recently-updated *Nuclear/Radiological Incident Annex* establishes a clearly-defined role for the Bureau's investigatory responsibilities in the aftermath of weapons of mass destruction (WMD) terrorist acts,[49] discussion of the details and parameters of FBI and other law enforcement response must be included in the response to F&A events.

Scenarios detailed in any new FAIA should include intentional introductions of food and agricultural pests or contaminants, and should address the source and means of those introductions. The FBI considers any foreign animal disease outbreak suspicious until proven otherwise, and seamless coordination in the early stages of investigation among law enforcement, animal health, and public health is therefore critical. Mitigating animal health impacts indeed must be the priority, but there is no reason that protocols developed by the FBI cannot be leveraged to ensure a concomitant investigation to determine the source of the outbreak which, if intentional, must be known quickly to then disrupt follow-on acts of terror or crime.

In accordance with Recommendation 9 of the *Blueprint for Biodefense* to better support and inform decisions based on attribution of biological events, the Panel proposes the following:

The Administrator of the Federal Emergency Management Agency should coordinate with the Administrator of the Animal and Plant Health Inspection Service (APHIS) and the Director of the Federal Bureau of Investigation to ensure that any update of the *Food and Agriculture Incident Annex* (Annex) recognizes and addresses the investigative mission of the Federal Bureau of Investigation (FBI), and clearly directs other federal departments and agencies to support inquiries into suspected acts of agricultural crime and terrorism. The next iteration of the Annex should incorporate concepts of initial consideration of intentional threats in unusual or suspicious disease events; the roles and responsibilities of the FBI, USDA Office of Inspector General, and FDA Office of Criminal Investigations; and subsequent joint criminal-epidemiological investigations. The Annex should also enumerate the role played by the nation's fusion centers in coordinating and disseminating information.

Further, the aforementioned officials should ensure that, to the greatest extent possible, responsibilities in this Annex related to law enforcement inquiries or investigations of acts of agricultural terrorism align with similar activities in the *Nuclear/ Radiological Incident Annex*, the *Biological Incident Annex*, and any other incident annex to the *Response and Recovery Federal Interagency Operational Plans*.

The Administrator of the Federal Emergency Management Agency should coordinate with the Administrator of APHIS and the Director of the FBI to ensure that Annex updates would be required to be regularly exercised at least at the state level, as is done with other areas of national security. These exercises should provide a means for the named agencies, as well as other federal and non-federal partners, to develop measurements of the capabilities needed for adequate and economically justifiable response and recovery efforts. They should also be used to gauge the value of funding programs to enhance the capabilities described within the Annex.

COLLABORATION

Collaborative effort within the interagency and among non-federal stakeholders has been a cornerstone of homeland security efforts since September 11, 2001. That same collaborative effort is necessary within agrodefense. This section of the report focuses on challenges in two areas: biosurveillance and reporting/information sharing. Avian influenza and other outbreaks have demonstrated the critical importance of timely and accurate biosurveillance. Early detection is one of the best methods available to prevent the spread of infectious disease. The emergence of infections not just in rural but also in urban areas, as evidenced by a rare avian influenza strain that infected 500 cats (and at least one human) in a New York City animal shelter in late 2016, demonstrates a requirement for vigilance and an acknowledgement that all areas, rural and urban, and many species, wild and otherwise, must be part of any surveillance framework. Adequately funding data collection and establishing a nationally notifiable animal disease list are critical to the success of this system, as is reporting and information sharing among federal, SLTT, and private sector stakeholders. Ultimately, leadership over federal biosurveillance efforts and, in particular, the integration of these efforts is still needed.

BIOSURVEILLANCE

The early detection of infectious disease outbreaks is one of the most important means available to mitigate their impacts and shorten the duration of response. This detection should occur at the level of livestock production and in wildlife. Stakeholders in this area span from government agencies at all levels to local farmers, veterinary hospitals, and even poison control centers. Although the *control* of many diseases is not possible in wildlife, early *detection* is one of the best defenses against catastrophic impacts of agricultural and zoonotic disease threats.

The drafters of HSPD-9 understood this concept. HSPD-9 tasks DOI, USDA, and EPA to operate surveillance and monitoring systems (section 8); DOJ, DHS, and the intelligence community (IC) with intelligence collection and analysis (section 9); and DHS with integration of this information (section 10). Each of these elements exists in various stages of maturity and interagency integration. An important missing element is a standard of expectation or quality by which the value of investment in biosurveillance can be measured. Such a standard could include: the

key area of characterization; risk determination; potential course of action; and a means of assessing the value of the contribution these measures have on health. Such a standard does not currently exist in biosurveillance, and without it, funding will continue to be inhibited and uninformed.

In December 2014, the USDA identified HPAI in poultry in Oregon and Washington in an outbreak that ultimately reached 232 farms across 21 states before federal and state officials and industry partners eradicated it.[50] The federal government spent $879 million to contain the outbreak,[51] a figure that includes $610 million toward response activities, $200 million in indemnity payments, $34 million in planning costs for the coming autumn, and $35 million in overtime, travel, and supplies for USDA employees.[52] While the costly response prevented a larger disaster, the 2014–15 outbreak still cost the U.S. economy $3.3 billion.[53] Nearly 7.5 million turkeys, 43 million layer hens, and 3.5 million replacement pullets (young female hens) were destroyed,[54,55] and an estimated 15,000 jobs were lost in the egg industry.[56] Indirect costs included higher prices for eggs;[57] non-indemnified losses to producers (estimated at more than $1 billion);[58] and bans placed by 15 countries on poultry imports from the United States, with many other countries placing targeted bans on particular U.S. states or regions.[59]

In January 2016, an unrelated HPAI strain appeared in a commercial turkey flock in Indiana, and a low pathogenic strain was confirmed at eight nearby farms; approximately 414,000 birds were depopulated to control this outbreak which lasted until May of that year.[60]

Combined, these avian influenza outbreaks resulted in the death or culling (selective slaughter) of 50.6 million animals, cost the federal government $930 million, and cost the U.S. turkey and egg sectors $1.6 billion.[61] Indirect impacts on the U.S. economy were even higher. We can expect more events of this nature in the years to come. As recently as March 2017, another HPAI outbreak occurred, this time in Tennessee.

The 2014–17 U.S. avian influenza outbreaks exemplify a partially effective detection and surveillance capacity linked to a response capacity fraught with significant challenges. The GAO reported that USDA evaluated response weaknesses revealed by the first two outbreaks (2014–15 and 2016).[62] USDA identified challenges in biosecurity, continuity of business planning, diagnostic testing, epidemiological investigation, incident management, mass depopulation and euthanasia, biosurveillance, and vaccination, among other categories. While response capacity is clearly of significant importance given the inherent difficulty of preventing pathogens like HPAI from entering U.S. borders via wild birds, some increased emphasis on biodetection and biosurveillance in wildlife and livestock

could improve mitigation efforts toward avian influenza and other diseases. This is particularly true for wild bird surveillance, which requires steady funding in advance of outbreaks.

Rapid biodetection, diagnosis, and integrated biosurveillance remain critical functions toward which the nation has made great strides, yet which still lag behind the need. Biodetection is hampered by an insufficient focus on rapid pen-side diagnostics, and insufficient investment to develop new wildlife disease detection technologies and validate existing tests (e.g., PCR assays for avian influenza and other pathogens). Biosurveillance is perpetually challenged by information sharing problems. HSPD-10 described the need for "an integrated and comprehensive attack warning system to rapidly recognize and characterize the dispersal of biological agents in human and animal populations, food, water, agriculture, and the environment."[63] However, animal health surveillance remains somewhat segregated from the model of comprehensive biosurveillance described. Livestock health surveillance is currently performed for the benefit of agriculture and food animal production. These data are typically unavailable on a regular basis to federal agencies with surveillance responsibilities outside of the USDA, although reportable zoonoses do make their way to state and federal public health authorities. Some argue anecdotally that animal and human health surveillance data are insufficiently integrated; while this may be the case, the Panel has to-date identified few examples that any such lack of integration has directly caused negative health impacts in animals or people. A deep evaluation of the nodes of connectedness, the lack thereof, and case studies of where failures have occurred could help guide further biosurveillance policy.

Spurred by outbreaks of FMD and BSE in the United Kingdom, along with the spread of West Nile virus in the United States, the USDA established the National Wildlife Disease Program (NWDP) in FY 2003 to provide wildlife disease surveillance and management at a national level. Because state wildlife agency efforts tend toward wildlife management rather than disease diagnosis, understanding of the wildlife disease surveillance picture, particularly in the context of the broader animal and human health picture, has fallen to the federal government. The NWDP program is designed to reveal key features of infectious diseases, such as prevalence, species predilections, species reservoirs, predominant strains, and geographic scope of given pathogens. The program accomplishes a great deal despite its low level of appropriated funding. For instance, NWDP instituted national disease monitoring programs for swine brucellosis, pseudorabies, and classical swine fever.[64] The program also undertook a pilot study examining feral swine as sentinels for anthrax.[65] Anthrax and other material threats are targets of other NWDP initiatives, such as its efforts to sample wildlife species for the presence of tularemia and plague. The monitoring was put to use in Indiana after the 2016 avian influenza

outbreaks to sample mice, starlings, gulls, and other animals that might be harboring the offending virus.[66] USDA also funded wild bird surveillance through its CCC funds; the USDA funding allotments toward surveillance are shared with partner agencies, an important example of collaboration.

Initially funded at approximately $6.2 million, NWDP has not seen an increase since its inception and operates now at just under $4 million. This fact illustrates that each year for the last decade-and-a-half the operational side of the program has ended up with about $3 million to surveil for more than 75 pathogens, toxins, and syndromes, at multiple scales ranging from state to national, continental, or even international.

This figure is surprisingly low when placed in context. USAID's EPT PREDICT, a critical global wild animal surveillance program, receives roughly $20 million annually; yet the core domestic program designed for wildlife sampling receives one-fifth of that. While the United States is not considered a hotspot for emerging infectious disease, its land mass, biodiversity, and commercial agricultural sector create a trifecta of risk for pathogen introduction. The surveillance effort should be commensurate with that risk. Much of the international biosurveillance work undertaken by USAID, particularly in predictive efforts, may serve as a model for future surveillance programs, and its work to build capacity abroad should be reflected as an element in the National Biodefense Strategy.

Current funding levels present limitations to our situational awareness and accumulation of scientific knowledge. As stated by Bevins et al., "Large-scale surveillance programs such as this... are important for providing ecological data on infections at politically and biologically relevant scales."[67]

Congress continues to appropriate funding as particular events occur. From 2006–11, USDA, DOI, and SLTT agencies implemented an NSC-requested plan for a nationally coordinated avian influenza surveillance effort in wild birds.[68,69,70] Their funding came from separate appropriations to the two federal departments as per the standard congressional approach, one that does not incentivize inter-departmental cooperation unless the subcommittees jointly build such partnering into the law. White House direction was likely, therefore, an important element of the program's ultimate success. Efforts ceased in 2011, and were not renewed until 2014 when HPAI reappeared in U.S. commercial poultry flocks. If history repeats itself, USDA or Congress may discontinue the program once again when a lull in avian influenza outbreaks tempts them to turn their funding elsewhere.

The integration of collected surveillance information is an essential component of the process.[71] Yet this piece has been perhaps the one most stymied by bureaucracy. The subject of a national, comprehensive, and integrated human and

animal health surveillance system has been much discussed since the issuance of HSPD-9, which stated:

> *The Secretary of Homeland Security shall coordinate with the Secretaries of Agriculture, Health and Human Services, and the Administrator of the Environmental Protection Agency, and the heads of other appropriate Federal departments and agencies to create a new biological threat awareness capacity that will enhance detection and characterization of an attack. This new capacity will build upon the improved and upgraded surveillance systems described in paragraph 8 and integrate and analyze domestic and international surveillance and monitoring data collected from human health, animal health, plant health, food, and water quality systems.*[72]

Similar to the related requirement in HSPD-10, no such system has ever been implemented. DHS' National Biosurveillance Integration System (NBIS) might have achieved this goal, at least in part, but has not realized the function envisioned for it for reasons described in the *Blueprint for Biodefense*. Acquiring the necessary data has proven to be difficult. Much of the data are owned by the private sector, thus requiring protected information policies that incentivize sharing. Similarly, successful analysis to detect emerging health threats depends on the cooperation of federal and state agencies. Despite such challenges, the Panel has previously concluded that NBIS could have been successful with centralized stewardship; and it remains true that White House leadership could still provide the basis for the coordination and collaboration necessary to optimize the function, if not the NBIS itself. Should NBIS be expected to continue its mission, the White House must get behind and support it. The White House would need to direct interagency sharing of information for the system, and encourage other departments to not just provide information, but to seek information from NBIS through well-formed queries with stated purpose for use. NBIS in turn should be required to evaluate how well its information contributions to DHS and other departments assist in risk reduction and other desired impacts associated with integrated biosurveillance. The approach should be tied to the standards for biosurveillance discussed previously.

The implementing partners of the wild bird surveillance system established an interagency steering committee for surveillance of influenza in wild birds. USDA APHIS (Wildlife Services and Veterinary Services), the U.S. Geologic Survey (DOI), U.S. Fish and Wildlife Service, CDC, state representatives, and the National Flyway Council are members of this Interagency Steering Committee for Surveillance for HPAI in Wild Birds. This committee has produced interagency plans for detection of HPAI in wild birds.[73] The steering committee has been a cohesive unit for designing and implementing large scale surveillance systems. The development of more

interagency steering committees similar to that for HPAI could perhaps provide a platform for this kind of education, information sharing, and relationship building.

The NAHLN, a network of federally-supported partner labs located across has country, also serves a vital function in quickly identifying, confirming, and providing diagnostic surge support for infectious disease outbreaks. In the 2014 Farm Bill, funding was authorized at the level of $15 million annually. The 2018 Farm Bill provides an opportunity for Congress to consider whether the currently authorized level is sufficient to meet the growing need for a national system capable of handling its daily diagnostic demand as well as surge demand for a massive outbreak. Additionally, in the 2008 Farm Bill, Congress authorized the creation of a prevention program for plant diseases and disasters funded by the CCC.[74] Congress should consider establishing a fund to address similar programs for animal health, one that provides more robust support for early detection and surveillance efforts at the state level.

In accordance with Recommendation 14 of the *Blueprint for Biodefense* to improve surveillance of and planning for animal and zoonotic outbreaks, the Panel proposes the following:

The National Security Council should direct interagency partners to develop a standard of expectation or quality by which the value of investment in biosurveillance can be measured. The White House should consider the full scope of wildlife surveillance activity that would benefit wildlife, livestock, and human health, and develop a commensurate budget request. The Administration and Congress should commit to such a plan for the long term. Congress should fund and facilitate enhanced opportunities for data collection from livestock and wildlife by the Department of Agriculture (USDA), Department of Homeland Security (DHS), and Department of Interior, through increased appropriations to the USDA National Wildlife Disease Program. The Secretary of Homeland Security should further DHS collaboration with other federal, state, local, tribal, and territorial, and private sector entities that collect animal health data. Congress should assess whether DHS and the USDA have the needed authorities to ensure the effective sharing of information, and amend statute as necessary.

Congress should continue to fund the National Animal Health Laboratory Network in FY2018 and thereafter at no less than authorized levels, leaving open the possibility that additional funds may be required to fulfill the Network's mission as the need to rapidly diagnose outbreaks grows.

Congress should establish a prevention fund for animal health disease and disaster programs through which capability gaps identified in this report and other relevant agrodefense analysis can be addressed. The Commodity Credit Corporation would be an appropriate vehicle for this funding. This fund could be based on the program created for plant health in Section 10201 of the Food, Conservation and Energy Act of 2008.

REPORTING AND INFORMATION SHARING

The SECD outbreak, perhaps more than any other livestock infectious disease outbreak in recent memory, demonstrated the importance of early reporting, whether for foreign or endemic diseases. APHIS has developed a National List of Reportable Animal Diseases (NLRAD), which has two categories: Notifiable Diseases and Conditions, and Monitored Diseases. The Notifiable Diseases and Conditions consists of foreign animal diseases, emerging disease incidents, and regulated disease incidents. Currently, only accredited veterinarians are required to report specific diseases, such as foreign animal diseases and other diseases not known to exist in the United States.[75]

Monitored diseases do not have a requirement for immediate reporting; they are included only in a monthly reporting requirement by state animal health officials and only when confirmed (not at the suspected or presumptive stage). Furthermore, disease reporting rules for monitored diseases do not require states to report the specific number of cases that have been identified. Last year, only 36 states voluntarily reported diseases on this list to USDA. Furthermore, some states have their own unique reportable disease lists which often differ in terms of which diseases are reported (*e.g.*, the only virus present on all state lists is influenza). Though newly-identified emerging infectious diseases are often placed on the mandatory notifiable reporting list, many known, long-standing diseases that are on the voluntary monitored list have not historically been tracked reliably or consistently.

A systematic and comprehensive animal disease reporting system that codifies reporting requirements and provides for consistent reporting is needed. The 2013 swine coronavirus outbreaks demonstrate the disadvantages apparent from the

lack of such a system. Although USDA was aware of the initial cases, it did not take further regulatory action that would require reporting from affected farms over concerns that it could have negative impacts on the swine industry. Instead, USDA initially supported industry-led efforts to address the outbreaks.[76] A balance between restrictive reporting requirements and the ability of industry and states to manage their own agricultural affairs is needed. The goal should be to allow greater availability of information, coordination of effort, quicker response, and reduced impacts on all stakeholders. The foundation for this eventual outcome is in place: many states are already voluntarily working with USDA to report diseases, and further support through the NAHLN, cooperative agreements, and veterinary accreditation can help strengthen regular reporting of diseases at the state level.

A 2014 concept paper from the USDA on building a reportable disease system has yet to be implemented, although the USDA has since issued a follow-on publication, a framework designed as a pre-cursor to rulemaking. USDA states that, "Regulatory action will officially recognize the NLRAD and codify specific reporting requirements for State animal health officials, laboratory personnel, veterinarians, producers, and others. The U.S. agriculture infrastructure is vulnerable to significant damage from listed as well as emerging diseases."[77] The NLRAD will provide consistent reporting across the United States and help animal health officials protect the U.S. agriculture infrastructure. USDA posted the draft framework for public comment in late 2016; if implemented in regulation, it would make reporting of notifiable diseases mandatory by veterinary practitioners, producers, diagnostic laboratory personnel, and others with knowledge of real or suspected occurrence of these notifiable disease categories. Monitored diseases are to be reported on a monthly mandatory basis by state animal health officials. Additionally, for the first time, private laboratories and entities would be required to report both notifiable and monitored diseases. Notably, the framework would rely on collaboration between federal, state and industry officials to decide the detail of data needed for each disease on the monitored list. At the time this report went to press, the framework was in a review period after receiving public comments.

In accordance with Recommendation 7 of the *Blueprint for Biodefense* to integrate animal health and one health approaches into biodefense strategies, the Panel proposes the following:

The Administrator of the Animal and Plant Health Inspection Service (APHIS) should finalize the rule to establish the National List of Reportable Animal Diseases (NLRAD), in accordance with APHIS' proposed framework and stakeholder comment on that framework. Once finalized, the Administrator of APHIS should ensure that sufficient data systems are in place to properly support the reporting and dissemination of data through the NLRAD. Additionally, the Administrator of APHIS should take appropriate steps to encourage and incentivize rigorous reporting from laboratories, veterinarians, and other stakeholders for cases of diseases on the monitored list, beyond the requirements detailed in the proposed framework.

INNOVATION

Innovative thinking, both in how we govern and in the technological solutions we bring to defense challenges, has been one of the foremost messages of this Panel. The nation needs new ideas and new scientific solutions to push agrodefense approaches beyond their current limitations. Options beyond culling, particularly those that consider animal welfare, must become core tenets of our response; government incentives for innovative research where commercial markets are lacking must become the norm; and academia, producers, and government officials must be encouraged to work together in new ways.

NEXT-GENERATION MEDICAL COUNTERMEASURES

As important as biosurveillance is, the bigger challenges seem to rest with other elements of the system: we have minimal MCM stockpiles or agreements with vendors; we lack the capability to produce MCM on demand; we cull animals because it is deemed to be the only option; and the direct and indirect costs of response are enormous. Reasons for this vary from insufficient federal investment in innovative technologies to the logistical hurdles, cost, and trade ramifications of vaccinate-to-live control strategies.

HSPD-9 requires a coordinated federal effort, led by the Secretary of Homeland Security, to accelerate and expand the development of countermeasures against catastrophic animal, plant, and zoonotic diseases. Relatedly, HSPD-9 requires DHS, HHS, USDA, and EPA to develop a National Veterinary Stockpile (NVS). The White House envisioned the stockpile to contain "sufficient amounts of animal vaccine, antiviral, or therapeutic products to appropriately respond to the most damaging animal diseases affecting human health and the economy and that will be capable of deployment within 24 hours of an outbreak."[78] To date, the NVS has not been authorized in statute.

While the NVS maintains supplies like personal protective equipment and depopulation equipment which have been distributed and used successfully in recent outbreaks, from an MCM standpoint, the NVS is entirely inadequate. For instance, although the stockpile had 9 million doses of vaccine for a North American avian influenza strain (H5N3) at the time of the 2015 HPAI outbreak, it lacked any doses for the strains that actually were infecting poultry during that outbreak. Following the outbreak, APHIS issued a series of Request for Proposals (RFPs) to stockpile avian influenza vaccine for those strains to be used in future

outbreaks. In July 2016, APHIS released its final RFP to acquire an undisclosed number of avian influenza vaccine doses, a purchase that used funding through the CCC. However, without sustained, continued funding, these additional doses will eventually reach the end of their shelf-life and will not be replaced.

Vaccination is generally an effective method of influenza control in poultry.[79] Yet vaccination factors only minimally into USDA HPAI plans[80], and it is unlikely that the NVS has sufficient access to HPAI vaccine for use in combating any large epidemic. Many elements of vaccination indeed make it a complex technical and policy decision: an abundance of viral strains confounds vaccine formulation and stockpiling decisions; vaccinated animals can still shed virus; and vaccination can negatively impact trade status. Yet mass culling is losing favor among the public and should not be the only option. MCM will need to play a more prominent role, and policy and technology will need to catch up to that necessity.

The lack of vaccine available for use during the 2015 outbreak points to larger problems facing the NVS. While USDA APHIS applies a threat-based approach to vaccine procurement, the agency lacks sufficient funding to procure the MCM that threat-based analysis actually reveals. APHIS is unable to support the procurement of MCM for many of the diseases on its *High-Consequence Foreign Animal Disease and Pests* list. There are no therapeutics in the stockpile, and mass procurement of vaccines for outbreaks is frequently a reactionary practice. In recent years, the NVS received on average $4 million per year in congressional appropriations, vastly less than that for the Strategic National Stockpile (SNS) which received $575 million in FY 2017 to serve a similar role for human health. While the precise dollar value of an optimal veterinary stockpile is not publicly known, and may not be the same as for the human stockpile, the magnitude of the difference is striking given that many of the costs for development and stockpiling are expected to be similar. At $4 million annually, USDA is forced to find efficiencies in the NVS supply chain and forge outside partnerships just to provide a limited supply and range of countermeasures. The NVS appears to be little more than a vehicle for MCM distribution, rather than an end-use driver for federal identification, procurement, and stockpiling of priority MCM. It is extremely concerning that a funding level that appears to be based on historical precedent rather than risk-based allocation is driving the contents of the nation's stockpile of veterinary countermeasures. At $4 million, the NVS can only remain on standby and await emergency funding assistance (e.g., borrowing from the CCC), to purchase sufficient amounts of a vaccine during a crisis.

Insufficient federal support for the development of animal vaccines and countermeasures has created an incentive vacuum for the private sector to create them. NVS funding has focused on procuring readily available vaccines, rather

than demonstrating a market commitment to procurement the way the BioShield Special Reserve Fund was designed to do for human MCM. Companies often face difficulties in bringing new animal vaccines, antivirals, and therapeutics to market, and those that would develop agricultural countermeasures that lack a commercial market have minimal advanced R&D support and no procurement commitment in the form of robust NVS funding. In the absence of such support, and without the guarantee of a viable federal market, companies hesitate to commit to developing countermeasures at all. Funding the NVS alone is, therefore, insufficient. If the federal government wants to meet the requirements of HSPD-9, a far greater investment in advanced R&D is also necessary. A system of determining how much funding is worth investing in which diseases is therefore of national interest. To date, APHIS has not approved the use of avian influenza vaccines in commercial poultry, including those it has purchased, and it has not indicated whether or when such a determination will be made. The potential of the stockpile will be significantly enhanced through the acquisition of necessary MCM, and through the establishment of policies for their use.

In accordance with Recommendations 27 and 28 of the *Blueprint for Biodefense* to prioritize innovation and to fully fund and incentivize the medical countermeasure enterprise, the Panel proposes the following:

To meet Homeland Security Presidential Directive 9 (HSPD-9) requirements, the Secretary of Agriculture should assess the ability of the National Veterinary Stockpile to deploy sufficient high-consequence animal disease medical countermeasures within 24 hours. Assessments should prioritize the pathogens identified on the Department of Agriculture's *High-Consequence Foreign Animal Diseases and Pests* list. The Department of Agriculture (USDA) should determine the level of funding needed for these efforts, and request it. USDA should use the findings to: inform its budget request; drive federal priorities for medical countermeasure innovation; and incentivize public-private-partnerships to develop, transition, approve, license, and procure these products. Congress should authorize the National Veterinary Stockpile program. Such authorization should require an annual analysis by the USDA of its progress and an identification of persistent capability gaps and costs associated with achieving the HSPD-9 goal.

The Secretary of Agriculture, in consultation with relevant public and private stakeholders, and in alignment with World Organisation for Animal Health policies, should further develop its vaccine use policy for avian influenza and other high-consequence diseases. Vaccine use policy should be based on an underlying commitment by the federal government to respond to outbreaks with rapid diagnostic and vaccine platform technologies.

The NVS also lacks therapeutics and rapid diagnostics. Rapid diagnostics, including patient-side diagnostics, may arguably be the most important element of an animal disease stockpile. They allow for quick decision-making to minimize the spread of disease before it spreads to larger groups, and to prevent inappropriate uses of vaccine or therapeutics. Absent these tools, diagnosis is dependent on empirical observation by veterinarians, followed by time-consuming laboratory identification. The ability to quickly deploy a user-friendly diagnostics capability to the field would allow for a rapid assessment for SLTT animal health officials, enabling earlier decision-making.

The government does not invest sufficiently in pen-side, innovative diagnostic technology, nor even in today's laboratory-based technology. Diagnostic test kits have short shelf-lives, making them expensive to obtain and maintain. Stockpiling diagnostic test kits would indeed require a sustained financial investment; the need must drive the funding levels, and USDA should determine requirements and request funding in its next budget request to OMB for this purpose.

In accordance with Recommendation 30 of the *Blueprint for Biodefense* to incentivize development of rapid point-of-care diagnostic technology, the Panel proposes the following:

The Secretary of Agriculture should request adequate resources for the National Veterinary Stockpile to maintain a diagnostic test kit for each stockpiled vaccine sufficient to ensure timely delivery of the kits to laboratories. In the Department of Agriculture's budget request, the Secretary should request resources to incentivize the development of rapid point-of-care diagnostic devices for high-consequence pathogens.

Among all livestock infectious diseases, the United States has been singularly focused on the development of vaccines for FMD since the 1950s. Yet today, the USDA's own FMD vaccination strategy states that the United States does not have sufficient vaccine to vaccinate beyond a small focal or moderate regional outbreak.[81] The United States contributes funding to the North American FMD Vaccine Bank, which is a repository for vaccine antigen concentrate (VAC). PIADC holds this supply of antigen. Whereas vaccine production from scratch can take up to 14 weeks, industry can produce 2.5 million doses within 21 days with the antigens contained in the bank.[82] Yet the supplies in the Vaccine Bank are insufficient to handle a major FMD outbreak in this country. Culling herds continues to be the highly unsatisfactory default tool for outbreak control. It will be years before the NVS and industrial capacity can address anything more than a local outbreak. No new and validated FMD technology, whether for diagnostics, vaccines, or therapeutics, is on the horizon that would rescue the United States in an FMD emergency.

The NBAF is intended, in part, to address this problem. DHS, the state of Kansas, and the city of Manhattan, Kansas are building the NBAF to expand capacity for disease research and MCM R&D for foreign animal and other agricultural diseases. With its large-animal capabilities, NBAF will also assist with the diagnosis and study of additional diseases more rapidly than its predecessor does. NBAF, however, will only reach its full potential if the federal government commits to funding the research its planners envisioned for it.

The fate of another DHS laboratory provides a case in point. The National Biodefense Analysis and Countermeasures Center (NBACC) is a new facility built across two presidential administrations and two parties to meet a national security threat. In the FY 2018 budget request, the Administration proposed elimination of NBACC to fund other priorities. If the federal government approaches the NBAF in similar fashion (a big vision to build, but a small vision to implement long-term programmatic activity once that building is erected), the $1 billion investment could be wasted. If the USDA is the only customer of the lab (much like the FBI has been the only customer of NBACC's bioforensics lab), this not only eliminates a large opportunity for public-private partnership, but places the lab at the mercy of USDA's R&D appropriations which are historically a fraction of what is needed.[83] It is also the subject of some debate within DHS, USDA, and Congress as to which federal department will assume oversight and funding of NBAF operations. The President's FY 2018 request would eliminate all agriculture and animal-specific research by the DHS Science and Technology Directorate; this would include agricultural screening and surveillance research and development, as well as foreign animal disease MCM research. The budget request provides no compensatory funding for USDA to take on these missions. As agrodefense is fundamentally a national security concern, it

should continue to be a primary responsibility of DHS. While final appropriations language may reject these proposals, they speak to a diminishment of support from the Executive Branch for agriculture and agrodefense research.

In accordance with Recommendation 27 of the *Blueprint for Biodefense* to prioritize innovation and incrementalism in medical countermeasure development, the Panel proposes the following:

The Secretaries of Agriculture and Homeland Security should establish an antigen bank for foot-and-mouth disease virus. This recommendation is consistent with the Panel's broader recommendation for federal stakeholders to establish a bank of antigen payloads to operationalize a plug-and-play strategy using proven platform technologies for use in emergencies. The Secretaries should ensure that the acquisition of any such antigen bank is tied to a business plan, to establishment of policies for vaccine usage, and to the National Biodefense Strategy. Further, the Secretary of Homeland Security, in coordination with the Secretary of Agriculture, should develop a business plan for the operation of the National Bio- and Agrodefense Facility, one that would engage the public and private sectors; consider domestic and global markets for agrodefense research and development; and identify a dollar figure that defines the need and the opportunity. In the development of this plan, the Secretary of Homeland Security should issue a Request for Information to assess market opportunity for agricultural research in high-containment laboratories. The Secretary should submit the business plan to congressional committees of jurisdiction, including homeland security and agriculture authorizers and appropriators; future Department of Homeland Security and Department of Agriculture budget requests should align with the plan.

CONCLUSION

Nearly all federal departments and a few independent agencies contribute directly or indirectly to the protection of American livestock. So do SLTT governments, and so does industry through the efforts of producers, veterinarians, biotechnology companies, and many others. Finding a way to coordinate them is not an easy charge. While a higher priority has understandably been placed to date on protecting human health from intentionally introduced, accidentally released, and naturally occurring infectious diseases, the increasing rate of emerging and reemerging zoonotic disease accompanied by the overt statements and attempts by those with nefarious intent to attack food and agriculture, indicate the necessity to exert more effort to combat threats, eliminate vulnerabilities, and reduce consequences associated with this sector.

The Administration must improve agrodefense efforts at the departmental level and among the interagency. Departmental efforts should be assessed and redirected per the forthcoming National Biodefense Strategy and along the points outlined in this report. One of the most important elements that could materialize from the Strategy is the emergence of departmental ownership of agrodefense. DHS investments in NBAF development, and USDA's commitment to funding response activities, demonstrate an acknowledgement of the threat. However, current funding levels in areas such as biosurveillance and MCM are insufficient to address mission needs. Furthermore, political leadership and policy coordination, particularly that which acknowledges the intentional dimension of agricultural preparedness, require strengthening. Agrodefense in many ways appears to be an orphan, with long-view funding and policy priority finding a home in neither DHS nor USDA.

Federal investment in the mission space is also temporally lopsided, with more attention and funding brought to bear on the issue when disaster strikes, rather than beforehand. This situation leads inevitably to the incursion of major costs and losses. Such a disparity should be rectified. Budget requests should be submitted and reviewed by OMB and Congress in unified fashion. Beyond the recommendation in this report for such a unified approach to agrodefense budgeting, the Panel will be issuing further analysis of how a more integrated approach can benefit all biodefense efforts. Assessment of capabilities, accountability for these capabilities, and transparency in OMB budget and performance submissions are needed.

The interagency nature of agrodefense means that many congressional committees oversee agrodefense efforts. The House and Senate Committees on Agriculture

and Homeland Security should lead these oversight efforts to ensure that all requirements for securing our agricultural enterprise are met. These Committees should both continue and expand previous efforts and increase their direction to the Executive Branch. The Farm Bill provides a significant opportunity every five years to do this legislatively.

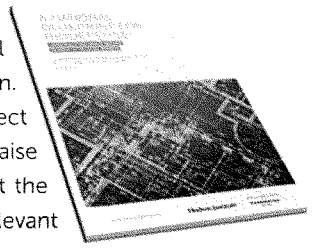
In the 115th Congress, Representative David Young and Senator Pat Roberts introduced legislation that would delineate agrodefense-related responsibilities within the Department of Homeland Security. Signed into law in June 2017,[84] these bills reflect congressional recognition of the need to establish some degree of ownership of the defense of F&A mission within the Executive Branch. The Panel's recommendation for further improvements could be directed via the Farm Bill and other authorization and appropriations vehicles.

While many experts agree that bureaucratic silos of the kind that may inhibit collaboration or information sharing do indeed exist, some silos do appear to be thinning over time. Breaking down all bureaucratic stovepipes may never be possible, so the more apt question may be whether it is possible to make the interaction of those silos more efficient and effective, such as through more joint steering committees. While it is important to put in place policies and even statutes that require collaborative effort, the human beings who implement that effort have to want to do so. Examples of success are often based not on policy and law, but on personnel with long-standing relationships across the interagency and the public/private divide, and who want to drive progress.

With each passing year, new threats are discovered that could have severe, long-lasting impacts on animal agriculture. Some of these threats arise at home, and others come from abroad, necessitating concerted effort not just domestically but also internationally. Even with optimized levels of federal leadership, coordination, and funding in place, a common sense of ownership of the challenge, from governmental and non-governmental stakeholders alike, will be necessary. It is essential that our animals, our lives, and our economy are not left vulnerable. The Panel believes that the implementation of the proposals contained in this report is an important step toward that end.

PROPOSED CONGRESSIONAL OVERSIGHT HEARINGS

Congressional oversight must ensure that federal departments and agencies meet congressional and other mandates, and in a coordinated fashion. The following proposed hearing topics reflect recommendations discussed in this report, and raise additional ideas for consideration. Parentheticals at the end of each description direct the reader to relevant recommendations in the *Blueprint for Biodefense*.



ANIMAL DISEASE REPORTING

A nationally notifiable animal disease system akin to the existing system for human disease would enhance surveillance and detection of biological threats. A proposed National List of Reportable Animal Diseases has been offered by USDA, but not yet finalized. What is the status of implementation? Will the final rule reflect both the mission need as well as stakeholder input? How could the list be integrated into a system by which states and other owners of disease information could willingly and comfortably report disease incidence? (See Recommendations 7, 14)

HOUSE COMMITTEES:

- Agriculture
- Homeland Security
- Natural Resources

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Environment and Public Works
- Homeland Security and Governmental Affairs

BIODEFENSE AND AGRODEFENSE STRATEGIES

In what ways is agrodefense being addressed and incorporated into the National Biodefense Strategy? Is it receiving the emphasis that the F&A sector requires as a national asset? (See Recommendation 3)

HOUSE COMMITTEES:

- Agriculture
- Armed Services
- Budget
- Energy and Commerce
- Homeland Security
- Oversight and Government Reform

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Armed Services
- Budget
- Health, Education, Labor, and Pensions
- Homeland Security and Governmental Affairs

BIOSURVEILLANCE

The United States lacks a comprehensive biosurveillance and detection standard and capability. An integrated biosurveillance function exists in statute, but has been difficult to realize. The program designed to do this, the National Biosurveillance and Integration System, was eliminated in the President's Budget Request for FY 2018. What would it take to bring agencies with biosurveillance responsibilities, including for animal agriculture and wildlife, together in a trusted, information-sharing environment? What is the needed end-state for a continuous capability to detect, validate, and warn of any biological threat, including agricultural threats, within the United States? Many questions about wildlife zoonoses remain, including the ecology of material threats like *Yersinia pestis*, and how changing climate patterns will affect the disease distribution of pathogens like avian influenza. How can we achieve a comprehensive and effective national surveillance architecture if we do not invest to answer these scientific questions? (See Recommendations 7, 11, 12, 13, 14)

HOUSE COMMITTEES:

- Agriculture
- Energy and Commerce
- Homeland Security
- Natural Resources
- Oversight and Government Reform
- Veterans Affairs

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Environment and Public Works
- Energy and Natural Resources
- Health, Education, Labor, and Pensions
- Homeland Security and Governmental Affairs
- Veterans Affairs

FOOD SUPPLY PROTECTION AND RESPONSE

The F&A critical infrastructure sector is a distributed and highly complex system. Many efforts have been made to reduce its vulnerability to terrorism and other insults. HSPD-9 (2004) and the DHS F&A Sector Specific Plan (2010), among other policy documents, guide protection of this sector. Have these and other plans been updated, exercised, and sufficiently funded? Are they integrated with related efforts for biosurveillance, attribution, decontamination, and remediation? How will USDA, FDA, CDC, and other federal agencies respond if a terrorist attack impacts the food supply? How can PPP in this area be improved? What efforts and funding are still required to protect the food supply, including plants? Who and in what state is planning for decontamination and remediation to make food processing plants operational again after an incident? (See Recommendations 3, 9, 10)

HOUSE COMMITTEES:

- Agriculture
- Energy and Commerce
- Homeland Security
- Natural Resources

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Environment and Public Works
- Health, Education, Labor, and Pensions
- Homeland Security and Governmental Affairs

FUNDING OF PREPAREDNESS AND RESPONSE EFFORTS

Funding for federal agrodefense programs is spread amongst a number of Departments and their corresponding activities. Although HSPD-9 provides a basic framework of agrodefense roles at each phase of preparedness, much of the federal investment in agricultural defense comes in the response phase, leading to greater costs and damages when calamity strikes. The CCC provides significant support to USDA to react to crises, but is not currently utilized in developing more robust preparedness efforts up front. What steps can departments and agencies take to better coordinate their agrodefense spending? What incentives might there be to encourage more investment in preparedness and prevention efforts in advance of a threat to food and agriculture? Is there an opportunity for CCC funds to be used for USDA prevention and mitigation efforts? (See Recommendations 4, 7)

HOUSE COMMITTEES:

- Agriculture
- Appropriations
- Budget
- Energy and Commerce
- Homeland Security

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Appropriations
- Budget
- Health, Education, Labor, and Pensions
- Homeland Security and Governmental Affairs

GLOBAL HEALTH RESPONSE

The world lacks a global health response apparatus that can react quickly and insert public health teams to respond to human, animal, and plant outbreaks. What is the current global response capacity and in what ways is it not meeting needs? How can international efforts be evaluated and better coordinated? What is the status of current global health response programs and how can they show more progress? What level of funding would be necessary? What lessons can be learned from recent outbreaks in animals, such as HPAI in China? (See Recommendation 33)

HOUSE COMMITTEES:

- Agriculture
- Armed Services
- Foreign Affairs
- Energy and Commerce
- Natural Resources

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Armed Services
- Foreign Relations
- Health, Education, Labor, and Pensions

OPERATIONAL RESPONSE AND COORDINATION

In the midst of a crisis, operational leadership is critical to successful outcomes. What is the status of response and recovery planning and recovery efforts for high consequence infectious disease scenarios at all levels of government? What further capabilities do responders, particularly those at the local level, require to combat threats to F&A? What can be done to further multi-agency coordination in this area? How can we increase training efforts related to existing plans and protocols? How can we strengthen relationships and communications among the responsible agencies, to ensure operational leadership? (See Recommendations 16, 17)

HOUSE COMMITTEES:

- Agriculture
- Homeland Security

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Homeland Security and Governmental Affairs

WORKFORCE

The national veterinary workforce trained to prevent, detect, and respond to livestock outbreaks of foreign animal diseases is limited. Yet it is this profession that is responsible for protecting animal health and welfare and, therefore, all of the elements of this sector important to human health and the economy. The National Veterinary Emergency Response Teams (NVERT) are the core federal response capacity needed for large animal health situations. Are the available NVERTs sufficient to respond to an animal emergency of catastrophic proportions? Is a USAJOBS-based application requirement the best way to invite and incentivize private sector veterinary professionals into the system? Is the Public Service Loan Forgiveness Program a potential vehicle for expanding the workforce? How can the barriers of entry for interested veterinarians be lowered?

HOUSE COMMITTEES:

- Agriculture
- Appropriations

SENATE COMMITTEES:

- Agriculture, Nutrition, and Forestry
- Appropriations

APPENDIX A: METHODOLOGY

Established in 2014, the Blue Ribbon Study Panel on Biodefense informs U.S. biodefense efforts and provides recommendations for needed change. The Panel, supported by seven ex officio members and funds from foundations, industry, and individual donors, assesses where the United States falls short in addressing biological terrorism, warfare, accidents, and emerging, reemerging, and other naturally occurring infectious diseases. Information-gathering is achieved primarily through public and private meetings and literature research, and recommendations are issued in the form of reports. The Panel works to educate all stakeholders and the public about its findings through these reports, public appearances, and other communications platforms.

RESEARCH QUESTIONS

In order to assess gaps in the animal agrodefense enterprise, the Panel developed the following research questions:

1) Are our priorities correct?
2) Are our investments commensurate with the challenge?
3) Can we benefit by rebalancing investments, or is new funding required?
4) What have we done that has brought a significant return on investment?
5) What else should we be doing that we are not?

RESEARCH ACTIVITY

For this special focus report, the Panel reviewed scientific studies; reports by congressional and presidential commissions; presidential directives; statute and proposed legislation; GAO reports; and federal strategies, plans, budgets, organizational constructs, and programs related to defense against deliberately introduced, accidentally released, and naturally occurring biological events with catastrophic potential. This review: 1) informed the Panel's assessment of the comprehensiveness of efforts to address postulated and actual agrodefense challenges; 2) informed the Panel's determination of how the understanding of the threat, knowledge base, and elements of the agrodefense enterprise should change in light of this assessment; and 3) shaped the structure and topics of the agrodefense special focus meeting held by the Panel on January 26, 2017 in Manhattan, Kansas.

AGRODEFENSE SPECIAL FOCUS MEETING

The Panel organized this special focus meeting around the major activities that comprise the biodefense enterprise at large: prevention, deterrence, preparedness, surveillance and detection, response, recovery, attribution, and mitigation. Two Panel Members, former Senate Majority Leader Tom Daschle and former Homeland Security Advisor Ken Wainstein, co-chaired the meeting and received: 1) information regarding national agrodefense policy, departmental and agency programmatic activities, and legislative matters; and 2) statements from a sitting member of Congress, former federal officials, current state officials, academic and private sector representatives, thought leaders, and subject matter experts. After the meeting, Panel staff summarized major insights, areas for improvement, and recommendations articulated by meeting speakers, and conducted preliminary high-level analysis of the meeting. See Appendix C for the meeting agenda and speakers.

ANALYSIS

Panel staff qualitatively analyzed the information gleaned from their research and from the special focus meeting. Staff evaluated facts, findings, and recommendations provided by meeting speakers and through other means, including policy research and interviews with subject matter experts and former high-level officials. Throughout the process, the five research questions above provided the basis for assessment. This approach allowed Panel Members and staff to identify continuing organizational, legal, policy, and programmatic issues, and to recommend solutions. Panel staff did not use statistical and other quantitative methods for this study. The study is not considered pseudo-qualitative/quasi-quantitative.

STUDY LIMITATIONS

Funding and other resource constraints prevented the Panel from performing site visits beyond visiting the Biosecurity Research Institute at Kansas State University. The Panel did not assess challenges in protecting the food supply or the plant sector, as these are extensive enterprises in and of themselves and require their own special focus. In addition, some agrodefense programs and policies; intelligence, raw data, and documents; appropriations and budget documents; and other sensitive pieces of information are classified or otherwise unavailable, and were not reviewed by the Panel as this was a wholly unclassified endeavor.

APPENDIX B: MEETING AGENDA AND SPEAKERS

The following is the agenda for the special focus meeting at Kansas State University, Manhattan, Kansas. Names and affiliations appear here as they did at the time of the meeting.

AGRODEFENSE: CHALLENGES AND SOLUTIONS

JANUARY 26, 2017

Opening Remarks

- Former Senate Majority Leader Thomas A. Daschle, Panel Member, Blue Ribbon Study Panel on Biodefense
- Former Homeland Security Advisor, Kenneth L. Wainstein, Panel Member, Blue Ribbon Study Panel on Biodefense
- President Richard B. Myers, Kansas State University (General, USAF – retired)

Congressional Perspective

- The Honorable Roger Marshall, MD, United States Representative, Kansas

Panel One – Prevention and Deterrence

Challenges and opportunities in reducing risk from agricultural threats. Understanding the challenges of laboratory research in the context of threats to F&A, regulatory regimes, and new technologies. Ways in which outbreaks have demonstrated strengths and weaknesses, with respect to medical countermeasures.

- Stephen Higgs, PhD, Associate Vice President for Research and Director, Biosecurity Research Institute
- Amy Kircher, DrPH, Director, Food Protection and Defense Institute, University of Minnesota
- Steve Parker, MBA, MSCM, Head, North America Veterinary Public Health, Merial

Lunch Keynote - Leadership in Protecting the Agricultural Sector

- Bret D. Marsh, DVM, Indiana State Veterinarian

Panel Two – Surveillance and Detection

Key elements of effective agricultural biosurveillance and detection, and continued challenges in the effectiveness of ongoing efforts. Technological and policy challenges for early and reliable detection of environmentally dispersed biological agents to attack agriculture. Key elements of effective animal and plant surveillance and detection architecture, and impediments and opportunities to increase situational awareness for early and accurate disease detection and clinical diagnoses. Requirements for medical countermeasures, including the need for extremely rapid development, distribution, and dispensing.

- Tammy R. Beckham, DVM, PhD, Dean, College of Veterinary Medicine, Kansas State University
- Ali S. Khan, MD, MPH, Dean, College of Public Health, University of Nebraska Medical Center
- Kelly F. Lechtenberg, DVM, PhD, President, Midwest Veterinary Services/ Central States Research Center/Veterinary and Biomedical Research Center

Panel Three – Preparedness, Response, Recovery, and Mitigation

Pre- and post-event planning, including the challenges faced by the food, agriculture, and public health communities, and the roles of state, local, and federal governments. Challenges of epidemiology and other tools for characterizing the spread of animal, plant, and foodborne diseases in the United States. Recovery and mitigation, including the challenges posed by cutting edge technology, lack of agreement regarding state and federal responsibilities, and implications for future preparedness.

- Jackie McClaskey, PhD, Secretary, Kansas Department of Agriculture
- D. Charles Hunt, MPH, State Epidemiologist and Director, Bureau of Epidemiology and Public Health Informatics, Kansas Department of Health and Environment
- C. J. Mann, DVM, Chief Executive, Empryse Group

Closing Remarks

- President Richard B. Myers, Kansas State University (General, USAF – retired)
- Former Homeland Security Advisor, Kenneth L. Wainstein, Panel Member, Blue Ribbon Study Panel on Biodefense
- Former Senate Majority Leader Thomas A. Daschle, Panel Member, Blue Ribbon Study Panel on Biodefense

APPENDIX C: ACRONYMS

APHIS.....Animal and Plant Health Inspection Service
BARDA.....Biomedical Advanced Research and Development Authority
BSE.....bovine spongiform encephalopathy
CCC.....Commodity Credit Corporation
CDC.....Centers for Disease Control and Prevention
DHS.....U.S. Department of Homeland Security
DOC.....U.S. Department of Commerce
DOD.....U.S. Department of Defense
DOI.....U.S. Department of Interior
DOJ.....U.S. Department of Justice
DPC.....Domestic Policy Council
EPA.....U.S. Environmental Protection Agency
F&A.....Food and Agriculture
FAIA.....Food and Agriculture Incident Annex
FBI.....Federal Bureau of Investigation
FDA.....U.S. Food and Drug Administration
FEMA.....Federal Emergency Management Agency
FMD.....foot-and-mouth disease
FY.....fiscal year
GAO.....Government Accountability Office
GDP.....gross domestic product
HHS.....U.S. Department of Health and Human Services
HPAI.....highly pathogenic avian influenza
HSA.....Homeland Security Act of 2002
HSC.....Homeland Security Council
HSPD.....Homeland Security Presidential Directive
IC.....Intelligence Community
MCM.....medical countermeasure(s)
NAHLN.....National Animal Health Laboratory Network
NBACC.....National Biodefense Analysis and Countermeasures Center
NBAF.....National Bio- and Agrodefense Facility
NBIS.....National Biosurveillance Integration System

NLRAD ..... National List of Reportable Animal Diseases
NEC ..... National Economic Council
NSC ..... National Security Council
NVS ..... National Veterinary Stockpile
OMB ..... Office of Management and Budget
PEDV ..... porcine epidemic diarrhea virus
PIADC ..... Plum Island Animal Disease Center
PPP ..... public-private partnership(s)
R&D ..... research and development
RFP ..... Request for Proposal
S&T ..... science and technology
SLTT ..... state, local, tribal, and territorial
SNS ..... Strategic National Stockpile
USDA ..... U.S. Department of Agriculture
USAID ..... U.S. Agency for International Development
WMD ..... weapon(s) of mass destruction
VAC ..... vaccine antigen concentrate

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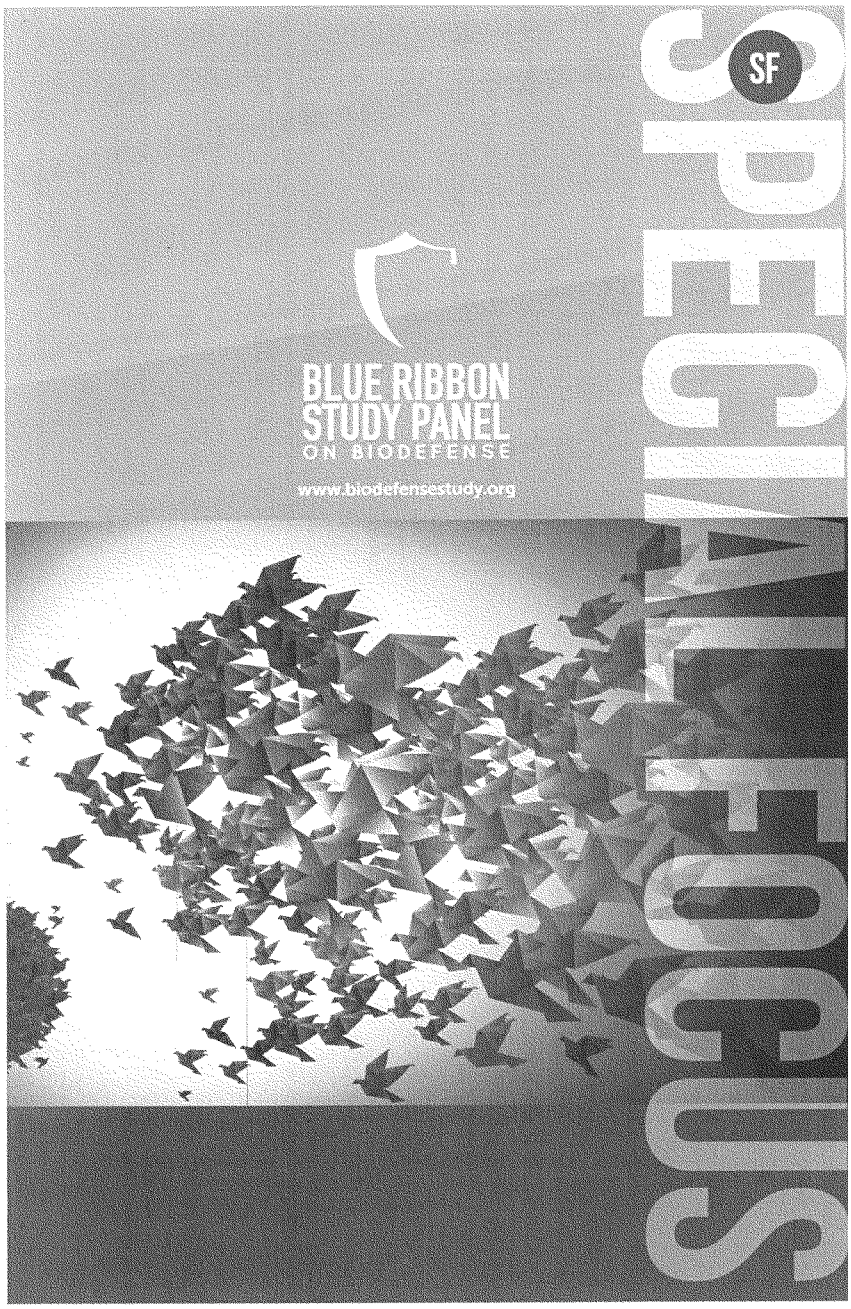
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QUESTIONS AND ANSWERS

DECEMBER 13, 2017

Senate Committee on Agriculture, Nutrition & Forestry
"Safeguarding American Agriculture in a Globalized World"
December 13, 2017
Statement for the Record

Senator Claire McCaskill

I would like to thank Chairman Roberts and Ranking Member Stabenow for holding this hearing on agriculture security.

Chairman Roberts and I introduced the Securing Our Agriculture and Food Act to help outline in law the responsibilities of the Department of Homeland Security in this area, and President Trump signed the bill into law in June. In August, Chairman Roberts and I held a roundtable in Kansas City, Missouri on agricultural security and we had a chance to hear from a wide variety of federal, state, local and private sector stakeholders about challenges and problems facing the agricultural community.

I very much appreciate this committee continuing to follow through with an oversight hearing on this important issue. Homeland security is a government-wide enterprise and departments and agencies across the federal government – Agriculture, Health and Human Services, Homeland Security and others – must partner and work together. We in Congress can help ensure this cooperation through thoughtful oversight and legislation, and that is what Senator Roberts' and my bill and the hearing today aim to achieve.

Our food and agriculture sector is the backbone of our economy. The sector is incredibly diverse and diffuse and almost completely under private ownership. It is not easy to secure. The food and agriculture sector includes an estimated 2.1 million farms, 935,000 restaurants, and more than 200,000 registered food manufacturing, processing, and storage facilities. It accounts for roughly 20% our country's economic activity. With almost 100,000 farms across Missouri spanning over 28 million acres, the agriculture industry generates about $88 billion a year for the state's economy. Missouri is one of the top producers for a number of crops including long grain rice, cotton, soybean, and corn. One in ten Missouri jobs are in the agriculture or forestry industries.

The food and agriculture sector is considered critical infrastructure - an attack on this sector – naturally occurring or intentional - could bring extraordinary consequences. An outbreak of avian influenza across 15 states in 2014 and 2015 forced U.S. farmers to kill approximately 50 million turkeys and chickens, including 29,000 in Missouri, at a cost of between $1 billion and $3.3 billion in total losses. An outbreak of two lethal, highly contagious diseases in pigs in 2013 and 2014 caused the deaths of millions of pigs in a number of U.S. states. Missouri also experienced outbreaks of low pathogenic avian influenza in 2011 and 2016, which led to the depopulation of approximately 70,000 turkeys.

There are many questions that need to be answered in order to safeguard American agriculture. What does effective security look like in the food and agriculture sector? How do we ensure that Americans are better prepared and build resilience into this critical sector of the

economy? Who is in charge when we have an agricultural security crisis? Are we appropriately funding biodefense and agricultural security measures? It is key to resolve these questions and make more coherent the patchwork of currently existing presidential directives and laws.

The Blue Ribbon Study Panel on Biodefense offers Congress and the executive branch agencies recommendations focused on addressing shortcomings in the areas of coordinated leadership, funding for the National Bio-and Agrodefense Facility (NBAF) and medical counter measures, and in research and innovation. These are all areas that deserve congressional attention. I thank Secretary Ridge, Senator Lieberman and the members of the panel for their thoughtful work and their continued engagement in biodefense. Organizing high-level, interagency leadership, increasing investment in bio surveillance and medical countermeasures, and improving animal-based bio surveillance are critical efforts to a sustained approach on agricultural security for real progress.

In additional to a longer term efforts, a few common sense measures should be taken now including increasing the number of Customs and Border Protection Officers and agricultural inspectors at our ports of entry. The Department of Homeland Security's Customs and Border Protection Office of Field Operations has been understaffed at our ports of entry for years. These inspectors are the front line defense for ensuring that plant and animal species that enter the U.S are safe.

And consistent steady progress towards our security goals requires transparency – what are agencies across government doing – and metrics – how much progress are agencies across government making. To that end a portal for agricultural security and biodefense that provides government agencies with some visibility into the work of their partner agencies in complying with statutory and presidential directives may be a useful tool.

I want to thank the Chairman and Ranking Member for their willingness to focus on this key issue and for partnering with me to advocate for the agricultural community in Missouri, Kansas, Michigan and across our nation.

Senate Committee on Agriculture, Nutrition, & Forestry
"Safeguarding American Agriculture in a Globalized World"
December 13, 2017
Questions for the Record
Dr. Raymond Hammerschmidt

Chairman Pat Roberts

1. In your testimony, you addressed the importance of early detection and accurate diagnoses. With new pests and diseases constantly emerging, how can we foster coordination among the federal government, state and local officials, and the farmers in the field, to ensure that the latest and best information is being collected and shared? What role does the extension service play in that effort?

   Coordination starts with effective communication and trust among all entities. Let's begin with the role of Extension. Through county-based educators/agents and campus-based specialists, Extension is a vital mechanism and conduit for gathering information from growers and delivering useful, practical advice in return. Equally important is the overall trust that agriculture producers have in Extension. With a presence in every county and working on behalf of every sector of agriculture, Extension agents and specialists are in a unique position to aid in the early detection of new and emerging problems. In addition, through educational programs such as the National Plant Diagnostic Network (NPDN) first detector programs, individuals have access to tools to aid them in the detection of new or unusual pest and/or disease events.

   Detection must be followed by accurate and rapid diagnostics. This is accomplished, in most cases, through plant and animal diagnostic labs at the land-grant universities. In many cases, the diagnoses are of a non-regulatory nature and can be dealt with via direct communication with the grower. However, when the diagnosis is of potential or serious regulatory concern, the diagnosticians need to contact the appropriate state agencies (e.g. State departments of agriculture) and/or federal agencies (e.g. USDA Animal and Plant Health Inspection Services (APHIS)) for confirmatory diagnoses and requirement of any appropriate action.

   Establishing effective communication networks and building trust can be formed through relationship building exercises. For years, the NPDN conducted scenarios simulating the detection of a pest or pathogen of regulatory concern. These involved everything from how to gather sample collections to diagnostics and recommendations for mitigation. Equally important was the establishment of the lines of communication to effectively carry out these steps. Through these exercises, the various participants interact with, get to know and build relationships with each other and understand the roles that each individual and entity (e.g., Federal and State regulatory agencies, universities, including Extension, commodity groups, etc.) play in a successful detection

diagnosis and mitigation. Because of job changeover and change to policies and regulations over time, it is important that these types of activities be performed on a continuous basis.

In summary, an effective program requires full cooperation among all entities, including government agencies, the land grant system -- especially Extension -- industry and the public. An understanding of each entity's role is also essential. The role of the NPDN in the detection of a new or regulatory pathogen/pest is one of coordination and support of diagnostics (e.g. assistance in diagnosis of the problem, surge support and communication). The diagnoses from the NPDN labs aid in the decision-making process with final say coming from state or federal agencies if the pest/pathogen is regulatory in nature. Decisions on how to manage or mitigate the problem are based on the nature of the final diagnosis. Having strong lines of communication with industry, including individual farms, is essential to ensure that decisions are understood and the appropriate actions are taken.

2. Have you encountered any obstacles to improving coordination and collaboration within the Federal Government to advance agriculture security? Similarly, what barriers may exist between the federal government, state governments, and private industry? And from your perspective, what risk management principles can government and industry each utilize when directing resources towards planning and preparedness?

   The main obstacle I have faced, as part of the National Plant Diagnostic Network (NPDN), has been our inability to conduct as many or frequent exercise scenarios as I believe necessary. This is directly related to the reduction in funding that occurred several years ago. These exercises were the foundation of relationship building between state and federal agencies, land grant universities and the industry. These exercises led to better coordination on how to deal with plant biosecurity issues, such as the introduction of a new pest or pathogen.

   Communication and "siloed" programs (ones that operate independently from one another) are some of the major barriers between the different agencies and industry. Competition for limited resources is also a driver in keeping some programs more inward focused than outward thinking. Helping to illuminate this issue were the two USDA-NIFA "Call to Conversation" meetings on Tactical Sciences (the program within NIFA that engages in animal and crop protection including the NPDN). The meetings united representatives from industry, land-grant universities, USDA NIFA and USDA ARS and USDA APHIS. Although the focus was on the tactical sciences program, one of the strongest messages that I took home was a need for better coordination of programs and communication. This means finding ways to keep programs from becoming too distanced from one another within a framework that absolutely relies on a coordinated

effort. We should move beyond the NIFA programs and look at how to better communicate between other USDA agencies, as well as other agencies involved in agro/biosecurity. These types of meetings would be beneficial in determining next steps and setting milestones.

We also need to find ways to engage all programs involved in agricultural security so that the various mission and responsibilities of each will be more broadly understood. This has happened in the past, but we must maintain communications so that each unit within the agrosecurtity sector knows its roles and how it relates to the others. This will help provide a framework for the coordination that is necessary to protect agriculture.

The USDA ERS lists several risks facing agriculture. Of those, diseases and pests are noted under the category of production risks. Knowing what potential biological pests and pathogens, including both endemic and exotic, may be potentially in play is a first step. However, evaluating the risk of unexpected threats must also be considered. This requires planning and preparation, including approaches for rapid detection and diagnostics followed by ways in which to eradicate and/or contain the pest or pathogen. Identifying the risks and developing mitigation and recovery plans through the collaboration of government agencies, industry and the land grant system is essential in effective action. It is also critical in avoiding the risk all together. Careful monitoring of pest/pathogen movement is key, and it may ultimately be necessary to develop strategies to reduce risk once an event is identified. This rapid and coordinated action across all groups further supports the need for each unit to know its role and the roles of the other entities, effective communication and trust.

Ranking Member Debbie Stabenow

1. In Michigan, we're constantly fighting against new pests and diseases. In 2016 our cherry growers lost over 21 percent of their crop due to the spotted wing drosophila.

    a. How do you and other researchers at MSU work with Michigan farmers to detect and combat plant pests and disease?

    The first step is identification of the problem through detection and diagnosis. Extension educators and specialists are often the first line of detection, although individual growers and crop consultants are also involved in the process. Once a potential issue is detected, a sample is sent to MSU's Diagnostic Services for diagnosis. The staff can perform diagnoses across all major pest and pathogen types and call on faculty for additional assistance if necessary. Through the NPDN network, the diagnosticians can also obtain advice and share expertise to aid in diagnostics. Once a diagnosis is complete, the growers are provided with one or more options for management. Researchers and faculty are brought in to assist when the identified problem needs further information and/or study to help identify a long-term

solution to the problem. Communication, rapid diagnostics and the trust between the diagnosticians, Extension staff and researchers with the growers and other members of the agricultural community is vital to success.

b. What are some examples of your work and successful eradication of a pest or disease in Michigan?

Eradication of disease and pest, while ultimately desirable, may not always be achievable. In some cases, for example in trade, it must be demonstrated that the product is pathogen- and pest-free. Much of this is done via regulatory inspection, although the tools to eliminate the pests or pathogens and the appropriate use of the tools often comes from university research.

Some pathogens, such as plum pox virus, have been eradicated in Michigan. However, in most cases, the research is aimed at management of disease and pests to a level that causes no damage to the crop. Spotted wing drosophila (SWD) is one example of an invasive pest that is proving to be extremely difficult to treat and/or manage, let alone eradicate. Researchers are feverishly working to find effective treatment options with little to no advancements.

Below are some examples, in addition to the intensive research on SWD, of how my colleagues at MSU are working to manage pest and diseases to protect Michigan's diverse and valuable agriculture and natural resources industries. This list also illustrates the diversity of crops and pests/pathogens Michigan faces.

European Brown Rot

Michigan leads the nation in tart cherry production, and its growers produce approximately 70 percent of the total U.S. crop. Controlling fungal diseases of tart cherry is imperative to produce this economically important crop annually, and in an average year, growers apply six to eight fungicide applications per season to manage key diseases, such as cherry leaf spot and powdery mildew. However, in 2013, an outbreak of European brown rot (EBR) occurred on Montmorency tart cherries in northwest Michigan. MSU researchers reported effective fungicides that could be utilized for EBR control, and fungicides that were not heavily used to control other tart cherry diseases. Our response to EBR through identifying effective fungicides for control and breaking down key wetting requirements for infection helped inform growers on the best methods for control and will better enable disease prediction and spray decisions into the future.

Soybean Sudden Death Syndrome

Sudden death syndrome (SDS) reduced soybean production by over 444 million bushels from 1996 to 2010 in the U.S. Yearly loss from the disease was estimated at over $190 million. SDS first appeared in Michigan in 2008 and has been found in more locations scattered throughout most Michigan fields since then. With support

from Michigan Soybean Promotion Committee, MSU researchers have evaluated over 300 soybean germplasm lines from the MSU soybean breeding program for SDS resistance in both artificially inoculated fields and natural heavy SDS-infected sites. This research identified DNA markers associated with SDS resistance. SDS resistance from resistance sources were transferred to elite soybean germplasm and the best SDS resistant lines were entered in 2016 Regional SDS trials in multiple states. One SDS resistant variety "Sparta -- the Soybean Aphid Shield" has been released to date.

Potato Common Scab

In the U.S., potato common scab is a devastating disease and is the primary factor limiting market quality. Use of scab-resistant varieties provides the best method of control for the commercial grower and to supply a quality product to the market. Researchers have made a set of crosses between advanced breeding lines and varieties from MSU and four other breeding programs that should combine high yield, scab resistance, market-quality traits, high specific gravity and smooth round shape. One variety is being named (Saginaw Chipper) and two other scab-resistant breeding lines are in the commercialization queue. The methods for detecting the pathogen via DNA sequencing in a commercial field were developed. This pathogen can also attack root crops, and is causing issues in crops such as turnip. The research on potato is now being utilized to develop new diagnostic tools for these crops as a means of slowing its spread by notifying problem areas.

Downy mildew on hops

Michigan is the largest hop producer outside of the Pacific Northwest. In 2016, hops were grown on 800 Michigan acres and valued at $16.4 million. Downy mildew is the No. 1 threat to Michigan hops. Currently, state-specific control strategies are not available for hop downy mildew but will be accomplished through developing greenhouse, nursery and hop recommendations to include fungicides and identification of resistant commercial cultivars. Fungicides with different active ingredients have been tested for efficacy under Michigan conditions. Multiple fungicide active ingredients are needed to delay the development of fungicide insensitivity in the pathogen. Growers have been advised on how to maximize the efficacy of currently registered fungicides in managing hop downy mildew. Multiple hop cultivars have been tested for resistance to the strains of downy mildew present in Michigan. Incorporating resistant cultivars and effective fungicides as part of an integrated management system can contribute to long-term management of hop downy mildew.

Stem gall wasp

The blueberry stem gall wasp is a sporadic but increasing pest of highbush blueberries in Michigan. MSU researchers are helping growers manage this insect by establishing novel methods of managing the pest. One significant challenge is that the gull wasp is closely related to bees so growers must take care not to poison bees in the process of getting rid of the wasps. Research has identified numerous varieties

of highbush blueberries highly susceptible to infestation. This information can be used in planting decisions. A few new insecticides were also uncovered in a trial last spring.

Hemlock woolly adelgid

Hemlock woolly adelgid (HWA) is an invasive forest pest that has been a nuisance to Michigan trees for years. Eastern hemlock is highly vulnerable to this pest, and infested trees typically die within 10 years. Hundreds of thousands of hemlocks in eastern forests have been killed by HWA since this invader was first reported in Virginia in 1951. MSU research is developing and evaluating a geographic information system–based, high-resolution model to project the likelihood of hemlock presence in residential and urban areas, as well as forested areas. Results of a 2015-16 surveys were regularly provided to cooperators at state regulatory and natural resource agencies. The work contributed to an improved understanding of the extent of the HWA invasion, eventually leading to a decision that HWA eradication was not feasible. The project also reinforced the need for better statewide information on distribution, size and condition of the hemlock resource in forests, as well as in residential or urban areas.

Dollar spot in tufgrass

Dollar spot, a foliar disease named for the silver dollar-sized dead patches and silvery dust it leaves behind, is the most common and deadly turfgrass disease in the Northeast and Midwest United States. MSU researchers have released Flagstick the first turgfrass cultivar that shows resistance to the fungal pathogen that causes dollar spot. This will have benefits both environmentally and economically with less pesticide use by golf courses. More money is spent each year on the chemical control of dollar spot than on any other turfgrass disease.

c. Can you describe how USDA's National Plant Diagnostic Network works with other state and federal partners across the country?

The NPDN interacts with both USDA agencies and State departments of agriculture at several levels. The main point of contact is with USDA National Institute for Food and Agriculture (NIFA) since funding for NPDN flows through this agency. We work closely with NIFA in the development of policy and programming on an ongoing basis through a committee that consists of each NPDN regional director and the USDA NIFA national program leader who has responsibility for the NPDN. The network also has a larger operations committee that consists of NPDN directors, diagnostician representatives from each region and representatives from USDA APHIS Plant Protection and Quarantine (PPQ) and the National Plant Board. This is the overall governing body of the NPDN.

The NPDN has very close ties with USDA APHIS PPQ in several areas. First, the NPDN has several labs that have been certified by APHIS to conduct diagnostics on specific pests and pathogens of regulatory concern. Through this, the NPDN labs serve as triage sites for samples, and though diagnostics at the NPDN lab level, can eliminate samples that are not of concern and send only those to APHIS that need final confirmation. At MSU, we currently aid APHIS in triage for the sudden oak death (Ramorum blight) pathogen and have assisted, along with the Michigan Department of Agriculture, in diagnostics for Plum Pox virus. Thus, the NPDN also can assist agencies if a need for doing many samples at once, such as in the event of an outbreak, occurs.

USDA APHIS has been a great value to the NPDN by offering diagnostics training on pests and pathogen of regulatory concern. Multiple day, hands-on trainings are offered on a regular basis. The trainings are well attended by NPDN diagnosticians. The NPDN has also benefitted from funds made available from APHIS through the current Farm Bill.

We have also worked with USDA Agricultural Research Service (ARS) in the development and deployment of new diagnostic tools (molecular diagnostics for soybean rust is one example) and in the development of new tools and trainings. For example, the North Central Plant Diagnostic Network (NCPDN) will meet in Beltsville, Maryland this spring to learn more about some of the newer diagnostic tools being developed by ARS scientists and how these can be deployed to aid the labs.

The NPDN also works closely with diagnosticians and others involved with plant protection in state departments of agriculture. At the regional level, state department diagnosticians participate in activities such as regional meetings. In the NCPDN, diagnosticians from several of the state departments attend and participate in the annual meetings allowing for information exchange and new training opportunities.

The NPDN serves a central role in plant biosecurity through coordination and support. It also provides linkages between the USDA, State departments of agriculture, the industry and the public that help enhance the linkages that already exist (e.g. between USDA APHIS PPQ and the state departments of Agriculture). Through cooperation among all of these groups, we can promote biosecurity through detection/diagnosis, response and overall protection of plant industries.

2. In your testimony you mention some of your work on plant resiliency and climate change. As you know, USDA's own reports, coupled with those from other federal agencies, indicate climate change poses a serious threat to production agriculture.

    a. Given that we're talking about safeguarding the future of American agriculture today, can you briefly discuss your thoughts on climate change and how it poses a threat to agriculture security?

Climate change can have major effects on production agriculture. With respect to crops, the changing climate may certainly alter when and where certain crops may be successfully planted. As changes in average temperatures and rainfall occur, it is likely that without alterations of the host though breeding or other genetic manipulation, certain crops may no longer be viable for production.

The aggressiveness and severity of certain diseases and pests is also driven by changes in climate. In addition to having a pest or pathogen, the environment plays an important role in determining the severity of an outbreak. Environmental stresses can weaken a plant's natural defense system leaving it more susceptible to infection and/or pest damage. In addition, there are some plant disease resistance genes that are sensitive to temperature.

Some changes, such as elevated CO_2 levels, may increase the amount of foliage produced. While this may increase plant productivity, this may also provide a microclimate that is more conducive to disease. Changes in the climate may also result in expansion of the geographic range of pathogens and pests, thus introducing new threats as well as potentially making them easier to survive the winter in greater numbers.

Climate can have multiple effects on plant growth and productivity at multiple levels. This can include effects on regional as well as more localized agroecosystems, the microclimate around plants within a field or orchard and even effects on the cellular processes that control growth, development and resistance to pests and pathogens. Thus, the changing climate has the potential for multiple effects on production agriculture and must be understood at numerous levels.

b. Do you feel that the current direction of our domestic policies to stem carbon pollution is adequate to protect agriculture from the climate impacts that scientists are warning us about?

This topic is out of my area of expertise, but I would be willing to assist in finding the appropriate scientists to provide this information.

c. What role could farmers, ranchers, and foresters play in the effort to reduce carbon pollution?

This topic is out of my area of expertise, but I would be willing to assist in finding the appropriate scientists to provide this information.

Senate Committee on Agriculture, Nutrition, & Forestry
"Safeguarding American Agriculture in a Globalized World"
December 13, 2017
Questions for the Record
Senator Joseph Lieberman

Chairman Pat Roberts

1. **Considering the fiscal constraints we face in Congress, what are some suggestions for improving governmental coordination and prioritization of agriculture security?**

   The new National Biodefense Strategy, which our Panel recommended 2015, is in the final phases of review at the White House. We are hopeful that the Strategy and its implementation plan will lay out the "universe" of biodefense responsibilities among federal agencies, a comprehensive perspective that will enable significant improvement in the way the federal government prioritizes and coordinates biodefense activities, including agrodefense.

   We next need to assess where we are (and are not) spending money. This process can be initiated through an Office of Management and Budget (OMB) budgetary data call and cross-cut analysis, ideally to occur on an annual basis. This process would allow OMB (and Congress) to better identify existing agrodefense investments across all departments and agencies. The White House would then be positioned to assess the extent to which existing efforts align with the National Biodefense Strategy and any other relevant policies, and determine appropriate future budget requests. This should, in turn, result in increased coordination in spending and goals amongst those actors. Importantly, this exercise will also help identify gaps in the federal government's agricultural security apparatus. By determining where those weak points are, we can better understand the areas with the greatest need, and adjust departmental and agency priorities accordingly. Such an approach will require OMB to assess overarching programs that have shared federal jurisdiction, such as biosurveillance, which, per Homeland Security Presidential Directive 9 (HSPD-9, *Defense of United States Agriculture and Food*), is the responsibility of the Department of Agriculture, the Department of the Interior, and the Environmental Protection Agency. The process will, as a result, enable improved information sharing and coordination among these federal entities.

   The Committee is well positioned to encourage these kinds of activities through its regular oversight and especially through the 2018 Farm Bill.

2. **Have you encountered any obstacles to improving coordination and collaboration within the Federal Government to advance agriculture security? Similarly, what barriers may exist between the federal government, state governments, and private**

industry? And from your perspective, what risk management principles can government and industry each utilize when directing resources to planning and preparedness?

The Panel found that, as with much of the nation's biodefense apparatus, the biggest obstacle to improved communication and collaboration among relevant federal agencies involved in agrodefense has been a lack of a centralized, unified strategy and corresponding accountability structure. It is difficult for federal agriculture programs to coordinate absent clear priorities by which to measure the mission. Additionally, we recognize the natural frictions at play in the budget and congressional appropriations process, where requests and legislation are generally delineated by department, rather than integrated across a common goal, such as agrodefense. The result can be duplication in effort and resources across departments, or, alternatively, gaps in needed effort.

The Panel has stated that strong leadership from the White House is essential to bring agencies together to better collaborate on the various aspects of the biodefense mission, including agricultural security. For example, the Departments of Interior and the Department of Agriculture jointly implemented an avian influenza surveillance effort in wild birds from 2006-2011, a success we believe would not have been possible without White House leadership. The Panel's *National Blueprint for Biodefense* recommended that the Office of the Vice President is best placed to serve in that role by providing the political leadership for federal biodefense.

Regarding barriers among federal, state, local, tribal and territorial (SLTT) governments and industry, information sharing is the key issue. Industry is a willing partner if issues like business sensitive information and incentivization structures and policies are addressed in advance. The majority of information needed to detect and diagnose emerging biological threats is in the hands of the producers and farmers who directly manage livestock and crops. Information can be shared in advance of emergencies through such means as enhanced data collection through the National Wildlife Disease Program and other relevant biosurveillance programs, and via improved reporting via the National List of Reportable Animal Diseases (the rule for which should be finalized). To improve coordination of response, any new iteration of the *Food and Agriculture Incident Annex* should provide detailed guidance on how information can best be shared in an agricultural emergency, such as through increased use of fusion centers.

Managing the risk of agricultural threats relies on a robust awareness and assessment process. Threats must first be identified characterized, and the federal government is uniquely positioned to characterize that risk (reference HSPD-9), both for the sake of its own programs and to aid state and industry partners in their own efforts. This information should then be used to assess risk, with a strong emphasis on the nature and scale of impact that a particular threat may have. Emphasizing efforts that could mitigate multiple threats – for instance, investing in platform medical countermeasure

technologies – is an approach to risk management that is necessary when budgets are finite. Finally, we emphasize the need for systematic response planning and exercising of those plans. Strong training and exercising regimens are demonstrated to improve response, and can help manage risk by stemming the scale of an outbreak. The Committee should encourage FEMA to ensure that agricultural emergency plans are regularly exercised. It should also ensure that federal agricultural partners are placing sufficient emphasis on providing training for animal and plant health criminal-epidemiological investigations; the Federal Bureau of Investigation and U.S. Department of Agriculture can and should take the lead in this area.

Ranking Member Debbie Stabenow

1. **You were a leader on the imperative to address climate change during your time in the Senate. USDA's own reports, coupled with those from other federal agencies, indicate climate change poses a serious threat to production agriculture.**

   a. **Given that we're talking about safeguarding the future of American agriculture today, can you briefly discuss your thoughts on climate change and how it poses a threat to agriculture security?**

      The Blue Ribbon Study Panel's agrodefense report focuses on the threat posed by biological agents, whether by natural, intentional, or accidental introduction. We wanted to understand, in an immediate way, what steps we could recommend that would strengthen the country's ability to defend against those threats. We therefore focused on issues like biosurveillance, medical countermeasures, and interagency coordination as near- and medium-term touchpoints for change. We did not look at the external drivers of natural outbreaks. As you noted, many reports both within and outside of government have pointed to the risks posed by rapid changes in climate to the environment and agriculture. To that end, I would say that it is perfectly reasonable to ask scientific and policy questions about all potential risks to livestock and crops, including extreme weather events, and including drivers like changing temperatures that may cause a change in the prevalence or geographic spread of pathogens.

   b. **Do you feel that the current direction of our domestic policies to stem carbon pollution is adequate to protect agriculture from the impacts that scientists are warning us about?**

      While the Study Panel has not issued findings or recommendations regarding climate change, I am happy to answer this from my personal perspective. I believe that more can be done to safeguard our country's agricultural infrastructure. That includes taking steps to mitigate weather- and climate-related impacts. One need

only to look at the increasing frequency of wild fires in certain parts of the country to understand the threat posed to agribusiness by extreme weather.

As you know, when I served in the Senate, I worked with you and our colleagues to try to address the growth of greenhouse gas emissions. That is why I coordinated with Senators Lindsey Graham and John Kerry to produce a framework for eventual bipartisan legislation that would have both ensured our energy security while also safeguarding our environment. The proposal acknowledged the need for further action on this topic, and sought to address the issue through consensus, mutual respect, and compromise. I am proud of the work that went into that proposal, and though we were ultimately unable to see those principals passed into law, I continue to believe that economic prosperity and the protection of our environment are not mutually exclusive.

c. **What role could farmers, ranchers, and foresters play in that effort? In the Kerry, Graham, Lieberman framework for the Senate climate/energy bill, released in late 2009, what was the role for farmers and ranchers?**

Farmers, ranchers, and foresters all have important roles to play in the cultivation and protection of our agriculture. They are often the first line of defense in identifying and intercepting threats to wildlife, livestock, and plants, such as avian influenza, fungal infections, or destructive pests. We should all rightfully recognize that our mission to safeguard the agricultural sector is deeply reliant on the successes of these professionals, and support them as such.

As you noted, in the 2009 Senate framework, Senators Graham and Kerry and I acknowledged the impact that a proposal for controlling carbon emissions may have had on these producers. Any solution that tries to address carbon output should strive to avoid harming one of the backbones of the U.S. economy. That is why the framework (and the eventual draft bill I released in 2010 alongside Senator Kerry) considered the economic realities of addressing carbon pollution, proposing a voluntary carbon reduction system for those groups by using monetary incentives and offsets to benefit farmers, ranchers, and foresters who took steps to reduce their carbon footprint. These programs would have been overseen by the Department of Agriculture. In pursuing this route, we would have rewarded those who chose to seize the initiative, rather than punish those who did not.

Senator Amy Klobuchar

1. **When Minnesota dealt with an outbreak of Avian Influenza in 2015, we found that it takes a tremendous amount of people and financial resources to deal with the challenges associated with a disease outbreak of this size. That's why I've been working to ensure the next Farm Bill includes language to support activities to enhance early detection and rapid response. In your testimony you noted that the**

establishment of such a program would create a legislative basis for prevention activities.

How would having sustained capabilities to detect animal disease threats improve rapid response and prevention? In your opinion, would an animal disease prevention fund – similar to the current plant health program – assist us in addressing risks to agriculture and our economy?

Federal efforts are often reactive. While billions of dollars are spent for federal response and recovery efforts to natural disasters, efforts to mitigate and prevent the damage in the first place receive a fraction of the amount. The same imbalance in attention and funding exists for agricultural security.

Early detection is one of our best defenses against agricultural threats. We do fund this function, but we don't fund it concomitant with the need, and we often only increase the funding after an outbreak has occurred. The National Animal Health Laboratory Network, a vital tool used to rapidly detect and diagnose animal diseases, is currently authorized for only $15 million in annual funding, which must be distributed across 59 veterinary laboratories in every state. The dedicated program dedicated to biosurveillance for avian influenzas in wild birds was stopped in 2011, being revived only in 2014 when highly pathogenic avian influenza reappeared in commercial poultry flocks. The Nationally Biodefense Strategy should have a strong animal health component, and we believe that a well-crafted implementation plan based on risk prioritization could ensure that key preventive programs do not lapse, and that they are funded for as long as they are needed to mitigate the most serious risks.

A well-supported diagnostic network, in conjunction with strong coordination among all levels of government and industry, and a fully-supported medical countermeasure stockpile, could make all the difference in curbing the next outbreak. For this reason, the Panel strongly supports the creation of an animal disease prevention fund to make the necessary advance investments in early warning activities and support state efforts to detect potential agricultural threats in their own backyards, quickly and effectively. This would bring animal disease prevention activities in line with programs already in statute for plant health. Such a move is made all the more important by the fact that three quarters of emerging infectious diseases are zoonotic – that is, transmissible between humans and animals. Safeguarding livestock from these diseases can directly benefit human health.

Chairman Pat Roberts

1. *One of the complicating factors in protecting American agriculture from biological threats is the sheer scale and diversity of our agriculture sector. Most of that critical infrastructure where interventions to improve security can be adopted are privately held —the processing plants, mills, trucks, barges, etc. Can you describe a few of the activities you are seeing implemented in North Carolina by farmers and those involved in food production to achieve this end of bolstering ag security? Further, could you describe a few ways in which the government could partner with private entities to bolster the security of our critical infrastructure?*

There are two considerations related to protecting American agriculture from biological threats. The first is the idea of physical security – frequently referred to as guns, guards, and gates. While the state's animal agriculture industries are just beginning some of these activities, we have found increased use of cameras and cell phone technology to monitor facilities, especially as those capabilities have become less expensive. We have even seen security guards posted at feed mills, hatcheries, and processing plant entrances. There is also an increased sensitivity to "insider" activity at facilities, as groups and individuals opposed to animal agriculture make efforts to gain access to operations by seeking employment and engaging in questionable activities. Industries have also encouraged installation of door locks and gates on growing facilities as a possible means to limit access by unauthorized personnel.

Obviously, the other piece of protecting American agriculture is biosecurity. After the Avian Influenza outbreaks in 2015, 2016, and 2017, and the Porcine Epidemic Diarrhea Virus that spread across the country in 2013 (33 states in 13 months), there was renewed emphasis on biosecurity across all facets of animal agriculture. In North Carolina, the industry has installed vehicle washing/disinfection facilities at processing plants that can be used for all vehicles entering and leaving should an event occur. The industry is also training staff and contract personnel twice yearly in biosecurity practices, and is auditing all farms quarterly for adhering to biosecurity practices which would include adding additional steps of cleaning or changing clothing/boots/gloves to existing protocols. Some have developed in-house laboratories capable of obtaining samples, rendering some diagnoses, and rapidly forwarding suspicious samples to appropriate reference laboratories. Others have purchased depopulation and disposal equipment and trained staff in its use. The poultry and swine industries continually work to improve biosecurity techniques as endemic diseases are an ever-present threat. The dairy and beef industries have learned by observing and applying the biosecurity techniques of their fellow food animal production partners as they have not yet experienced firsthand the industry-wide disease outbreaks seen in the vertically-integrated food production systems. Finally, exercises, advancing plans, and continued improvement in response procedures all help to identify weaknesses in the biosecurity programs at all levels.

Effective, consistent, and competent biosecurity has associated costs measurable in dollars, time, commitment, and effort, and as a result its implementation can suffer from personnel

attrition, business cost prioritization, tired personnel, and worker inconsistency. To achieve the desired level of biosecurity on the farm, the partnership of government and industry has already been successful through efforts to create of the myriad of Secure Food Supply Plans; the Secure Beef Supply Plan (SBS) is a great example of public and private partnership. The SBS plan was developed through collaborative efforts between the beef industry, state and federal government officials, Iowa State University and Kansas State University. For more information on the SBS plan visit www.securebeef.org. All in all, the nation is definitely in a better position with regards to safer and more protected farms/systems, though in truth we are still quite vulnerable to highly-contagious diseases and those who would want to attack the production systems, leaving much work to be done. The federal government should continue to provide financial incentives for producers to implement animal identification and traceability, improved biosecurity, and comprehensive surveillance. Another possibility – government could act as a partner to facilitate insurance premium reductions or other perks for agricultural entities possessing completed biosecurity plans or fully implemented Secure Food Supply Plans.

2. *How are our foreign animal protein producing competitors addressing agriculture security? Is it something they are acting on? Are there any lessons we can draw from them? Do you believe the U.S. lack of attention and focus on agriculture security threatens our competitive advantage over other countries that are taking a more proactive approach to agriculture security?*

There are very few proprietary secrets with regard to biosecurity; rather, the opposite would be more often the case. Agriculture across international borders has shared biosecurity models and practices quite readily, with a well-known example being the Danish biosecurity entry model that has been accepted in many counties, including the US, for prevention of introduction of HPAI to poultry farms. There are always advances in techniques and protocols, and since many of the US food animal production companies are international by virtue of trading across national borders, biosecurity measures and advances are shared quite readily. The point that food animal production competitors understand is that there is no one vaccine, no one protocol, no one biosecurity measure that can protect production facilities from highly contagious diseases once the disease has entered the marketing systems which all the competitors use. Thus, competitors are subject to one another's biosecurity weaknesses and gaps. The world markets reward the high health standards of US agriculture with open markets (at least from a disease standpoint) which has allowed the US to build its exports. However, therein lies the problem: so much of the dollar is tied to international exports that the US, without a rapid and effective recovery capability, has lost its ability to recover if a disease outbreak such as Foot-and-Mouth Disease (FMD) shuts down exports. Very few businesses can survive the loss of 30-50% of its profits with additional input costs over a long time period. Thus, the importance of staying free of Foreign Animal Disease (FAD), which allows the US to promote and grow its position in the markets as well as protect itself from the fact that competitors would easily be able to replace the US once regulatory restrictions cease exports. The most sobering thought is what it would take for the US to regain those markets in addition

to the battle that would ensue for even US domestic markets. As US food animal production continues to expand its exports, these challenges will continue to grow.

Many other exporting countries have well-developed animal identification and traceability systems (the US continues efforts to achieve appropriate ID and timely traceability), which helps to rapidly identify the spread of animal disease and help to bring it under control. Animal ID and traceability enhance confidence by assuring trading partners that we can contain an outbreak to a limited area, and provide strong assurances that other areas are free of disease and can continue to export, or resume exporting sooner. New Zealand and Australia have very strong biosecurity efforts in place, and are actively funding biosecurity planning, training, and education.

Finally, politics continually plays a role in trade between countries, and agricultural security can easily be used to limit trade between other countries and the US. Given the tremendous impact transboundary animal disease has historically had on trade (eg. BSE in US), countries will continue to escalate the level of importance placed on the protection of their animal agriculture industries through international biosecurity.

3. *Zoonotic diseases were mentioned in several testimonies. Can you describe some of the early warning work that may be occurring with regards to zoonotic disease detection? And do you have any suggestions for improving surveillance and protection from zoonotic threats?*

In recent years, USDA has funded the development and delivery of educational materials to enhance the ability of recently-graduated veterinarians to be aware of and to detect emerging and exotic diseases of animals that may be zoonotic. This One Health/One Medicine approach to address infectious diseases needs to be emphasized more amongst veterinary and human medical professionals alike, and in doing so will promote sharing of information and data regarding disease syndromes observed in clinical settings to assist in early identification of zoonotic diseases shared between people and animals. Efforts should be undertaken to promote the integration of human health, animal health, and environmental health. Recognition by all involved that 75% of emerging diseases over the last decade have had an animal component would ensure adequate funding to bring the One Health/One Medicine concept to the forefront of battling infectious disease.

With regard to surveillance, as is always the case, the National Animal Health Laboratory Network (NAHLN) stands on the front line of surveillance for animal and zoonotic diseases. Additional funding is a necessity.

4. *Have you encountered any obstacles to improving coordination and collaboration within the Federal Government to advance agriculture security? Similarly, what barriers may exist between the federal government, state governments, and private industry? And from your perspective, what risk management principles can government and industry each utilize when directing resources towards planning and preparedness?*

USDA has made commendable progress in working with states to advance response capability and capacity over the past 10 years. Even so, there is still much to be done – protecting a constantly growing, changing agriculture infrastructure against ever-evolving disease agents and the threat of bad actors continues to be, as recently described, a wicked, complex problem. That said, state Low Path Avian Influenza (LPAI) plans, which were previously approved by USDA APHIS, were not followed in the LPAI outbreaks in the Spring of 2017. Surveillance, permitting terminology, and indemnity/compensation were inconsistent with previous understanding of existing state plans. This is currently being addressed through meetings and discussions involving the US Animal Health Association's National Assembly, USDA, and industry partners. Indications are that resources, specifically financial, are limited as a result of the 2015 High Path Avian Influenza (HPAI) epidemic in the US.

Another concern is that, because the footprint and commercial effects of food animal production infrastructure spans state and local jurisdictions, there are no borders. However, too often our planning and preparedness efforts do have borders. Disease preparedness efforts are hampered because they are subject to jurisdictional funding and development rather than being more accurately applied to the actual footprint of the industry. For example, the swine industry in the US is not state-oriented in production. Not one swine-heavy state handles all phases of production within its own borders. Every swine state is dependent on the whole system, but planning from a system perspective is incredibly difficult because each state divides the system and plans to its capability and strategy due to its jurisdictional authority and funding. All-encompassing response planning should be more frequently implemented rather than limited to state or small regional areas.

Finally, federal select agent rules and laws against having FMD virus on the US mainland are regulatory hurdles precluding the production of safe, new-generation FMD vaccines by US manufacturers. These regulations are intended to prevent virulent virus from being used on the US mainland. They are being over-interpreted to include new-generation, genetically-engineered vaccines which cannot spread in animals even if accidentally released from a laboratory or manufacturer. Allowing US manufacturers to produce these new-generation vaccines and sell them internationally would provide a rapidly available source of US vaccines in the event of an FMD outbreak.

5. *Your testimony mentions that the current Foot and Mouth Disease (FMD) vaccine stockpile shared by the U.S., Canada and Mexico is insufficient in addressing a domestic outbreak of scale, and that the agriculture sector stands to lose $200 billion over ten years from a domestic outbreak of FMD. If a more robust vaccine bank were established and should immediate and aggressive vaccine use be deployed in response to a U.S. outbreak of FMD, as was done in Uruguay, compared to the "stamp out" approach used by England when those countries experienced FMD outbreaks, do you anticipate the economic impact to U.S. agriculture to be lessened, and to what degree?*

The US would still lose export markets at the beginning of an outbreak. However, rapid use of vaccines can help to bring the outbreak under control much more quickly so that exports can be regained sooner. In a large outbreak that is not controlled with the benefit of vaccination, it is likely that many herds will become infected, stamping out would be discontinued, and infected herds would be allowed to recover. Producers will have extremely high losses due to the effects of FMD infection on animal health and productivity. An unknown number of animals will likely die or need to be euthanized. This will depend on the strain of the virus. Indemnity is only paid for animals that the government requires to be destroyed. If stamping out is discontinued because it is not feasible, producers will have to withstand their losses due to FMD infection like any other disease. The effects of the disease, coupled with a dramatic decrease in prices due to lost exports, will likely drive many producers into bankruptcy. Rapid use of vaccines will keep herds healthy and productive, and will prevent the spread of the virus to new herds. This could have a dramatic effect on the overall cost of the outbreak. As much as we would like to take an "either/or" approach to an FMD outbreak in the US, no one technique will be successful alone. Given the tremendous number of animals in the US, stamping out is not going to be a solution; however, in certain situations and in certain types of livestock, stamping out will definitely be one of the tools in the arsenal. The same can be said for vaccination. While not a total solution, it can be effectively used to create a buffer zone around actively infected premises. An adequate and readily accessible supply of vaccine must be available at the time it is needed. What is critical in addressing an FMD outbreak is a continuing and realistic dialogue to identify as closely as possible the vaccine needs, personnel projections, and length of time to implement response activities.

6. *Aside from the need to increase our U.S. FMD vaccine stockpile, what other preparedness and response priorities necessary in responding to an FMD outbreak remain unaddressed or insufficient? For example, does USDA have appropriate quantities of pen-side FMD diagnostic tests and FMD Differentiating Infected from Vaccinated Animals (DIVA) tests that will also be critical in managing an outbreak? What other "tools" will be necessary to manage an FMD outbreak that merit additional resources?*

While the FMD vaccine stockpile would be the highest priority, having stockpiles of pen-side tests to detect infected animals and DIVA serology test kits to detect vaccinated herds that also have some infected animals would be ideal. Radio-frequency animal identification tags and mandatory animal identification would greatly facilitate tracking vaccinated animals as part of the eradication program. Additionally, there needs to be a significant focus on continuous training for ag response personnel due to the turnover of personnel in this area, which leads to states hiring individuals to replace lost experience and then not providing them with adequate training. Another tool which is critical to responding to a significant transboundary animal disease outbreak in US livestock is position typing and credentialing for response personnel.

Vaccines and surveillance are closely intertwined if DIVA technology is in play, and so a comprehensive vaccine/surveillance response program should be the path we pursue, as

opposed to the current situation where surveillance is considered apart from vaccines as we do not currently have a realistic vaccination capability.

Finally, a major issue will be adequate cleaning and disinfection of transport equipment before it leaves production facilities and processing plants. Inadequate sanitation has significantly prolonged control of several different swine diseases in recent years (pseudorabies, PRRS, PED). The cattle industry is even further behind on transport equipment sanitation.

7. *Have sufficient exhaustive plans detailing federal and state administrative planning in preparation for a potential FMD outbreak been developed? Are current plans pertaining to establishing FMD vaccination protocol, establishing biosecurity requirements for impacted farms and regions, establishing cleaning and disinfecting policies, developing carcass disposal plans, continuing contractor training, etc. sufficient or do they require greater development?*

At the federal level, progress has been made in each of the areas listed above and is ongoing. States vary greatly in their plans so more planning opportunities are always beneficial. Additional topics that have not received very much attention are: 1) design of an eradication program for after the outbreak is coming under control; 2) factors which could help mitigate the economic impact of lost export markets; and 3) approaches to zoning and compartmentalization for segments of the industry to demonstrate that they are free of infection.

However, the preparedness planning efforts have only matured to level of the capabilities that we possess. For example, our vaccination plans suffer because we cannot craft plans for vaccines that we know will not be available. Without a credible vaccine supply, our planning efforts in the US have been based on a partial and limited "defense" strategy that has prevented in-depth planning. As more sophisticated measures are added to our response capabilities through funding (such as vaccine or surveillance technologies), then more sophisticated planning and preparation will be encouraged and undertaken. These next planning steps utilizing advancements are critical as they address more fully the type of business continuity planning that will allow for a safer arena (vaccines harden immune systems and surveillance advancements provide a clearer picture of the outbreak).

8. *Many countries have FMD countermeasure stockpiles which they have established through a variety of structures. Some countries, such as Australia, have implemented a collaborative approach between government and industry to both manage and fund their FMD vaccine banks. Given the severity of the threat posed by an outbreak of FMD, has there been any consideration of collaborative approach in the U.S. for a FMD vaccine stockpile to ensure this risk is addressed as thoroughly as possible?*

The issue has been broached. However, industry has thus far been unwilling to discuss a collaborative approach. Perhaps a facilitated "FMD Vaccine Stockpile Summit" which brings together federal, state and industry representatives could identify issues and seek solutions.

Ranking Member Debbie Stabenow

1. *As we have seen in recent years, animal disease outbreaks pose a serious threat to our nation's biosecurity, rural economies, and export markets. The 2015 avian influenza outbreak, in particular, demonstrated that a rapid and coordinated response to disease outbreaks is critical.*

    a. *Could you expand a bit more on the importance of broad-based animal disease surveillance efforts and why early detection and response is so critical for animal disease outbreaks in particular?*

On any given day, there are 1,000,000 pigs, 500,000 head of cattle, and 25 million birds on the highways of America. That much movement of animals, which is inherent to American agriculture, requires the earliest possible identification of a disease event. Avian Influenza is the perfect disease to demonstrate early detection for disease elimination. Any H5 or H7 subtype of Avian Influenza may quickly turn from low path to high path (as seen during both the 2016 Indiana and 2017 Tennessee breaks where both LPAI and HPAI overlapped). Monitoring for LPAI and then eradicating affected populations before HPAI develops should abbreviate any breaks and limit damage to contract farmers as well as export markets. Similarly, early identification of disease in the cattle and swine industries will initiate a "stop movement" of livestock until the extent of the disease spread is determined, and mitigation efforts can be initiated. Early detection and effective, timely response minimizes the impact to the animal agriculture industry and the US economy.

    b. *While vaccines are one aspect of disease response, what more do you believe should be done to adequately prepare for and quickly respond to animal disease outbreaks?*

We must do the following:

- Continue to maintain emergency response depopulation equipment and crews at the federal and state levels
- Fully fund LPAI eradication efforts rather than wait for LPAI to turn into HPAI
- Ensure pen-side diagnostic capability
- Increase surveillance testing with additional staffing at our state veterinary diagnostic laboratories
- Develop plans that will adapt/streamline the marketing systems to account for vaccine/surveillance advancements

Our current marketing systems do not adequately account for disease response where animals would need to move with as little comingling through production to processing as well as parallel positive/negative marketing channels to move recovered/vaccinated non-clinical animals. The dual marketing system used in the Pseudorabies eradication effort in the 1990s is

a great model to consider as we develop our FMD marketing strategies for a managed FMD response program.

Senator Amy Klobuchar

1. *In your testimony you discussed the importance of an early warning system for animal diseases. Both our turkey and hog industries in Minnesota have faced hardships due to disease in recent years, which makes it particularly important to me that we ensure we have the right policies in place for investments in animal health research and response preparedness. I led a letter to the Agriculture Appropriations Subcommittee with eleven of my colleagues requesting strong funding for the National Animal Health Laboratory Network (NAHLN) this fiscal year.*

   How would providing additional federal resources to the NAHLN increase its ability to further protect animal agriculture? Could the NAHLN meet the challenges of another outbreak situation without emergency resources?

The NAHLN is the first line of defense for rapid detection of new disease outbreaks, and it is absolutely essential to manage an outbreak. A large outbreak will overwhelm the current ability of the NAHLN labs to analyze samples in a timely manner. Rapid diagnostic results are essential to determine which herds or flocks are infected. Uninfected animals can be safely sent to market. Allowing infected animals to move will spread the infection. It is not possible to reliably determine which herds are infected early in the disease process just by examining them. The NAHLN labs also need state of the art biosecurity equipment so that they can operate at biosafety level 3 to safely work with some of the most highly contagious animal pathogens. Additional federal resources for the NAHLN would allow for the stockpiling of diagnostic test kits. Such diagnostic tests cannot be mass-produced in a short period of time. In the event of an FMD outbreak we would need a large quantity of tests to be readily available to diagnose infected animals and differentiate between vaccinated and infected animals. There are obvious and astounding gaps in capability and capacity to respond to diseases that currently exist in many countries, shortfalls that have been identified and that we deal with every day but have not been addressed. Considering the potential impact and what is at risk, the fact that our country would even consider responding to a disease as contagious as FMD without a credible vaccine capability (a tried and true component of every successful response to modern contagious disease outbreaks) is simply beyond comprehension. Biosecurity is a fantastic and needed capability and should not be downplayed, but once an outbreak of a highly contagious virus appears, the HPAI experience has taught us that it has limited ability to stop the disease itself. Thus, the funding of research and implementation of response and surveillance advancements needs to be a priority. Furthering the efforts of the NAHLN is a very effective component, but it must be recognized that once established the laboratory network must be given the opportunity to support an aggressive response strategy that includes tools such as vaccines and DIVA-based surveillance. We currently are not able to implement those

sophisticated and aggressive protective responses to recovery strategies thus somewhat negating the full investment in NAHLN.

Senate Committee on Agriculture, Nutrition, & Forestry
"Safeguarding American Agriculture in a Globalized World"
December 13, 2017
Questions for the Record
General Richard Myers

Chairman Pat Roberts

1. **Chairman Roberts' Question:** In the next few years, we will be nearing completion of the construction of NBAF. I know that a great deal of work has been done at the university, and throughout the state, in preparation for the work that will be done there. **(a)** What has Kansas State done to prepare for the transfer of research from Plum Island to NBAF? **(b)** In what areas do we need to continue developing to ensure that the best and the brightest work force in the world is in Manhattan, Kansas, conducting this critical research?

   President Myers' Answer (1.a.): In 2008 as part of the "best and final offer" for NBAF during the site selection process, the State of Kansas included $35 million for NBAF-related research in K-State's biocontainment facility, the Biosecurity Research Institute (BRI) at Pat Roberts Hall (PRH). If NBAF is to have "the best and the brightest work force in the world," hands-on research in BSL-3/3Ag biocontainment is required, and the BRI/PRH is one of a limited number of laboratories in the world that can provide such research training with livestock. While the BRI/PRH doesn't have BSL-4 livestock space (NBAF will be the first such facility in the U.S.), the safety and security principles are the same in BSL-3Ag. Thus, K-State can provide much of the research training needs for the future NBAF workforce.

   As of 2017, there were seven (7) foreign animal diseases (FADs) projected to be worked on in NBAF when operations begin in 2022/2023. These include the livestock-only threats, African Swine Fever (ASF), Classical Swine Fever (CSF), and Foot and Mouth Disease (FMD), along with the zoonotic threats, Rift Valley Fever (RVF), Japanese Encephalitis (JE), Nipah virus, and Ebola virus. Any of these and innumerable other FADs could ravage America's agricultural infrastructure, food supply, and economy if they hit the U.S. Furthermore, zoonotic FADs could devastate public health as well.

   K-State jump-started NBAF research in the BRI/PRH on RVF in 2013, JE in 2014, CSF in 2015, and ASF in 2016. Research and development (R&D) continues on all four of these FADs, but the Kansas funding commitment will end in FY2019 when the last $5 million is appropriated. The majority of the research is conducted by K-State faculty, staff and students, but collaborators from the U.S. Department of Agriculture's (USDA's) Center for Grain and Animal Health Research (CGAHR) in Manhattan participate on some of the NBAF-related FAD projects. Going forward, federal support is needed for R&D on RVF, JE, CSF, and ASF to help mitigate these threats to U.S. animal health and public health. It's needed to continue training the workforce for NBAF as well.

   President Myers' Answer (1.b.): Until NBAF is fully operational in 2022/23, USDA has no livestock biocontainment facilities where R&D can be conducted on zoonotic FADs. Moreover, DHS stopped funding CSF and ASF research in 2017 at PIADC; a facility unsafe for

work with zoonotic diseases. As a result, training the NBAF R&D workforce is highly reliant on the BRI/PRH until the new DHS facility becomes operational. Of the thirteen (13) recommendations in my written testimony, three (3) of them (#2, #3, #4) are particularly relevant to your question regarding what "do we need to continue developing to ensure that the best and the brightest work force in the world is in Manhattan, Kansas?"

2) **Emerging FAD Threats** — Exploit "awareness and warning" intelligence information regarding newly emerging biothreats to establish bio/agrodefense "mitigation strategies" at USDA CGAHR prior to NBAF becoming operational and fund "research and development" in the BRI/PRH.

3) **Zoonotic Animal Disease Research** — Establish federal threat "mitigation strategies" for zoonotic FADs at USDA CGAHR prior to NBAF becoming operational and fund RVF and JE "research and development" in the BRI/PRH.

4) **Non-Zoonotic Foreign Animal Disease Research** — Expedite federal threat "mitigation strategies" for non-zoonotic FADs by moving the research portfolios for ASF and CSF from USDA PIADC to CGAHR and funding ASF and CSF "research and development" in the BRI/PRH until NBAF becomes operational.

With federal R&D funding at USDA CGAHR for the global FAD threats, RVF, JE, ASF, and CSF, critical research and workforce training can continue in K-State's BRI/PRH until NBAF becomes fully operational. That should help "ensure that the best and the brightest work force in the world is in Manhattan, Kansas."

2. **Chairman Roberts' Question: (a)** Have you encountered any obstacles to improving coordination and collaboration within the Federal Government to advance agriculture security? **(b)** Similarly, what barriers may exist between the federal government, state governments, and private industry? **(c)** And from your perspective, what risk management principles can government and industry each utilize when directing resources towards planning and preparedness?

President Myers' Answer (2.a.): With regard to "any obstacles to improving coordination and collaboration within the Federal Government," the biggest obstacle I have encountered relates to significant shortcomings in biological threat intelligence analysis and operations. The lack of sufficient numbers of plant and animal infectious disease SMEs with high-level security clearances became clear during my visits to the Kansas Intelligence Fusion Center (KIFC) for classified briefings. As you know, the KIFC reviews the same intelligence information as other cleared analysts do, but identification of biothreats requires Subject Matter Experts (SMEs) that understand biology to make connections most non-SMEs can't. The KIFC biothreat team includes such SMEs, and they make the required connections.

Potential solutions to overcoming these obstacles were outlined in parts a) to d) of the first (#1) of thirteen (13) recommendations in my written testimony, so they are reproduced here. Additional suggestions – long-term and near-term – follow.

1) **Enhance Intelligence Operations and Analysis Capabilities** — Leverage "awareness and warning" intelligence information to conduct federal, state, and local agriculture and food "vulnerability assessments." Advanced warning of over-the-horizon biothreats is vital, but today, the U.S. is often minimally aware and insufficiently warned. One reason appears to be insufficient numbers of bio/agrodefense subject matter experts (SMEs) – veterinarians, animal scientists, crop scientists, plant pathologists, etc. – with high-level security clearances to assess classified intelligence.

    a) **Security Clearances** — Increase the number of food crop, food animal, and food supply SMEs with high-level security clearances (TS-SCI) to monitor bio/agrodefense threats worldwide.

    b) **Sensitive Compartmented Information Facilities (SCIFs)** — Increase the number of SCIFs with secure communications that have agriculture/food SME analysts and/or cleared SME advisors with TS-SCI clearances.

    c) **USDA Clearances** — Increase the number of USDA personnel with TS-SCI clearances. It's unknown how many bio/agrodefense SMEs there are within the intelligence agencies, but there are nowhere near enough within USDA. Conversations in 2016 with the USDA's chief scientist and a USDA intelligence analyst confirmed their frustrations with an inability to convey critical classified information within USDA to make it actionable. This creates huge federal impediments to safeguarding agriculture, particularly when DHS stopped meeting their HSPD-9 responsibilities in 2016/17. Undertaking "vulnerability assessments," developing "mitigation strategies," conducting "response planning and recovery,"[23] and defining time-critical "research and development" strategies are virtually impossible when there is limited awareness and no warning. This must be rectified immediately.

    d) **Intelligence Fusion Centers (IFCs)** — Increase the number of state IFCs with agriculture and food SMEs with TS-SCI clearances. The Kansas IFC (KIFC) appears to be the only such center of over 70 nationwide that has a biothreat team with cleared SMEs capable of assessing the full range of biohazards to food crops, food animals, the food supply, and people. These include a DVM and PhDs from K-State and MDs from the University of Kansas Medical Center as well as SMEs from multiple 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 planning with regard to "vulnerability assessments, mitigation strategies, and response planning and recovery."

Long-Term Solutions: The intelligence community overall must have more analysts and SMEs that understand biology; i.e., individuals that have formal training in the biological sciences. However, that will take time and global terrorist groups could employ bioweapons against the U.S. at any time, targeting crops, livestock, poultry, or people. Thus, consideration should be given to stop-gap measures, particularly in the agriculture realm where biothreat expertise is most lacking.

Potential Near-Term Solutions: Two potential stop-gap measures come to mind based on expertise that already exists in Kansas on the KIFC biothreat team.

A. First, there's a SCIF in the basement of the BRI/PRH that is of sufficient size to accommodate multiple tenants; the FBI is the sole tenant today. If that SCIF was to become a KIFC annex with intelligence analysts stationed there, the K-State biothreat SMEs (3 PhDs and 1 DVM) with high-end clearances could be "on-call" almost immediately if/when agriculture issues arise requiring their input. To accommodate this, secure communications would need to be installed in the SCIF, some minor renovations would be required, and a source of funding for analyst staffing would need to be identified. However, doing so would provide a rapid and significant step forward in protecting U.S. agriculture.

B. Second, to start growing biothreat analyst capabilities nationally, consideration should be given to having existing intelligence analysts from the federal government and other state fusion centers spend blocks of time at the KIFC. Interacting with the KIFC biothreat team would allow them to gain an understanding of how to identify biothreat indicators within raw intelligence.

A Marine intelligence officer with a biology degree attending your hearing confirmed afterwards that few in the intelligence community have a clue what to look for in the biothreat realm. Since it would take years to recruit the requisite biology SMEs into those ranks (assuming the intelligence community actually does so), utilizing the KIFC biothreat team to provide "in the trenches" training for existing analysts could be beneficial. The KIFC biothreat team monitors natural disease outbreaks globally, not just bioterrorism threats, so making this part of "business as usual" within the intelligence community would also help protect the nation. Biothreats can be naturally occurring or deliberate, and some terrorist groups have been known to monitor emerging infectious disease outbreaks for the purpose of exploiting them. Therefore, intelligence analysts should pay attention to those too.

The KIFC has SCIF space available that could accommodate additional cleared analysts, but lease or rent payments would be required; the KIFC operates on a minuscule budget already and the biothreat SMEs are volunteers. Thus, external resources would almost certainly be required.

President Myers' Answer (2.b.): With regard to "what barriers may exist between the federal government, state governments, and private industry," there are clearly many, particularly between private industry and the federal government. First and foremost,

private industry doesn't interact regularly with the federal government, and when they do, it may not be for positive reasons. And although there may be fewer issues between state government and private industry, there may be instances where those interactions are negative as well. Thus, a "trusted broker" intermediary might be in order, and in most states, the 1862 land-grant university would be positioned to serve in that role. Land-grant personnel interact with agriculture producers in their state routinely and food processors quite frequently as well. Thus, assigning agriculture security intermediary duty to America's land-grant institutions could make great sense, perhaps in partnership with the state's agriculture department.

Significant portions of the research conducted at land-grant universities benefit the private-sector agriculture producers in the state where they're located, so adding agriculture security research to the portfolio makes sense. Federal funding in the state where the R&D solutions are needed should go a long way towards knocking down barriers.

President Myers' Answer (2.c.): With regard to "what risk management principles can government and industry each utilize when directing resources towards planning and preparedness," a few general observations can be made, noting that agriculture risk management is not my specialty.

Nonetheless, first response always begins where an adverse event occurs – i.e., locally – so in this case, with private-sector agriculture industry producers – farmers and ranchers. With an animal disease, the first call will likely be to a private-sector veterinarian serving that farm or ranch. With a plant disease, the call might go to a county extension specialist from the state's land-grant university. If the infectious disease appears to be something unusual/exotic, it's at that point when state and/or federal experts are likely to be brought on board.

As a result, planning and preparedness resources must be directed to the state and local levels. The federal government must respond, but planning and preparedness should be outsourced to where the first response will occur. That would seem to be an important risk management principle to follow.

Two final risk management-related points: (1) Agriculture is often overlooked when U.S. "critical infrastructure" is considered; it was not on the original protection list in 1998, but was added after Sept. 11, 2001. Today, it seems to be slipping to second tier status again, which is hugely problematic from a risk management perspective. (2) USDA is not a national security agency, so if DHS removes agriculture – crops, livestock – and food from its critical infrastructure protection portfolio (as recent trends indicate), that could make agriculture risk management even more difficult.

Our enemies focus on our vulnerabilities, not our strengths. As a result, strengthening agriculture security is vital to safeguarding national security.

So, to reiterate the last statement in my testimony, "Congress must act before it's too late."