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Before the  
Senate Homeland Security & Government Affairs Subcommittee on Oversight of  
Government Management, the Federal Workforce, and the District of Columbia  
October 4, 2007

Chairman Akaka, Ranking Member Voinovich and Members of the Subcommittee, I appreciate the opportunity to testify today about Project Argus, the biosurveillance priming system developed and implemented at Georgetown University's Imaging Science and Information Systems (ISIS) Center. Argus is designed to detect and track early indications and warnings of foreign biological events that may represent threats to global health and national security. Argus serves a "tipping function" designed to alert its users to events that may require action. It is not in the business of determining whether, or what type of actions should be taken.

In the late 1990's, I worked with the World Health Organization and NASA to examine environmental and climatic activities in Africa potentially associated with the emergence of the Ebola virus. This work led to the first model for rapid identification of "conditions favorable" for Ebola epidemics using satellite imagery. In 2003, we applied this idea to West Nile virus at Georgetown University's ISIS Center with funding from the Telemedicine and Advanced Technology Research Center (TATRC), the US Army Medical Research and Materiel Command (USAMRMC). This led to the concept of "graded alerting" married to "graded response", where clues of the emergence of a biological event may sensitize a network of biosurveillance analysts to begin actively searching for more information that may ultimately yield a response action. That work evolved into Project Sentinel which was supported by the National Library of Medicine (NLM) and examined the role of syndromic surveillance in biodefense. The most substantial realization of Project Sentinel was the possibility of connecting a global biosurveillance system seamlessly to hospitals in America using information technology so that patients would not be seen by American healthcare workers without access to immediate situational awareness of what that patient might have been exposed to while traveling overseas.

These early endeavors made evident the significant limitations of situational awareness relating to emerging global biological threats among our medical, veterinary, public health, and homeland security communities. We concluded that, particularly with regard to hyper-communicable diseases, there was a critical need for identifying the earliest possible indications and warnings of foreign biological threats to enhance our ability to proactively implement effective countermeasures.

Then, in the summer of 2004, we received an allocation of funds from the Intelligence Technology Innovation Center (ITIC) and the Department of Homeland Security (DHS) to support research and development of a completely novel approach in foreign biosurveillance: Project Argus. The objective of Project Argus was to create and implement global foreign biological event detection and tracking capability. Argus is based on monitoring social disruption through native language reports in electronic local sources around the globe. Local societies are highly sensitive to perceived emergence of biological threats, and the resulting conditions and responses are readily identifiable through a granular review of local sources of information. Argus specifically focuses on taxonomy of direct and indirect types of indications and warnings including:

- Environmental conditions thought to be conducive to support outbreak triggering;
- Reports of disease outbreaks in humans or animals; and
- Markers of social disruption such as school closings or infrastructure overloads.

The system is built on a broad range of technologies and capabilities including:

- Advanced operational social disruption and event evolution theory;
- Unique disease event staging and warning systems modeled after NOAA and NASA;
- Collaboration with the MITRE Corporation in developing a doctrine of bio-surveillance;
- Collaboration with the MITRE Corporation in developing state of the art real-time high performance computer and internet technologies coupled with advanced modeling and linguistics capabilities;
- Visualization and modeling capabilities developed in collaboration with NASA, and IntelSense Technologies; and
- Disease propagation modeling developed by the University of Maryland.

Project Argus has been organized into teams of from three to six analysts focused on each of nine global regions outside of the United States, each supervised by senior and chief analysts. These teams of analysts are tasked with using the technologies referenced earlier to review local, globally distributed reports and summarize relevant indications and warnings of the categories I noted earlier. Their summary reports are forwarded to senior analysts and are stored into a database to be subjected to mathematical modeling and utilized in longitudinal studies. The senior analysts bring to bear their expertise in medicine, public health, epidemiology, climate patterns and other fields and develop daily national assessments from the raw data gathered by the regional analysts. Findings are also checked against established baseline data. This represents a fundamental shift in global biosurveillance: these analysts are not only experts in identifying trends in disease but also in social behaviors associated with these events at the local level. This in-depth understanding enables the analysts to recognize unusual conditions prior to diagnostic confirmation of the biological agent involved.

We estimate we are accessing over a million pieces of information daily covering every country in the world which results in producing, on average, 200 reports per day. Using a

disease event warning system modeled after NOAA's National Weather Service, we issue Warnings, Watches, and Advisories in accordance with guidelines agreed upon by our research partners in the federal government. On average, we have 15 Advisories, 5 Watches, and 2 Warnings active on our Watchboard at any given time, with 2,200 individual case files of socially disruptive biological events maintained and monitored daily in over 170 countries involving 130 disease entities affecting humans or animals. We reached a maximum load of 3,300 individual case files maintained and monitored daily this past winter. These advisories are shared with our user community through the Argus Watchboard. This information sensitizes our user community to be vigilant for the most concerning biological events in the world; this vigilance may result in proactive requests for more information by our partners such as CDC. Since the program began, we have logged over 30,000 biological events in varying stages of social disruption throughout the world involving pathogens such as H5N1 avian influenza, other influenza strains, Ebola virus, cholera, and other exotic pathogens. Of note, while the majority of these events are naturally occurring, this capability has identified several laboratory accidents and, occasionally, allegations of intentional use of biological agents.

To facilitate operational validation, we initiated the creation of the unofficial, informal federal Biological Indication and Warning Analysis Community (BIWAC). As mentioned above, it is the BIWAC that reviews our reporting requirements with us on a quarterly basis to ensure proper product alignment with the user. The BIWAC now includes CDC's Global Disease Detection team; USDA's Centers for Epidemiology and Animal Health (CEAH); DHS' National Biosurveillance Integration Center; the Armed Forces Medical Intelligence Center; other Intelligence Community organizations; the Defense Threat Reduction Agency; and the US Strategic Command Center for Combating Weapons of Mass Destruction. The key federal decision process activated by Argus is whether to prompt for ground verification of a biological event. To enhance this process, we activated Project Wildfire, which is an experimental information sharing system that enables tactical, unclassified dialog among the BIWAC partners. Wildfire, although experimental, has attracted a substantial amount of federal use. Argus information is not the only information that triggers Wildfire discussion by the BIWAC; BIWAC members themselves share relevant information as well.

Furthermore we collaborate with CDC and USDA/CEAH. We understand that CDC provides relevant reports to the World Health Organization, and USDA/CEAH likewise provides relevant reports to the World Animal Health Organization and the United Nations Food and Agriculture Organization. We are currently in discussion with CDC and USDA/CEAH in regards to whether to provide direct access to these and other international organizations.

The inherent nature of biological event indications and warnings means that more often than not, there is a significant degree of uncertainty until ground verification has been obtained. Time is critical, particularly when considering the discovery of a novel influenza virus such as H5N1 and whether or not it may be efficiently transmitting between humans. Ground verification must occur rapidly enough to enable decision making for rapid global response. Developing an approach to integrated federally-

facilitated ground verification remains a key, critical discussion by BIWAC members, and we could benefit from guidance from the Congress. This then has direct implications for decisions regarding sharing of this information with domestic state and local authorities.

The Argus Watchboard has a much larger audience (215 users from 100 organizations) of which the BIWAC is a much smaller subgroup. We have two test user groups for state/locals: State of Colorado officials and the District of Columbia Department of Health. We have painstakingly spent hundreds of hours with these test users trying to understand their operational mission space, requirements, and most importantly how they may use Argus data.

While there are many examples of Argus information having real-world applications, I would like to share with the Subcommittee several examples of what has been possible:

- Since project inception, we have served the country as the lead tactical global event detection team for H5N1 avian influenza and were the first group in the world to detect the expansion of H5N1 from southern China to Russia and then Eastern Europe. To date, we have filed over 12,000 reports of events possibly related to H5N1 avian influenza. Although media attention of H5N1 has waned in recent months, we continue to monitor the global situation with the same level of attention as the first day we began operations.
- In late 2004 and early 2005, Argus participated in the tsunami response by providing daily situational awareness reports to humanitarian responders. In commenting on our operations, the US Pacific Command wrote, “Information is power only when it's shared. The situational awareness that portions of ARGUS provided during tsunami relief efforts was an impressive attention step. We see some tremendous opportunities and value added for this capability within our area of operational responsibility, which literally covers half the globe. Thanks for keeping our situational awareness up during difficult times.”
- On August 3<sup>rd</sup> of this year, Argus was the first to notify the US government of undiagnosed vesicular disease in cattle in Surrey, United Kingdom that later was diagnosed as hoof and mouth disease (FMD). Of additional interest, this event was later found to be the result of a laboratory accident, and intentional release was explored as a possible etiology but later discounted. Subcommittee Members may recall the tremendous economic damage observed during the last epidemic of FMD in the UK in 2001. This example highlights the need for Argus to not only focus on diseases that effect human health directly, but those that effect agriculture as well.
- On August 27<sup>th</sup> of this year, we were the first to report indications of the current Ebola epidemic in Kasai, Democratic Republic of the Congo. This information was made available immediately to CDC, and Wildfire was activated for the entire federal BIWAC. CDC's collaboration in rapid access to ground verification information was impressive, as it highlighted the potential reduction of the time between initial event detection to ground verification to hours and

days as opposed to weeks or months. This highlights substantial improvements needed in local disease surveillance, particularly in Africa.

- Influenza kills an estimated 250,000 to 500,000 people globally each year. The Argus team, while monitoring the current pandemic threat of H5N1 avian influenza, monitors all influenza strains in support of global influenza surveillance. This past influenza season, the Argus team issued nearly 3,000 event reports across 128 countries and 27 languages, which included 181 Advisories, 58 Watches, and 38 Warnings. We identified hundreds of reports of an H3N2 influenza virus that had possibly drifted away from the current vaccine strain of H3N2 beginning eight months ago in a multitude of countries and collaboratively worked with CDC to track this important finding. The value of this information was validated when the World Health Organization and its partners recommended a change in the southern hemisphere influenza vaccine to include an updated H3N2 strain. This represents a major accomplishment for the Argus program and highlights its potential contribution over the long term.

We have discovered the Argus methodology can be made sensitive to events involving nuclear and radiological, chemical, terrorist, political instability, genocide and conflict, crop surveillance, and natural disasters. These topical areas are currently under evaluation for potential operational use; however, initial results are very promising. The broader implications of this methodology to support the global war on terrorism, as well as basic humanitarian mission work are significant. Perhaps most significantly, our government sponsor has now described the Argus methodology as a novel analytic discipline.

We are proud of what we have been able to accomplish thus far. We reached full operational capability in July 2007 within the 12 months of current funding from the Intelligence Community. Project Argus is now integrated with the educational and research programs of Georgetown University Medical Center. The University's graduate programs have begun training the next generation of scientists and professionals as part of a new academic discipline. A comprehensive research program consisting of senior scientists, physicians, and veterinarians is working to improve the sensitivity and specificity of our surveillance capability.

But there are challenges ahead. We see Argus as providing a critical resource to many end-users, most importantly those who are tasked with protecting our homeland security and public health. Funding to bring Argus on line has come from a number of sources over the years and current research and development funding has come from the research arm of the Intelligence Community and the Defense Threat Reduction Agency. Ownership of Argus has now shifted from the Intelligence Technology Innovation Center to the Open Source Center. Funding is currently secure through July, 2008. We hope the Subcommittee and your colleagues in Congress will agree that this is a valuable resource for the national interest and that it should be maintained well beyond that date. Since such work has benefited significantly from the academic environment at Georgetown, the University is pleased to house the program; however, external funding sources would need to be found to continue current Argus work.

Beyond that, we see the need to “close the loop” by connecting this global biosurveillance resource with a comparable operation internal to the United States. As I explained previously, last winter Argus identified a possible drifted H3N2 influenza virus in China and tracked that strain of influenza as it spread to Chile, Argentina, Australia, and several other countries. We were not, however, able to monitor what occurred with that strain of influenza here within the United States since our activities, because of the funding source, are prohibited from monitoring domestically. From CDC, we did learn that, indeed, there had been an increase in H3N2 clustered initially around regions of the United States connected directly to China by international air flights. Later reports from CDC indicated this virus may be drifting away from the existing vaccine strain. The implications for proactively advising healthcare professionals are profound and warrant further study. This summer, the Department of Homeland Security issued a sole source request for proposal to the ISIS Center to initiate work on what DHS has dubbed, “Project Hyperion.” However, DHS has indicated Hyperion could not be funded in FY07 but have indicated possibly FY08. It is our view that closing this loop will prove tremendously valuable to our domestic health care system, and we would strongly encourage DHS to support a domestic extension of Argus without delay. Overall, we believe Project Argus, the BIWAC, Project Wildfire, and the proposed Project Hyperion will contribute substantially to fulfillment of HSPD-7, -9, and -10; NSPD-33; and Public Law 110-53. We note the DHS National Biosurveillance Integration Center has offered to sponsor Project Argus, the BIWAC, Project Wildfire, and the proposed Project Hyperion. We stand ready to support the fulfillment of our country’s need for enhanced biosurveillance.

It is also clear to us that there remains an important need for continued enhancements of Argus. For example, the current Argus network does not fully incorporate wildlife disease outbreaks. With that in mind, we have approached the Wildlife Conservation Society Global Avian Influenza Network for Surveillance and Global Animal Information Network for Surveillance. The Wildlife Conservation Society is a U. S.-based non-governmental organization with wildlife health field programs around the world; we wish to pursue collaboration that would incorporate information at their disposal into the Argus framework and vice versa for their network of users. There are, no doubt, other similar enhancements that warrant our attention. Preparing a cadre of appropriately qualified analysts will require the development of academic coursework to that end as is underway at Georgetown University.

Finally, as this rich source of information is expanded and deepened, decisions need to be made about the sharing and dissemination of what Argus and, ideally its domestic component, uncovers. What entity should sponsor information sharing from Argus? Who are the appropriate information recipients, and might that vary depending on the information secured? What would be the appropriate communication mechanism to state and local authorities?

In summary, Project Argus has changed the expectations for biological event detection. The Argus methodology is operating effectively on a global scale. The Argus

methodology is now seen as a novel professional analytic discipline with newly emergent training and education programs at Georgetown University designed to complement ongoing research and development. Project Argus has played a substantial role in promoting the creation of a group of operational biosurveillance analysts meeting national needs in support of the National Biosurveillance Integration Mission. Soon we hope this powerful capability will be fully extended to state and local authorities for fuller realization of the Argus capability.

We thank our current sponsors, the Intelligence Technology Innovation Center and the Defense Threat Reduction Agency for their support of the program and its mission. We also thank our special partner, the MITRE Corporation, and all of our collaborators for helping make this a successful program in the service of our country and the world.

Once again, I am grateful for this opportunity to testify, and I stand ready to answer any questions you might have.

Thank you.