INTRODUCTION

Improving Epidemic Response: Building Bridges Between the U.S. and China was held in Washington, DC, on May 15, 2012. Hosted by the Center for Biosecurity of UPMC, this conference brought together leaders from China and the U.S. who represent federal government, city and county government, research organizations, industry, think tanks, and academia.

The meeting provided a forum to increase mutual understanding of U.S. and Chinese strategies for responding to major disease epidemics. It was also a venue for leaders, scientists, and officials from both countries to present their approaches to disease outbreak response and to consider effective practices and the potential for future collaborations in epidemic preparedness and response. Distinguished speakers and panelists explored a range of topics, from surveillance and sequencing, to medicine and vaccine development, to lessons from natural disasters, to partnerships between the respective federal agencies, to epidemic response in large cities.

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Strengthening Our Pandemic Response Efforts Together

In his opening remarks, Center for Biosecurity Director Tom Inglesby set the stage for the discussions. He began by stating there is mutual interest in deepening the relationship between the U.S. and China to enhance abilities to prepare for, mitigate, and respond to epidemic disease. Citing the examples of SARS, H5N1, and the 2009 H1N1 pandemic, he noted that strengthening partnerships is critical in the face of the serious global threats of pandemic and epidemic disease. Dr. Inglesby called for the U.S. and China, as the world’s largest economies, to collaborate on pandemic preparedness to lessen the social and economic impacts that would result. In particular, these 2 nations must be prepared to treat large numbers of people, develop vaccines, and vaccinate their populations quickly. Improvement is needed in all of these areas. Dr. Inglesby called for the U.S. and China to learn from each other and identify opportunities for collaboration that would help both nations prepare before the next crisis strikes. He emphasized the need to deepen the personal relationships prior to the next pandemic, as these relationships are critical in times of crisis.

State Department Views on the Importance of U.S. and China Collaborations

As Acting Deputy Assistant Secretary of State, Dr. Jonathan Margolis restated the commitment of both President Obama and Secretary Clinton to international health. He called China one of the U.S.’s most important international partners and cited ongoing and historical collaborations in cooperative research as well as a recent strategic dialogue in Beijing on science and technology. Dr. Margolis described past collaboration between the U.S. and China in the areas of disease surveillance, epidemiological response, and immunizations. He highlighted several U.S. investments in international efforts to prepare for and respond to epidemics and pandemics, including $2 billion for containment and mitigation of H5N1, the U.S. Department of Agriculture’s efforts to train animal health workers to better understand animal diseases and zoonoses, as well as the U.S. Agency for International Development’s (USAID) Emerging Pandemic Threats program.

Looking forward, Dr. Margolis presented 3 core ideas that will continue to guide the State Department’s approach to international collaborations for improving epidemic response. First, he called for a whole society approach to surveillance and response, with involvement of industry, NGOs, and governments. Second, he emphasized the need for clear, consistent, timely, and accurate information, which was highlighted during the 2009 H1N1 pandemic. Finally, he pointed to the International Health Regulations (IHRs) as an essential part of response. He noted that although many countries will miss the upcoming June 2012 IHRs capabilities deadline, every country is responsible for, and should invest in, surveillance and response systems needed to meet their obligations under the IHRs. Dr. Margolis concluded with the observation that maintaining interest of government and civil society is of great importance for continuing progress in improving resilience to infectious disease threats.

Scientific Innovations to Improve Response to Epidemics

Jennifer Nuzzo, Noel Chen, and Nathan Wolfe engaged in a discussion about new tools and approaches in surveillance and sequencing that will strengthen response to epidemics. Ms. Nuzzo pointed to the role of surveillance and sequencing in the identification and ultimate containment of both SARS and the 2011 E. coli O104:H4 outbreak in Germany. Dr. Chen and Dr. Wolfe described their organizations’ efforts to apply new scientific approaches to strengthen epidemic response.
Dr. Chen described the growing capabilities, staff, and global reach of the genome sequencing company, BGI, which currently has approximately 4,000 employees at 4 branches. With additional branches in development, BGI features the latest DNA sequencing tools, with 127 Illumina HiSeq 2000 sequencers, complemented by Sanger, Roche/454 Life Sciences and Ion Torrent platforms. According to Dr. Chen, during the 2011 *E. coli* outbreak in Germany, BGI used 3 of their sequencing platforms to identify the causative agent of the outbreak within 3 days, and to develop a complete genetic map of the agent in 10 days. BGI made this information available to the public and worked successfully with German researchers to do so.

Dr. Wolfe observed that interaction between animals and humans is more common than in any point in human history and that this interaction is a significant driver of viral mixing and emergence of infectious diseases. To anticipate and prepare for the emergence of diseases, it is important to understand how viruses are circulating in animals. Dr. Wolfe called attention to the need for new ways to interpret the vast amounts of data that are being generated in surveillance and research. Dr. Chen reinforced this point of view, calling for increased metagenomic approaches to microbiological research. Both Dr. Wolfe and Dr. Chen emphasized that international collaborations and data management and interpretation will improve our ability to respond to epidemics.

**Opportunities and Challenges for Developing Vaccines and Medicines**

To set the stage for a panel discussion about development of vaccines and medicines, moderator Kunal Rambhia discussed how the governments of China and the U.S. are investing in and prioritizing biopharmaceutical research and industrial development. Mr. Rambhia noted, for example, that the U.S. and China file more patents globally than any other country, and they have the first and third largest pharmaceutical markets in the world respectively.

The first panelist, Dr. Frank Liu, began with a question: what can we do in the face of all the biological threats that we must contend with today? In answer, Dr. Liu asserted that countries must work together to discover, identify, and truly understand pathogens in order to fight back. He described the ongoing work at the Chinese Academy of Sciences (CAS) to understand host-pathogen interactions in the interest of developing better vaccines, adjuvants, and antivirals against new and emerging diseases. He also highlighted the successes of China in development of vaccines for influenza, hepatitis, and rabies and noted that CAS is exploring new approaches to vaccine development such as virus-like particle-based vaccines and recombinant vaccines. He also offered insight on how molecules or targets are translated from the laboratories at CAS to industry partners for product development and manufacture.

In his presentation, Dr. Dong Xie described 2 case studies of drugs under development by Frontier BioSciences: an HIV inhibitor, and a drug for acute radiation syndrome. As a contract research organization (CRO), his company works within a new model for drug development, where CROs conduct in vitro and in vivo studies in collaboration with industry partners to reduce the cost and time of required experiments and clinical trials. His organization conducts GMP production, nonclinical toxicity studies, and clinical trials in China, where costs are as low as 20% of total costs of doing the same experiments and trials in the U.S. His company complies with international standards and numerous U.S. agency standards to ensure high quality data. Dr. Xie noted that he has conducted work that is partially funded by both U.S. and Chinese federal government agencies in addition to some work with support of private investor funding. Dr. Xie pointed out that international challenges remain in protection of intellectual property, sample shipment, and regulatory processes. However, he and Dr. Liu were optimistic that progress is being made in these areas.
Looking Forward: Understanding the Context for Cooperation Between the U.S. and China

Former National Security Advisor General Brent Scowcroft delivered the keynote for the day, providing historical context and a look to the future of the U.S.-China relationship. He observed that “the issues today are infinitely more complicated than they were” when he first went to China in 1972 to address the common threat of the Soviet Union. Since that time, the 2 countries have had to iteratively grow and recalibrate the relationship, as economic growth and global events have changed the nature of their engagement. Now, the 2 countries interact on all levels—in government, business, education, and culture. General Scowcroft was encouraged by the fact that in recent years, both nations have focused on pragmatic solutions, even while staying true to their fundamental beliefs.

General Scowcroft believes that effective response to infectious disease outbreaks is critical to global economic stability, noting “I don’t need to tell this audience that public health emergencies and infectious disease outbreaks have already had significant economic impacts on China and the U.S.” He cited as examples the economic impact of SARS, the emergence of H5N1, and the 2009 H1N1 pandemic. The emergence of these diseases highlights the need for rapid identification of new cases, development of vaccines, and conducting clinical trials during a public health emergency. While these events first seemed to be unique, he made the case that we know public health emergencies will recur, “SARS also taught us we need to be prepared for the unimaginable,” and we need to have protocols in place to respond. He closed with a sentiment of hopeful confidence that the U.S. and China would take advantage of the opportunity to develop the necessary relationships to prepare together for future epidemics and pandemics.

Wenchuan to Katrina: Public Health Response to Large Scale Disasters

Moderator Eric Toner led a discussion with Lulu Zhang and Herminia Palacio on the response to 2 iconic disasters—the 2008 earthquake in Wenchuan, China, and Hurricane Katrina in 2005 in the southern U.S. Dr. Toner noted that there has been an unprecedented rise in natural disasters, which have become increasingly costly and deadly. Responses to natural disasters offer lessons on ways to better prepare for epidemics and other large scale disasters.

Professor Zhang spoke about the Institute of Military Health Management’s work in resource allocation, evidence-informed research, and decision making, particularly as related to the response to the Wenchuan earthquake, one of the most devastating in China’s recent history. The government response to the earthquake was at both the strategic and regional levels. The strategic level involved the national and provincial governments, and the regional level involved the city and county governments.

Professor Zhang described the evacuation of patients by air, rail, and road to 3 levels of hospitals: frontline hospitals, central hospitals in safer regions, and rear hospitals around the country. She recalled that, in total, more than 10,000 patients were moved to more than 350 hospitals in 58 cities nationwide. Professor Zhang noted that rapid activation of supportive medical personnel and integration of all different levels of response remain areas of focus for China’s response to large scale disasters.

Dr. Palacio shared her experience of the impressive response to Hurricane Katrina in 2005. While her jurisdiction of Harris County surrounding Houston, Texas, was not acutely affected by the storm itself, the Houston Astrodome would ultimately provide shelter to 17,000 evacuees while an additional 38,000 were moved to other nearby locations. Dr. Palacio described the immense challenges in serving as a receiving community for a mass evacuation, such as meeting the medical needs of evacuees, navigating the complexities of the incident command center, and managing infection control procedures. She offered insight about a number of topics, including the importance of collaborations.
and partnerships; the significant mental health needs of the population; the importance of food safety, sanitation, and mass vaccination as well as difficulty of public communication and rumor control.

Professor Zhang and Dr. Palacio noted that early preparation is crucial and that building an evidence base for response activities will greatly improve efficiency and organization. The speakers also agreed that they hope to better incorporate new mobile technologies to facilitate response to disasters.

**The Next Pandemic: How China and the U.S. Will Respond**

In a discussion about federal government approaches to pandemic response, Dr. Inglesby moderated a conversation among federal officials including Dr. Zijian Feng, Dr. Daniel Sosin, and Mr. Edward Gabriel. Each addressed his agency's goals and approaches to pandemics as well as some of the lessons of 2009 H1N1 and other events.

Dr. Feng offered the perspective of both the China Ministry of Health and China Center for Disease Control and Prevention (China CDC). He described the improvements China has made to its epidemic response capabilities and systems since SARS and the emergence of H5N1. Dr. Feng described the framework and responsibilities for public health emergency response in China, including coordination among county, municipal, and provincial Centers for Disease Control, and with the national China CDC. He then described components of China’s response to the 2009 H1N1 pandemic, covering topics of estimating numbers of cases, laboratory response, nonpharmaceutical interventions, medical surge capacity, and immunization strategy. He highlighted the national campaign for public health education during the pandemic, which focused on a few core messages relating to disease severity, personal hygiene, and vaccination.

Dr. Sosin described the U.S. CDC’s approach to public health emergency response through the Office of Public Health Preparedness and Response. He outlined the strategic and policy roles, the funding mechanisms, and operational components of the office in support of their mission. Reflecting on lessons from SARS and the 2009 H1N1 pandemic, Dr. Sosin highlighted the importance of the IHRs, diagnostic tests, and communications in response to global pandemics. He also described the collaborative work that CDC engages in across the world, emphasizing the need to increase in-country public health capacity and independence to improve global health security.

Mr. Gabriel described the role of the office of the Assistant Secretary for Preparedness and Response (ASPR) in the U.S. Department of Health and Human Services in pandemic response. In the context of the National Response Framework and the National Health Security Strategy, he outlined the goals, strategic objectives, and operational capabilities of ASPR. He called specific attention to the Hospital Preparedness Program, the National Disaster Medical System, the Medical Reserve Corps, and the Emergency System for Advance Registration of Volunteer Health Professionals as important components of the U.S. domestic preparedness and response programs, supported by ASPR.

Finally, Mr. Gabriel outlined ASPR’s ongoing international collaborations as well as the existing international assistance frameworks developed by ASPR.

**Inside the U.S. CDC, China CDC Partnership**

Anita Cicero moderated a discussion with Melinda Frost and Xing Gao about their work in Beijing in partnership with the China CDC. Ms. Frost described some of the history of and funding for their collaborative work, which began in 1979, and has focused on influenza, HIV, preparedness and response, and noncommunicable diseases. She emphasized progress that has been made in risk communication activities during the past several years. Dr. Gao gave several examples of how the U.S. CDC supported and advised Chinese authorities in
response to disasters including the 2008 Wenchuan earthquake, the 2009 H1N1 pandemic, and the 2010 Yushu earthquake. U.S. CDC has also aided in preparation for several mass gatherings and helped China establish its WHO collaborating center on influenza. Ms. Frost and Dr. Gao noted that U.S. CDC and China CDC have established a relationship that allows for access to meetings and the ability to exchange ideas during epidemics.

A Tale of Two Cities: Responding to Epidemics in Shanghai and New York City

The meeting concluded with a look at responses to epidemics in Shanghai and New York City, discussed by city officials Fan Wu and Jay Varma and moderated by D.A. Henderson. In describing the preparedness and response systems at the New York Department of Health and Mental Hygiene, Dr. Varma noted the unique autonomy held by the health department, which is authorized to pass regulations that have the force of law. New York strives to improve its epidemic response capability and capacity, and Dr. Varma cited improvements in electronic laboratory reporting, animal disease surveillance, and syndromic surveillance. Recalling the experience of New York during the emergence of West Nile virus, Dr. Varma pointed to the role of clinicians and good communications in recognizing the outbreak. In citing the response to H1N1, he noted the limited role of syndromic surveillance as a confirmatory, not predictive, tool and the critical importance of laboratory capacity.

Dr. Wu, who works in a city of 23 million people, described the challenges of decreasing morbidity and mortality in an aging and large population. In Shanghai, the municipal CDC prioritized disease surveillance, particularly for early warning of respiratory disease, following the emergence of SARS. Shanghai also strives for high immunization coverage among the city’s floating population of nearly 9 million as well as among children. Dr. Wu highlighted the experience of Shanghai in preparing for the World Expo in 2010, which required a coordinated approach to risk assessment, laboratory capacity reserves, risk communication, disease prevention, immunization, and vaccine stockpiling. She noted that integrating their surveillance systems, improving laboratory capacity, promoting local emergency preparedness, and enhancing cross-sectional communication from different government agencies are priorities for improving response to future epidemics.

Dr. Wu and Dr. Varma also reflected on the challenges and successes during 2009 H1N1 vaccination efforts. Shanghai vaccinated 3 million people in 10 days. Dr. Wu credited the success to having available pandemic vaccine and communicating to the population the seriousness of the pandemic. Dr. Varma added that in New York, as a result of a health department requirement, they have more than 98% immunization coverage in school children. This requirement has been challenged in courts, but has so far been successfully defended.