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Chairman Duncan, Ranking Member Barber, and Members of the Subcommittee, good afternoon.

Thank you for the opportunity to present to you some of my thoughts and observations regarding disaster preparedness and to introduce you to the Rutgers Institute for Emergency Preparedness and Homeland Security and the University Center for Disaster Preparedness and Emergency Response.

These are my personal professional thoughts and observations regarding disaster preparedness and do not represent official positions or policies of any organizations or entities.

Types of Disasters

Disasters can be categorized as caused by natural hazards, technological hazards, or intentional threats.

Natural hazards are naturally-occurring disasters of geophysical, hydrological, climatological, meteorological, and biological origin that occur with or without warning. These hazards include earthquakes, wildfires, hurricanes, tornadoes, storm surges, and disease epidemics, among others.

Technological hazards are caused by humans and include, among others, industrial accidents, transportation mishaps, infrastructure failures, power service disruptions and blackouts.

Intentional threats are deliberate and purposeful hazards caused by humans and include, among others, biological, chemical, radiological, nuclear, explosive, and cyber threats.

In many respects, disaster preparedness in the United States is significantly better today than before 9/11, the Anthrax bioterrorism, Hurricane Rita, and Superstorm Sandy. However, many gaps in preparedness still exist that need to be addressed. There is urgency to enhance preparedness to respond to threats in advance of the next major incident.

With respect to weather events, although prediction capabilities have markedly improved, there is still a great need for more granular information by specific location to be able to prepare, mitigate, and respond to local effects. For example, more accurately prediction of the extent of local storm-related tidal surge would allow municipalities and their residents to institute effective strategies to minimize adverse consequences from extreme weather events.

With respect to technological events, deterioration of infrastructure can lead to building and bridge collapses, dam failures, power service disruptions, among other incidents. Some US infrastructure has aged more than twice its expected lifespan. Some thoroughfares built many decades ago now carry five to ten times the traffic originally anticipated. Infrastructure failures continue to occur, but catastrophic events fortunately remain quite rare. Attention and funding need to be increased to support the physical infrastructure that allows continuity of operations and society.

Biological threats include naturally-occurring emerging and re-emerging infectious diseases, such as Ebola Virus Disease (EVD), which is currently spreading out-of-control in West Africa, and Middle East Respiratory Syndrome (MERS), which emerged in the Arabian Peninsula – both of which are associated with high mortality rates among victims. Although Ebola Virus Disease, a form of hemorrhagic fever, is taking a terrible toll in West Africa with approximately 70% mortality rate, it is fortunate that the disease is not readily transmissible in humans via the airborne route and does not become contagious through contact with body fluids until signs and symptoms appear. MERS, a coronavirus infection, is a recently-emerged infectious disease, with approximately 40% mortality rate. Although the disease has spread to 22 countries, it is fortunate that person-to-person transmission has been limited. Of major concern is that diseases like MERS or H5N1 Avian Influenza may gain the ability to be easily transmitted person-to-person, resulting in a worldwide pandemic of enormous proportions and grave effect.

In addition to naturally-occurring infectious diseases, laboratory accidents and errors have resulted in exposures, infections, and deaths involving most of the dangerous Select Agents. Even the most highly-regarded Biosafety Level 3 and Biosafety Level 4 laboratories have experienced mishaps with highly hazardous biological organisms.

Also, laboratories in the United States and around the world are creating new biothreats, either through modification of existing biological agents or through creation of novel organisms. The genetic sequences for these synthetic biothreats are shared worldwide through scientific publications and presentations and may serve as blueprints for development of devastating infectious threats by those who wish to do us harm. Scientists today are performing so-called “gain-of-function” experiments to ascertain which genetic modifications would enable infectious disease organisms to be more lethal, transmissible, and resistant to existing countermeasures. Inadvertent release of one of these agents could cause a worldwide health crisis.

Chemical threats continue to be a major concern, especially those that involve Extraordinarily Hazardous Substances (EHS) and are located in populous areas of our nation. There continue to

be chemical containment facilities within urban areas that have yet to convert to Inherently Safer Technologies (IST) that use feasible alternatives (such as replacement of chlorine with sodium hypochlorite) to reduce the potential harm that would result from accidental release or terrorist attack.

Another ongoing concern involves the transport of hazardous substances through populated areas. Tanker cars of crude oil, chlorine, and other dangerous substances pass through urban and suburban areas of our nation on a daily basis. Notification of state, county, and municipality is only mandated if certain conditions are met. Disaster planning must include an understanding of these risks, mitigating factors, countermeasures, and strategies for in-place sheltering and/or evacuation.

Radiological threats are another major concern. I will defer remarks on improvised nuclear devices and the effects of electromagnetic pulse, since these can result in catastrophic impact of immense scale. It should be noted, however, that catastrophic planning activities for these threats are being carried out.

On a smaller scale, accidental releases and exposures to radioactive isotopes continue to be reported, sometimes related to improper disposal of medical equipment. In addition, some radiological sources are not well secured. Numerous instances of theft or loss of isotopes occur each year. Exposure to these substances can be extremely harmful to health. The addition of radioactive material to conventional explosives creates radiological dispersion devices (RDD), weapons of mass disruption and fear, that can affect involved areas for long periods of time and at great cost.

Explosive threats have been weapons of choice in both military and civilian settings. These events can be caused by improvised explosive devices and manufactured explosives. These threats are among the least difficult to carry out. As was observed in the aftermath of the Boston Marathon bombings, multidisciplinary planning and the immediate involvement of general-public-as-first-responder can mitigate harm and save lives and limbs. As one of my colleagues recommends, "Don't just see something and say something, do something."

Active Shooters is another threat that is difficult to prevent. Efforts to refine behavior assessment, predictive accuracy, and early intervention may avert some of these incidents. It is critical to be prepared and alert. Tactical EMS, providing medics with the skills and training to support tactical law enforcement teams, creates a multidisciplinary capability to intervene in an effective and timely fashion in instances of active shooters or explosive incidents.

Cyber threats continue to grow internationally in scale and intensity. State and non-state actors are breaching the security of government agencies and private businesses resulting in denial-of-service and theft of money and intellectual property. Of great risk are cyber threats to Industrial Control Systems (ICS) including Supervisory Control and Data Acquisition (SCADA) systems providing control of remote equipment and also threats to healthcare-related computer systems and electronic medical devices.

Approach to the Threats

The number, magnitude, and complexity of threats and hazards can be quite daunting. The approach to these issues must be evidence-based, comprehensive, and multidisciplinary. It starts with effective command, control, and communications. All-hazards generic readiness must be enhanced with threat-specific preparedness. A major focus must be the increase in understanding of interdependencies between critical infrastructure sectors, with special protection of lifeline sectors. There needs to be more consistent and effective incorporation of lessons-learned from real-world situations and from simulations and exercises. Organizational silos must yield to cross-cutting collaboration. Information sharing is critical at all levels, both horizontally and vertically. Interoperability of equipment is a necessity for situational awareness and coordinated response. Evidence-based responses require research to establish best practices. Planning, training, and the conduct of exercises in advance of a disaster are critical to effective management of the event. Greater engagement and inclusion of the private sector, which owns and operates the majority of critical infrastructure, is necessary for effective preparedness and response.

U.S. Department of Homeland Security and FEMA funding need to be restored to prior levels. The public health system, which has been significantly stressed by the increasing presence of communicable diseases, needs to be re-energized and infused with funding.

In addition to nurses and pharmacists, one health care provider group that has not been fully engaged to date is the practicing physician, a vital resource for surveillance, detection, identification, and response to health threats. More continuing medical education should be devoted to disaster medicine and the entire healthcare team must participate in planning, training, and exercises. There needs to be better understanding of the inevitability of the occurrence of major threats and hazards and a greater focus on resiliency, continuity of operations, and return to full functionality.

Finally, there needs to be increased involvement of the subject matter experts in public and private sectors, especially tapping the expertise and experience of our colleges and universities to enhance national preparedness and response to the vast spectrum of existing and emerging threats.

New Jersey Academic Institutions Active in Preparedness

Rutgers University and its partner Robert Wood Johnson University Hospital in New Jersey play major roles in the disaster preparedness and response arena.

The *Rutgers Institute for Emergency Preparedness and Homeland Security* was recently established to play a national and international leadership role in developing and implementing initiatives to protect the lives, health, and well-being of individuals and populations, through collaboration in research, education, community outreach, and practice.

The Institute brings together experts from the broad spectrum of disciplines, schools, departments, and centers that exist across the statewide campuses of Rutgers, The State University of New Jersey – and with federal, state, national, and international partners in the public and private sectors – to address all aspects of emergency preparedness, disaster response, and homeland security.

The multidisciplinary subject matter experts work together to optimize prevention, protection, preparation, mitigation, response, recovery, and resiliency for all-hazards emergencies, disasters, and terrorism – whether of natural, accidental, or intentional origin.

The experts span the spectrum of disciplines including health care, behavioral health, public health, biosafety and biosecurity, emergency medical services, emergency management, law, public safety, criminal justice, homeland security, transportation science, engineering, pharmacology and drug development, computer science and cybersecurity, mathematics, environmental and exposure science, business, and public policy, among other areas having a nexus to preparedness and response.

The Institute is a single point of entry to a wide spectrum of experts and a one-stop portal to address educational, clinical, research, and community outreach needs.

The Institute's major features include: fostering collaboration among Rutgers faculty, students, and staff; developing collaboration between Rutgers University and outside public and private entities; serving as a single portal to connect with Rutgers experts; and featuring a one-stop capability for access to the full breadth and depth of expertise in the relevant subject matter.

The *University Center for Disaster Preparedness and Emergency Response (UCDPER)* is a collaborative initiative of Robert Wood Johnson University Hospital, Rutgers Robert Wood Johnson Medical School and Rutgers, The State University of New Jersey.

The Center's mission is to develop and implement initiatives to advance preparedness and response to all-hazards emergencies, disasters, and terrorism.

Areas of expertise include: mechanisms of action of chemical warfare agents; development of countermeasures to chemical threats; safety and security of bridges, roads and related transit systems; security of pipeline and energy distribution systems; port security; plume modeling; analysis of big data; triage; decontamination; mass casualty management; trauma care; disaster medicine training; economic analysis of preparedness initiatives; survey research; risk communication; victim tracking; public and private sector policy development; information assessment and analysis; clinical and health care preparedness; research and development; education; training; exercises; and service and outreach to the community.

Robert Wood Johnson University Hospital (RWJUH) is a 965-bed academic health center in Central New Jersey. RWJUH is the core hospital of Robert Wood Johnson Health System, which currently has more than 10,000 employees, 3,200 medical staff members, and over 1,700 beds.

RWJUH New Brunswick is the flagship cancer hospital of the Rutgers Cancer Institute of New Jersey and the principal hospital of Rutgers Robert Wood Johnson Medical School. Its Centers of Excellence include cardiovascular services, cancer care, and women's and children's services at the Bristol-Myers Squibb Children's Hospital at Robert Wood Johnson University Hospital. The hospital is a Level 1 Trauma Center and a Tier 2 Ebola Facility. It serves as a national resource for ground-breaking approaches to emergency preparedness and mass casualty management through the University Center for Disaster Preparedness and Emergency Response, International Center for Terror Medicine, State of New Jersey Regional Medical Coordination Center, Regional EMS Communication Center, EMS Education and Training Center, participation in preparedness exercises including the highest level of play in TOPOFF-3 (the nation's largest bioterrorism exercise), and major educational conferences on disaster management. The hospital functions as a laboratory to study innovative preparedness and response strategies, especially with respect to surge volume and mass casualty management.

The hospital has received Department of Defense funding through the US Army Medical Research and Materiel Command (USAMRMC) – Telemedicine and Advanced Technology Research Center (TATRC).

A major funded project is *"Evidence-based Best Practices for Explosive/Incendiary Incidents: Translating the Israeli Experience for Use in US Military and Civilian Pre-Hospital Health Care Systems."* In this project, approximately 50 national and international subject matter experts participated in a working group to identify best practices for management of blast incidents from the U.S. and Israeli military and civilian experience. Scientific journals articles are currently under review for publication.

Another major funded project is the *"Use of Real-Time Locating Systems (RTLS) Optimize Response during Disasters and Other Mass Casualty Events and during Routine Hospital Operation"* which evaluated the use of real-time locating systems (RTLS) to optimize the efficiency and effectiveness of patient management and disaster response under conditions of markedly increased patient surge volume (during simulated full-scale mass casualty events) and in periods of usual patient volume (during routine hospital operation). The hospital was outfitted with RTLS technology, 6000 pieces of equipment were tagged, and four Full-Scale Dress Rehearsals and Full-Scale Exercises/Experiments were performed with participation of a total of 2000 role players (volunteer simulated blast victims and staff personnel). Data analysis is currently in process, to be followed by publication of results in scientific journals.

Concluding Remarks

It is inevitable that hazards and threats will evolve and incidents will occur. Our preparedness and response must evolve as well. Tapping the robust expertise and experience of university partners will greatly benefit the ability to effectively address these threats. The Rutgers Institute for Emergency Preparedness and Homeland Security and its collaborating schools, centers, programs, and experts stand ready to assist federal, state, county, and local public and private entities in optimizing our nation's preparedness and response.

Thank you for the opportunity to make this presentation today.