



**Testimony before the  
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**Meeting the Challenge of Drug-Resistant  
Diseases in Developing Countries**

**Thomas R. Frieden, M.D. M.P.H.**

**Director, Centers for Disease Control and Prevention and  
Administrator, Agency for Toxic Substances and Disease  
Registry**

**U.S. Department of Health and Human Services**



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Chairman Smith, Ranking Member Bass, Members of the Committee, thank you for the opportunity to testify today and for your ongoing support of the Centers for Disease Control and Prevention's (CDC) work in global health, which is critical to addressing antimicrobial resistance and the other global threats I will discuss today. I am Dr. Thomas Frieden, Director of CDC. CDC works 24-7 to save lives and protect people from harm. Today, I would like to specifically address how CDC works to protect Americans from threats that can cross our borders with ease. Four key trends have emerged in recent years. These trends are the rise of antimicrobial resistance, emerging global threats such as the Novel Influenza A (H7N9) virus, globalization of travel and trade, and the potential for deadly pathogens or products to inadvertently or intentionally be released. These trends demonstrate the need for public health action to identify serious health problems and to coordinate a targeted response that ensures the protection of our Nation.

### **Antimicrobial Resistance**

Antimicrobial resistance is one of our most serious health threats. Infections from resistant bacteria are now too common, and some pathogens have even become resistant to multiple types or classes of antibiotics. The loss of effective antibiotics will undermine our ability to fight infectious diseases and manage the infectious complications common in vulnerable patients undergoing chemotherapy for cancer, dialysis for renal failure, and surgery, especially organ transplantation, for which the ability to treat secondary infections is crucial.

When first-line and then second-line antibiotic treatment options are limited by resistance or are unavailable, healthcare providers are forced to use antibiotics that may be more toxic to the patient and frequently more expensive and less effective. Even when alternative treatments exist, research has shown that patients with resistant infections are often much more likely to die, and survivors have significantly longer hospital stays, delayed recuperation, and long-term disability.

Resistance is not just a problem for the infected patient. When an infection is not effectively treated because of resistance, the microorganisms can persist and spread to others, further extending the resistance problem. The emergence of new forms of resistance that we have not previously encountered remains a risk. There are now at least 6 different deadly microbes that have strains resistant to all or virtually all antibiotics (e.g. Enterobacteriaceae, Acinetobacter spp., Pseudomonas aeruginosa, Enterococcus, Mycobacteria tuberculosis, and Neisseria gonorrhoeae), and healthcare providers are limited to providing supportive care rather than directly treating an infection. The costs of treating antimicrobial-resistant infections place a significant burden on society – a burden that will grow as drug-resistance spreads.

CDC combats antimicrobial-resistant infections here at home by collecting data on highly antibiotic-resistant infections and triggering the “Detect and Protect” strategy that identifies pathogens and transmission within and between facilities. CDC’s work is critical to improve the capacity of healthcare facilities and states to detect drug resistant organisms and protect patients and communities. CDC regularly releases information on antimicrobial-resistant pathogens including our recent “Vital Signs” on carbapenem-resistant enterobacteriaceae (CRE), and issues guidance to healthcare providers on recognizing and treating resistant infections.

### **Globalization of Travel and Trade**

Today, the high mobility and interconnectedness of global populations complicate the detection and prevention of both emerging organisms and antimicrobial resistant infections. The ease of international travel and trade, increasing population density, changes in animal husbandry practices, environmental changes, continuous pathogen evolution, and immune suppressive therapy have all increased the potential for the emergence and rapid dissemination of new microbes and new forms of known pathogens.

Antimicrobial resistant organisms can spread in days from one part of the world to another. Poor quality

treatment of tuberculosis or of hospital-acquired pneumonia in Asia or Africa can become a challenge in United States hospitals within days.

The scope and complexity of today's antimicrobial threats underline the critical need for a public health response that is fully integrated domestically and globally to prevent not only antimicrobial resistant infections but also the broad range of other global health security threats that originate around the world and put our citizens at risk. Efforts to prevent such threats build on the foundation of proven public health strategies: immunization, infection control, protecting the food supply, antibiotic stewardship, and reducing person-to-person spread through screening, treatment and education. To mitigate global health threats we need better information about health threats anywhere in the world, better information to help guide the use of resources available to keep us safe, and ultimately a robust response to detect, prevent, and stop urgent and emerging global health threats. CDC, with its integration of laboratory and epidemiologic science and ongoing commitment to public health, both within the United States and abroad, is unique in its ability to leverage its expertise and respond aggressively to urgent and emerging global threats.

### **Current CDC Efforts to Strengthen Global Health Security**

Throughout its history, CDC and its local, national, and international partners have addressed global health security threats by improving detection, response, and prevention. In the past decade alone, CDC has helped to detect, track, and respond to major public health threats in the United States and abroad including H1N1 influenza, H5N1 influenza (avian flu), Severe Acute Respiratory Syndrome (SARS), and West Nile Virus; numerous *Salmonella* and *E.coli* outbreaks; the cholera outbreak in Haiti and the earthquake and tsunami in Japan; and Hurricanes Irene, Katrina, and Sandy. In the past month, we have activated our Emergency Operations Center and been fully engaged in responding to a novel strain of influenza, H7N9.

CDC works with our partners around the globe to improve disease detection and response and help them develop capacity to respond to emerging threats. Our international influenza partners, including those in Africa and Asia, have made great strides in their ability to detect and respond to novel influenza viruses. For example, right now in China, authorities are moving quickly to limit the spread of Novel Influenza A (H7N9) virus. This type of flu has never before been detected in humans, and with the recent human cases and deaths, the government in China is working to monitor the illness and share information quickly. CDC's partnership with China over the past decade has allowed authorities there to move quickly to sequence the genome of this particular strain of Novel Influenza A (H7N9) virus, and post it in an internet database for others to see.

CDC strives to address these and other global health security threats in a comprehensive manner through programs that work on multiple, complementary levels, including:

- CDC's Global Disease Detection (GDD) Program develops and strengthens global capacity to detect, identify, and contain emerging infectious disease and bioterrorist threats through a network of 10 regional centers around the world.
- CDC supports the development of clinical laboratories in partner countries, improves labs to meet international quality standards, supports the creation of national laboratory strategic plans, and trains laboratorians to enable partner countries to detect and respond to a broad range of infectious diseases.
- CDC's Field Epidemiology Training Program (FETP) works with Ministries of Health to implement in-country programs to train disease detectives who lead detection and response efforts locally. Approximately 80 percent of FETP graduates continue to serve their home public health system. In China, we have helped train more than 100 disease control specialists who are now available to help contain H7N9 and other similar programs.

- The Global Foodborne Infections Network—founded by CDC, the World Health Organization (WHO), and other partners—it equips countries to better detect and control foodborne and other enteric infections, including antimicrobial resistant pathogens.
- CDC’s Division of Global Migration and Quarantine (DGMQ) protects the health of United States communities by preventing the introduction, transmission, and spread of infectious diseases in mobile populations such as travelers, immigrants, and refugees.
- CDC, along with NIH, FDA, and others, developed the Public Health Action Plan to Combat Antimicrobial Resistance, a blueprint for specific, coordinated Federal actions to address antimicrobial resistance.

These and other CDC programs play a critical role in supporting the 194 WHO Member States that have committed to detect, assess, notify, and respond to public health emergencies of international concern (PHEICs). Under these commitments, Member States must report to WHO any cases within their borders of certain diseases, as well as notify WHO in a timely way of any threat that qualifies as a PHEIC—whether infectious, chemical, biological, or radiological.

Unfortunately, many countries lack the essential resources and sufficient health infrastructure to meet these commitments. CDC helps promote compliance and coordination for the United States and WHO member states, and supports countries with limited resources to develop the essential detection and control capacities for full and effective implementation. CDC’s global health resources support at least one commitment in over 90 countries through our network of laboratories, surveillance systems, training programs in field epidemiology and laboratory science.

## **The Path Forward**

CDC and our partners have made tremendous progress building the human resources, infrastructure and systems necessary to safeguard the health of the American people. My testimony reviews four key issues that we continue to focus on in this work: drug resistance, emerging organisms, globalization of travel, food, and medical supplies, and potential use of laboratories to engineer and inadvertently or intentionally release deadly pathogens or products.

While we are not able to predict with certainty which diseases will present epidemic threats to the United States and the world, or when they will threaten us, we do know that such potential threats will continue to be an important area of our focus. Globalization of travel and trade means that every day, people and goods that can transport disease are moving between and among nations as never before.

The following are just a few of the most dangerous emerging and urgent threats related to antimicrobial resistance and inappropriate antibiotic use that challenge us domestically and globally:

- carbapenem-resistant Enterobacteriaceae (CRE).
- drug-resistant gonorrhea: Strains of *Neisseria gonorrhoeae* circulating in the United States are showing evidence of declining susceptibility to cephalosporins, the only drugs left to treat this infection. Treatment failures were first detected in Asia several years ago and are now being observed around the world, raising concerns about the threat of untreatable gonorrhea in the United States.
- *Salmonella*: Antibiotic resistance is increasing among some strains of non-typhoidal *Salmonella*, a frequent cause of foodborne infection outbreaks. CDC focuses on judicious use of antibiotics in both healthcare and agriculture.
- multi-drug resistant (MDR) and extremely drug resistant (XDR) tuberculosis; : A significant and growing worldwide threat exacerbated by deficient health systems abroad, globalization, and

international travel. United States cases are almost always imported or related to overseas exposure, where diagnostic capabilities for susceptibility testing are often limited and treatment is too often poorly organized and monitored.

- *C. difficile*: The rapid spread and burden of deadly *Clostridium difficile* infections is directly attributable to the accelerating use of broad-spectrum antibiotics; a significant proportion of these drugs are used unnecessarily research indicates that up to 50% of antibiotic use in healthcare is inappropriate.
- *Artemisinin*-resistant malaria. Since 2008, malaria infections in parts of Southeast Asia have been shown to be resistant to artemisinin drugs. This is the last remaining class of antimalarial drugs and forms the basis of malaria treatment around the world. If these resistant parasites were to spread to sub-Saharan Africa (which has occurred with other forms of drug resistant malaria), the results could be devastating.

### **Window of Opportunity**

Despite these threats, we have an unprecedented opportunity to make progress. Given the scope of the threats that we face, we need to equip our scientists with the best available tools to identify these threats rapidly and accelerate our nation's response. That is why the FY 2014 President's Budget request proposes an Advanced Molecular Detection (AMD) initiative that would equip CDC's scientists with two powerful technologies -- molecular sequencing and bioinformatics -- to help solve complex disease mysteries. With new technology CDC can find outbreaks we're currently missing, find outbreaks sooner, stop them faster, and identify ways organisms are spread so we can better prevent them. With these new tools we will be able to take many important disease threats off the table, if we act now.

The basic tools of shoe leather epidemiology and spreadsheets that CDC's disease detectives rely on to answer outbreak questions can't be replaced, but new tools can help disease detectives solve more health



mysteries and solve them faster. Bioinformatics at CDC allows experts in the fields of molecular science, epidemiology and computer science to join forces as never before to prevent illness and save lives. AMD technology has already been used to investigate several outbreaks of drug-resistant infections. For example, researchers in the United Kingdom used whole-genome sequencing (WGS) to re-examine a Methicillin-resistant *Staphylococcus Aureus* (MRSA) outbreak that had occurred earlier in a neonatal unit, and were able to identify a cluster of associated infections as well as other cases not related to the outbreak. Although this investigation was performed retrospectively, it highlighted the potential use of WGS in providing timely and highly accurate information to better guide patient care and to improve infection control.

Genetic sequencing of infectious microbes, if funded, will revolutionize how CDC investigates and controls disease outbreaks, including those caused by antimicrobial resistant pathogens. CDC has attracted some of the brightest minds in science today. They need the right tools at the right time to protect Americans from infectious microbes.

### **A Safer United States and A Safer World**

The United States must intensify our efforts to support countries in their development of systems to detect threats early, respond effectively, and prevent avoidable catastrophes. We must strengthen international laboratory systems and support the development of safe, secure national laboratory systems capable of conducting the full range of tests necessary to detect and characterize new threats. We must help our partner countries to develop real-time information platforms to manage and use critical disease data.

This is both a challenge and opportunity, and it is the shared responsibility of many actors: the United States Government, partner countries and governments, multilaterals including WHO, private sector, non-governmental organizations, and civil society. In order to be successful, all actors need to engage their

respective strengths and identify critical needs that they can contribute to. Ultimately, three major components need to be addressed: Detection, Response, and Prevention.

### ***Detecting Threats Early***

To detect global health threats as soon as they emerge, all nations must develop epidemiologic and laboratory capacity that can detect and characterize any epidemic or threat in every part of every country. As our partner nations develop this core public health capacity, we must support them to ensure that their laboratory systems are safe and secure. We must help our partner nations develop effective surveillance systems that identify disease cases and outbreaks earlier. Effective laboratory systems are needed to characterize pathogens in order to inform appropriate responses. Developing nations face a critical shortage in trained disease detectives who can lead outbreak investigations and epidemic responses. Many nations lack basic infrastructure for surveillance and health information systems, and sufficient laboratories and other needed facilities. As I mentioned before, infectious diseases do not recognize national borders, which makes the need for effective international detection systems even more apparent.

### ***Responding Effectively***

When health threats are detected, nations must have rapid response capability and trained rapid response teams to respond to emerging information and contain disease outbreaks. All nations should develop interconnected, appropriately-scaled public health Emergency Operations Centers (EOCs). All nations should also develop and maintain real-time information systems able to securely store disease surveillance and other relevant data, present visualizations of outbreak data in real-time for actionable decision-making, and securely share health information with international health officials. Nations must also improve their border safety and ability to implement quarantine measures when necessary to control disease outbreaks and prevent the exportation of disease outside their borders through travel, migration, and trade.

There are excellent examples of detection and response capacity paying dividends—in Uganda, where CDC has supported the Uganda Virology Research Institute, the government has significantly reduced the amount of time between the first known case and the investigations, laboratory confirmations, and containment during Ebola virus outbreaks. Uganda no longer needs to send laboratory samples to Atlanta or other nations for confirmatory testing—they can do it in-country, cutting down their response time and saving lives. Due in part to this in-country capacity, recent outbreaks have been more effectively contained and have resulted in fewer cases and deaths. If disease outbreaks occur where detection and response capacity is poor, the impacts could be devastating.

### ***Preventing Avoidable Catastrophes***

To prevent these global health threats, we must ensure the global food, drug, and medical device supply is safe. We must improve infection control as well as the judicious use of antibiotics and other drugs, and intensify our efforts to develop new drugs and tools to reduce the impact of drug resistance. Nations must improve the safety and security of their laboratories and other facilities working with dangerous organisms to prevent the intentional or unintentional release of disease.

### **Conclusion**

Epidemic threats to our security arise at unpredictable intervals and from unexpected sources, affecting Americans and others around the world. However, we have an unprecedented and unique opportunity to make progress in preventing these threats. We have the commitment and goodwill of partner governments, multilateral organizations and other critical stakeholders necessary to strengthen global health security. Now we must continue our work of adapting this commitment to global health security into action.

CDC is committed to work with our partners to leverage our current investments, and to support partner countries to detect, respond to, and prevent global health threats, including antimicrobial resistant threats. However, to reach the goal of a world safe from epidemic threats, the United States must redouble our efforts to generate commitment from partner countries and accelerate progress. The stakes are too high for the United States and international partners to delay.