ISSUE REPORT



Remembering 9/11 and Anthrax:

PUBLIC HEALTH'S VITAL ROLE IN NATIONAL DEFENSE

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Introduction

By Governor Lowell Weicker, Jr., former three-term U.S. Senator and Governor of Connecticut and President of the Board of Directors of TFAH

Ten years ago, the September 11th and anthrax tragedies shook the country to our core.

All of us at the Trust for America's Health (TFAH) wanted to take the anniversary to remember those we lost and their loved ones — and to commemorate those who worked tirelessly and heroically to respond and protect us.



Photo courtesy of CDC

This project features first hand accounts from public health professionals who were pivotal in the response efforts — and these stories reveal the selflessness and bravery of these individuals, as well as illustrating the vital role that public health plays in protecting the health and safety of Americans. We know these memories are tough ones.

The stories range from the steps health officials took on September 11th in the face of uncertainty to practitioners who diagnosed and treated anthrax victims to lab directors who tested thousands of potential anthrax samples in rapid response time.

The contribution that public health makes in preventing, detecting and containing threats is often overlooked and underappreciated.

At TFAH, we believe every community in the United States should be prepared to meet the threats of bioterrorism, infectious disease outbreaks and natural disasters.

In 2001, we experienced the unimaginable. In 2011, we know we need to expect the unexpected. Over the past decade, we learned a lot of hard lessons about what it means to be adequately prepared for diseases, disasters and bioterrorism. We've made smart, strategic investments, and there's been a lot of progress to show for it. We can be proud of the improvements that have been made. Of course, there is a lot left to be done, which will require further effort and investment. But, regardless, the field of public health preparedness was forever changed 10 years ago, and we should never forget why.

The top lesson we learn and relearn in each tragedy and emergency is that being prepared means we must sustain enough resources and vigilance so we can prevent what we can and respond when we have to.

TFAH would like to extend our thanks to all of the public health professionals who work unwaveringly to help keep us healthy and safe – and our thanks to all of the individuals and organizations who participated in this project, including the Robert Wood Johnson Foundation, the Association of State and Territorial Health Officials, the National Association of County and City Health Officials, the Association of Public Health Laboratories, the American Public Health Association, the U.S. Centers for Disease Control and Prevention (CDC), the Center for Biosecurity of UPMC, and numerous state and local health officials.

CHRONOLOGY OF KEY EVENTS FOLLOWING THE ATTACKS

- **September 11, 2001** — Terrorists crashed planes in New York City, outside Washington, D.C. and in Pennsylvania.
- **October 2, 2001** — An infectious disease physician recognized a possible case of inhalational anthrax in a man hospitalized in Palm Beach County, Florida. This physician contacted the local health officer in Palm Beach County, who immediately began a public health investigation. By October 2, there were already seven persons with cutaneous anthrax in the northeastern U.S., but none had yet been diagnosed.
- **October 4** — The microbiologic diagnosis of *B. anthracis* was confirmed by the Florida Department of Health (FDH) and CDC, and the diagnosis was made public. Epidemiologic and environmental investigations were launched to determine the source of the patient's anthrax exposure. Evidence of contamination with *B. anthracis* was found at American Media Inc. (AMI) in Boca Raton, Florida, where this first victim worked as a photo editor.
- **October 5** — The first victim of the anthrax attacks died. A second AMI employee, who had been hospitalized for pneumonia on September 30, was diagnosed with inhalational anthrax. He was an employee in the AMI mailroom.
- **October 6** — The Palm Beach County Health Department began to obtain nasal swabs from those who had been in the AMI building in an attempt to define exposure groups. Because nasal swab testing was known to be an insensitive diagnostic test, the health department also recommended prophylactic antibiotics for all those people who had been in the AMI building for at least one hour since August 1 regardless of the results of their nasal swab tests. Environmental samples taken from the mailroom showed evidence of *B. anthracis*.
- **October 7** — A nasal swab was positive on another employee. A swab from the first victim's computer screen was positive. The AMI building was closed.
- **October 9** — The New York City Department of Health notified CDC of a woman with a skin lesion consistent with cutaneous anthrax. The woman, an assistant to NBC anchor Tom Brokaw, had handled a powder-containing letter postmarked September 18 at her workplace.
- **October 13** — Another cutaneous case of anthrax was recognized in a 7-month-old infant who had visited his mother's workplace, the ABC office building on West 66th Street in Manhattan, on September 28.
- **October 13** — Symptoms of cutaneous and inhalational anthrax in New Jersey postal workers began to be observed and reported by physicians to the New York City Health Department. Diagnoses of anthrax were confirmed by CDC on October 18 and 19.
- **October 15** — A staff member in the office of Senator Daschle in the Hart Senate Office Building opened a letter (postmarked October 9) which contained a powder and a note identifying the powder as anthrax. The powder tested positive for *B. anthracis* on October 16. Nasal swab testing of anthrax spores was performed on 340 Senate staff members and visitors to the building who potentially were exposed and to approximately 5,000 other people who self-referred for testing. This testing indicated exposure in 28 persons. Antimicrobial prophylaxis was administered on a broader scale and environmental testing was initiated.
- **October 19** — CDC linked the four confirmed cases of anthrax to "intentional delivery of *B. anthracis* spores through mailed letters or packages."
- **October 19–22** — Four postal workers at the Brentwood Mail Processing and Distribution Center in the District of Columbia were hospitalized with inhalational anthrax. The Brentwood facility was closed on October 21. On October 22 two of these four postal workers died.
- **October 24** — CDC sent an advisory to state health officials via the Health Alert Network recommending antibiotic prophylaxis to prevent anthrax for all people who had been in the non-public mail operations area at the U.S. Postal Service's Brentwood Road Postal Distribution Center or who had worked in the non-public mail operations areas at postal facilities that had received mail directly from the Brentwood facility since October 11.
- **October 27** — A CDC alert recommended antibiotic prophylaxis for workers in the mail facilities that supplied the CIA, the House office buildings, the Supreme Court, Walter Reed Army Institute of Research, the White House, and the Southwest Postal Station after preliminary environmental sampling revealed *B. anthracis* contamination in these mailrooms.
- **October 31** — A 61-year-old female hospital stockroom worker in New York City died from inhalational anthrax after she had become ill with malaise and myalgias on October 25. The source of her exposure remains unknown despite extensive epidemiologic investigation.
- **November 16** — A 94-year-old woman residing in Oxford, Connecticut, was hospitalized with fever, cough, and weakness. She died on November 19. Her diagnosis was confirmed as *B. anthracis* on November 20 by the Connecticut Department of Public Health Laboratory. Subsequent environmental and epidemiological testing indicated exposure from cross-contaminated letters.

Sources: Centers for Disease Control and Prevention. Update: Investigation of Bioterrorism-Related Inhalational Anthrax — Connecticut, 2001, *Morbidity and Mortality Weekly Report* 11/30/01: 50(47):1049–1054. And, "Anthrax 2001: Observations on the Medical and Public Health Response" Elin Gursky, Thomas V. Inglesby, and Tara O'Toole

Biosecurity and Bioterrorism. Volume 1, Number 2, 2003. © Mary Ann Liebert, Inc. Reprinted with permission. (http://www.upmc-biosecurity.org/website/resources/publications/2003_orig-articles/2003-06-15-anthrax2001observations.html)

Summary of the Investigation into the Anthrax Attacks

In September and October 2001, at least five envelopes containing *Bacillus anthracis* (anthrax) were mailed to Senators Patrick Leahy and Thomas Daschle and to members of the media in New York City and Boca Raton, Florida. The specific strain which infected individuals was known as Ames – it was isolated in Texas in 1981 and transferred to the United States Army Medical Research Institute of Infectious Diseases (USAMRIID). No other natural outbreak of Ames has ever been recorded.

After the bioterrorist attacks were identified, the Federal Bureau of Investigation (FBI) and the United States Postal Inspection Service (USPIS) formed a task force to investigate the crime. The investigation lasted seven years and was undertaken by FBI field offices in Miami, New York, Newark, New Haven, Baltimore and Washington, D.C. At the beginning of the investigation, the limitations on scientific analysis prevented the task force from finding the culprit because it was impossible to determine precisely which spores the anthrax came from.

Early investigative efforts focused on genetically classifying the spores and tracking the envelopes used in the attack. However, it was slow going because the laboratory tests required to analyze the spores had to be created and subsequently validated. Furthermore any traditional forensic protocol for examining evidence was difficult since the letters were contaminated.

While the tests were being developed, validated and implemented, the FBI created likely profiles of the offender(s), which included scientific ability, access to the Ames strain, proximity to where the letters were mailed, any suspicious behavior, public tips and motive.

At first, Dr. Steven J. Hatfill became a person of interest because people came forward who suspected that he might be involved. Dr. Hatfill worked for USAMRIID from 1997-1999 and had unrestricted access to the Ames strain. In 2001, Dr. Hatfill had filled multiple prescriptions for Cipro, the only U.S. Food and Drug Administration (FDA) approved drug to treat anthrax. In addition, he was well versed in the intricacies for dispersing anthrax via mail. However, the Cipro was also consistent with treatment of an infection Dr. Hatfill had at the time and knowledge of anthrax dissemination was commonplace among those in the bio-defense community of which Dr. Hatfill was a member.

In 2007, after scientific spore analysis was developed specifically for the case, it was established that RMR-1029 was the parent material to the anthrax used in the attacks. This exculpated Dr.

TIMELINE OF THE ANTHRAX ATTACKS

9/17-9/18/01
Letters to New York Post and Brokaw mailed sometime between 5 p.m. on 9/17 and noon the following day.

9/18/01
Letters to New York Post and Brokaw postmarked in Trenton, NJ.

10/3/01
Robert Stevens (AMI employee in Boca Raton, FL) diagnosed with pneumonia; rod-shaped bacteria consistent with anthrax noted in medical report.

10/4/01
Announcement made that Stevens had contracted anthrax.

10/5/01
Stevens died from inhalational anthrax in Boca Raton, FL.

10/6-9/01
Letters to Senators Daschle and Leahy mailed sometime between 3 p.m. on 10/6 and noon three days later.

10/9/01
Letters to Senators Daschle and Leahy postmarked in Trenton, NJ.

Hatfill as he never had access to the bio-containment suites at USAMRIID that held RMR-1029, meaning he never could have obtained the specific spore batch used in the anthrax attacks. Eventually the FBI settled with Dr. Hatfill for $4.6 million.

This discovery helped narrow the search to those who were at the USAMRIID lab where RMR-1029 was stored between September 11 and 18, 2001 and October 1 and 8, 2001. Interviews, polygraphs, laboratory notebooks and records analysis, home and computer searches, and other investigative efforts established Dr. Bruce E. Ivins, who worked at the USAMRIID, as a person of interest.

According to the FBI report, Dr. Ivins was alone in the lab late at night and on the weekends immediately preceding when the letters were mailed. He had never before exhibited this work pattern, never did so after the attacks and was unable to give a legitimate explanation for why he kept those hours. Also, as the investigation continued, the investigators found that Dr. Ivins suffered from psychological problems.

The investigation was undertaken in a covert manner until the fall of 2007. At that point, agents obtained search warrants for his home, cars and office. On November 1, 2007, the FBI searched his property and found 20 years of letters Dr. Ivins had sent to Congress and the news media, three handguns, two stun guns, a taser and other suspicious items.

On July 12, 2008, Dr. Ivins' home was again searched because he had made threats in a group therapy session. They found a bullet-proof vest, a homemade reinforced body armor plate, hundreds of rounds of ammunition and handgun powder. In addition, the investigation



Photo courtesy of CDC

noted that Dr. Ivins had boasted about his ability to create highly pure batches of anthrax.

The investigation concluded that Dr. Ivins had the opportunity, motive (based on e-mails and statements to friends), mental health problems, proximity to where the letters were mailed, a similarity in language to the letters, consciousness of guilt (he decontaminated his office and failed to report it), an inability to explain his behavior when confronted with evidence, and obsessive behavior. During the investigation, it was found that, dating back 40 years, Dr. Ivins had been obsessed with the Kappa Kappa Gamma (KKG) sorority. Many times, he would drive several hours to visit various sorority chapters. The letters were all mailed outside of an office building that housed a KKG sorority.

In the summer of 2008, authorities began to seek an indictment charging Dr. Ivins with the use of a Weapon of Mass Destruction. Before he was charged, Dr. Ivins committed suicide. The investigation concluded by confirming that Dr. Ivins was the guilty party.

- **10/12/01** Letter to Brokaw recovered by FBI.
- **10/15/01** Letter to Senator Daschle opened in Hart Senate Office Building.
- **10/19/01** Letter to New York Post discovered and recovered.
- **10/21/01** Thomas Morris died (Brentwood Postal Facility employee in Washington, D.C.).
- **10/22/01** Joseph Curseen, Jr. died (Brentwood Postal Facility employee in Washington, D.C.).
- **10/31/01** Kathy Nguyen died (New York City, NY).
- **11/16/01** Letter to Senator Leahy discovered and recovered.
- **11/21/01** Ottilie Lundgren died in Connecticut (believed to be the result of cross-contaminated mail).

Source: DOJ Paper (http://www.justice.gov/amerithrax/docs/amx-investigative-summary.pdf): Amerithrax investigative Summary, released pursuant to the Freedom of Information

At least 22 victims contracted anthrax, with five people dying from the infection. In addition, 31 people tested positive for exposure to anthrax spores and 10,000 more people were deemed at risk from possible exposure.

In all, 35 post offices and mailrooms were contaminated along with seven buildings on Capitol Hill in Washington, D.C.

The investigation included over 600,000 investigator hours, 10,000 witness interviews, 80 searches and over 6,000 pieces of evidence. In addition, there were 5,750 federal grand jury subpoenas issued and 5,730 environmental samples collected from over 60 sites. The investigation cost $100 million.

Nevertheless, the investigation never produced real forensic evidence that proved how Dr. Ivins made the spores and weaponized them.

While Dr. Ivins had access to RMR 1029, some co-workers said that others at the facility or potentially even outside visitors could have had access to the stock.

In July, 2011, Justice Department lawyers filed court papers that said Dr. Ivins lacked access to the equipment required to actually produce weaponized powder.

Justice Department civil lawyers wrote in a July 15 filing that "the sealed area in Bruce Ivins' lab did not contain the equipment needed to turn liquid anthrax into the refined powder that floated through congressional buildings and post offices in the fall of 2001."

However, just four days later, Justice Department lawyers revised the filing to say Dr. Ivins merely lacked access in his specific lab to the required equipment, noting that the filing should have said, "while the Army lab did not have a lyophilizer, a freeze-drying machine, in the space where Dr. Ivins usually worked, there was a lyophilizer and other equipment in the building that he could have used to dry the anthrax into powder," according to the *New York Times* in a July 19 story.

In its revision, the Justice Department contends the original filing was mistaken and Dr. Ivins had access to the equipment at the facility.

According to Justice Department Spokesman Dean Boyd, as noted in a ProPublica story on July 20, the government has "never wavered from the view that Dr. Ivins mailed the anthrax letters."

Sources:

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- Justice Department Court Filing: https://www.documentcloud.org/documents/217092-doc-154-1.html

Public Health Response to Terrorism and Bioterrorism: Inventing the Wheel

By Dan Hanfling, MD, Special Advisor on Emergency Preparedness and Disaster Response to the Inova Health System; Board Certified Emergency Physician

On the cloudless, blue sky morning of September 11, 2001, I was driving to Chantilly, VA to the National Reconnaissance Office (NRO) to give a presentation to their facility leadership on steps to take to protect workers in the event of a terrorist attack. Drawing upon some of my experiences as a medical team manager for the Fairfax County, Virginia Urban Search and Rescue team, my intent was to focus on some of the simple steps everyone can take to better prepare themselves to respond to a disaster.

It was a beautiful day. Later, I was going to meet my wife at her office at the National Academy of Sciences (right across the street from U.S. Department of State) for lunch. When I got to the NRO at 9:30 am, less than an hour after the attacks began, the gates to the facility were closed and there was a guard standing out front with the biggest machine gun I had ever seen.

He lifted it towards my car. The guard was quite adamant about me turning my vehicle around. I kept asking him why and finally he shouted "because the U.S. is under attack." I thought I was in a movie.

I pulled my car over, turned off the Grateful Dead and dialed in the radio to WTOP. I also picked up my pager, which was flashing from a dozen missed pages, and heard the first reports of an attack on the Pentagon. Immediately, I made a beeline back to the hospital, knowing I would have to oversee implementation of the hospital emergency operations plan, and thinking I might be activated for search and rescue. This was the first and only time in the three years I had served as the operational medical director of Fairfax County Fire and Rescue Department that I put the "Kojak" light on top of my car. On the way, I spoke with hospital officials to activate the disaster plan.

As I continued my drive towards the Inova Fairfax Hospital with the news on, I heard the report of a bomb at the State Department. It was surreal, it seemed there was chaos everywhere and everyone was in danger. My immediate thought was — that's exactly where my wife parks her car, directly across the street from the front entrance of State. While I was scared for her safety, and I thought about our little kids in school, I knew there was little I could do about what I had just heard. So I focused on the task at hand. Around noontime I was picked up by a first responder and hurriedly driven down to the fire station where the search and rescue team was assembling. Soon thereafter, we were at the Pentagon and our team members were making entry into a building that was on fire and had already collapsed.



Photo courtesy of CDC

Over the course of the next couple of hours, it became clear that it was going to be a recovery mission…that there wouldn't be any more survivors. The hardest phone call I ever had to make was to the hospital telling them to stand down the emergency response. I know it was an incredibly hard call to receive.

I didn't learn until later that afternoon that there hadn't been a bomb at the State Department. There had been a kitchen fire that morning which prompted a fire department response, and the mistaken news report regarding an explosion. I was also able to make a quick call to my wife, who told me she needed two hours to complete what is normally a 20 minute commute home. It was a great relief to know she was safe.

Over the next few days, we stabilized the Pentagon and shored-up the many support columns that had been wiped out. We worked inside an unbelievably dangerous tangle of debris, metal, fire, smoke and water — it was like Dante's Inferno. But we made important discoveries. We found the black box and located information on some of the hijackers. We also recovered a number of bodies, helping to bring closure to many families whose lives were tragically upended on that September morning.

I felt incredibly fortunate to have the ability to contribute at a time of utter helplessness. It was important for me to be there and to be able to do something.

On October 2, 2001, Robert L. Stevens was admitted to a hospital in Palm Beach County, Florida after a camping trip to North Carolina. Two days later, he was diagnosed with inhalational anthrax. Shortly thereafter, Health and Human Services Secretary Tommy Thompson said it was an isolated case that he probably contracted while on a camping trip.

I was seeing patients in the emergency department at Inova Fairfax when Secretary Thompson's news conference was broadcast live on CNN. At the time, I didn't think this sounded right. When I finished my shift, I put together a one-page primer on anthrax detailing what it is, how it presents clinically, what the initial treatments would be, and what it might look like on a chest x-ray and CT scan. I faxed it to all of the hospitals within the Inova Health System and also to my colleagues at the fire department. I wasn't taking any chances.

On October 15, a letter containing anthrax was opened in the office of Senator Tom Daschle, located in the Hart Senate Office Building. A few days later, on October 19, the first of what would become hundreds of patients with concerns of anthrax exposure came to our emergency department seeking care. The patient's chief complaint was that he thought he might have been exposed to anthrax.

The Emergency Department physician on duty that evening, Dr. Cecile Murphy, did what all great clinicians do — she listened to the patient. When he diagnosed himself with anthrax, he did so because he knew his body and something didn't feel right — his chest felt strange. So Dr. Murphy asked typical questions like "where do you work?".

The patient said he delivered mail from the Brentwood postal facility. At that time, Brentwood had no special meaning to anyone. Still, Dr. Murphy asked where the bulk of the mail eventually ended up. The patient answered that most of it goes to the Senate. In hindsight it seems pretty apparent what was going on.

However, at that point in time, the Centers for Disease Control and Prevention (CDC) was very clear that unless you were in the Hart Senate Office Building, SE Wing, 5th or 6th floor, between the hours of 9:00 am and 7:00 pm on October 15, you had nothing to worry about.

The good news is that most patients don't read textbooks and many doctors don't read CDC alerts. What we knew of anthrax, we heard on WTOP. Thankfully, our doctors also convinced us that we couldn't believe everything published in the Morbidity and Mortality Weekly Report because, based on what CDC had provided as guidance, our patients wouldn't have been in the high risk group.

So Dr. Murphy pursued the case further. She did an x-ray which just didn't look right, and then followed that up with a chest CT Scan that was demonstrable for the telltale sign of inhalational anthrax — a widened mediastinum. Sure enough, it was clear as day that the patient was suffering from inhalation anthrax.

The first call Dr. Murphy made was to the D.C. Department of Health, because she was watching the news and knew D.C. was dealing with this.

At the time, there was limited guidance on the management of a bioterrorist attack. Treatment protocols for anthrax were tucked away in journal articles sitting in the hospital library. And no effective means for managing the multitudinous information that was beginning to ripple across the healthcare community was in place.

Later that same night, another of our emergency department physicians, Dr. Denis Pauze, took care of another postal worker from Brentwood. He came in because he had the worst headache of his life — which, in the ER, triggers an automatic workup for a leaking aneurysm. He had a normal Head CT scan and a normal spinal tap. Still, he didn't look right, so Dr. Pauze did a chest X-ray which was borderline abnormal. He followed this up with a chest CT

scan, given that the patient told him he was a postal worker from Brentwood (and, by that time, the words 'anthrax' and 'Brentwood' were echoing throughout our large, suburban emergency department like a rifle volley on a firing range). The scan was abnormal, just like the previous case, and all of a sudden, Inova Fairfax had two diagnosed cases of inhalation anthrax sitting in our emergency department. In short, we were inventing the wheel. This wasn't reinventing the wheel, because virtually no clinicians in the United States had faced this before.

We realized there was no cavalry coming to sort things out, and that we would have to manage most of this ourselves. Part of what contributed to the difficulty in coordinating our efforts was due to what we sometimes call the 'Potomac Ocean' effect — even though the three surviving cases were in Northern Virginia (we helped contribute to the diagnosis of the third case of inhalational anthrax in a postal worker from the Federal mail facility in Sterling, VA), all the media attention was essentially focused on D.C. Indeed, even the 9/11 attacks took place in northern Virginia, not D.C.

We created our own treatment protocols and put together an ad-hoc communication information management system that reached all Northern Virginia hospitals. It was very important that we coordinate these emerging protocols with our public health colleagues in the Fairfax County Health Department. Late nights on the phone with Dr. Carol Sharrett and Dr. Gloria Addo-Ayensu produced templates for screening patients, offering prophylaxis countermeasures, and suggesting basic risk communication statements for our regional hospitals to use. We did this under the joint imprimatur of Fairfax County and Inova Health System. And like many in the region, we participated in the gazillion conference calls held to discuss and share information about the emerging and rapidly evolving event, and passed this information along to the rest of the hospitals in our region.

We made clinical decisions on the management of the anthrax cases by committee and involved infectious disease and intensive care doctors. While I helped to contribute to a number of these early discussions, I turned my attention to creating the systems needed to manage the ongoing bioresponse event — essentially to invent the wheel. Along with colleagues in emergency medicine from across northern Virginia, we created the Northern Virginia Emergency Response Coalition (NVERC), one of the first healthcare coalitions in the country, and the



Photo courtesy of CDC

model for much of what HHS/ASPR has encouraged in the years since these awful attacks. In October 2002, the NVERC was formally re-established as the Northern Virginia Hospital Alliance, governed by the CEOs of the northern Virginia hospitals who comprise its Board of Directors. In the 10 years since the attacks, this group has never failed to have a quorum of participants, which demonstrates the absolute commitment to emergency preparedness by the healthcare system leadership in our community.

We have evolved these efforts into a much stronger community of emergency responders in the decade since the attacks, coordinating closely with, not only our public health colleagues, but those in public safety and emergency management.

September and October 2001 was a frenzied and chaotic time in the history of our country. These successive attacks stretched thin all aspects of the public health system.

As an emergency physician who was deep in the trenches in the fall of 2001, I can tell you that the entire public health community was dealing with a world that was turned upside down. It was clear to me that emergency physicians and nurses were now on the frontlines of the public health response in this new age of catastrophe, terror and fear.

In short, emergency physicians and nurses have become the operational lynchpin of our new focus on public health emergency preparedness. While the emergency department has long comprised a significant portion of the public health safety net, providing equal access to all who seek care, we now find ourselves in the added role of community protector. And it doesn't stop at the emergency room threshold. In fact, hospital staff have become the 'new first responders' or what has now been termed 'first receivers.' We are all essential personnel in the continued struggle to keep our communities safe and healthy.

No News Wasn't Good News

By Jack Herrmann, MSEd, NCC, LMHC, Senior Advisor, Public Health Preparedness, National Association of County and City Health Officials (NACCHO)

It is hard to believe that 10 years have gone by since September 11, 2001. In my memory, it feels like yesterday because I can recall the events vividly. That day and the work I did in the days, weeks and months afterward shaped my life in many ways.

When you think about public health and responses to natural or manmade tragedies, you think about the physical destruction these events leave on communities. However, the mental health impact from disasters is also incredibly important to consider. I began my disaster relief response work in 1993 with the American Red Cross and was deployed to my first large scale disaster in 1994, the Northridge, CA earthquake. I had seven years of disaster response under my belt before 9/11 and knew firsthand the importance of an integrated behavioral health response.

What I wasn't ready for was how the events of September 11th would transform my own understanding of terrorism as well as those of most everyone in our country.

At the time of the attacks, I was the New York State Disaster Mental Health Volunteer Lead for the Red Cross and in that leadership role responsible for working with Red Cross chapters across the state recruiting and training disaster mental health responders. At the moment the first tower was struck, I was in an aviation disaster exercise planning meeting with city and airport emergency management officials at the Greater Rochester International Airport in upstate New York. As we watched news footage of the events, the second plane struck the World Trade Center towers. I immediately called the NY State Red Cross Disaster Lead and received instructions to deploy to New York City. I rented a van, went to the local Red Cross chapter to gather supplies, packed a few personal items and began my drive downstate.

Ultimately, I fell into a caravan of state officials and other responders who were deployed to the city as well. Normally a trip that would take five hours was accomplished in three. Having to stop mid-way through my drive, I was separated from the caravan. A short time later I continued my trip and eventually had the city in sight. I was struck by the absence of two of New York City's most well known landmarks replaced by a landscape of billowing gray-black smoke. I approached the Holland tunnel on the New Jersey side, which was secured by the National Guard. After verifying my identification and seeing I was with the Red Cross, they allowed my van through — it was a surreal moment being the only person in the tunnel, a transportation landmark that typically sees thousands of cars traveling through it each day.

As I emerged out of the tunnel into lower Manhattan I made my way up the westside to the New York City Chapter of the Red Cross. Crawling my way up, I was driving over fire hoses and the debris from the fallen towers. At one point I passed close enough to see the rubble from the buildings and the continuing fire and smoke. At that moment I thought to myself: "what could I possibly do, as one volunteer, in response to this massive event?"

The thought wasn't with me for long as I was determined to do what I was trained to do. I needed to get to the Red Cross chapter and begin to coordinate our disaster mental health response. I arrived at the Chapter and was struck by the thousands of people standing in line. Many of them were waiting to donate blood, make a monetary donation, or lend their hand to the response. I entered the Chapter, found the Emergency Services leader, and was briefed on what had transpired and their initial response plan. Throughout the rest of that day and into the first night I provided psychological support to Red Cross personnel that responded immediately to the scene after the first plane struck the tower, many of whom found themselves running for their lives when the buildings began to collapse. I also worked with the staff to coordinate the recruitment and selection of volunteers that would ultimately provide psychological support to victims and their families in the days and weeks to come.

At 4:00 a.m. on September 12, I and my Red Cross colleagues were called to a meeting with representatives from the New York City Mayor's office to review the plan for opening a Family Assistance Center later that morning. This Cen-

ter would be the first stop for many that were in search of the whereabouts of their family and friends who had still not returned home after the buildings collapsed.

Initially the plan was to stand up the Assistance Center at New York University Medical Center, but the proposed auditorium could realistically only accommodate 350 people. We knew this would be grossly insufficient — as we were expecting thousands of people in a matter of hours.

It was announced that the center would open at 8:00 a.m., and by 6:00 a.m. there were thousands of people in line. We filled the first few hundred seats and began our work. Families were led to rooms to meet with representatives of the New York City Police Department and Medical Examiner's Office. Many were unprepared for the extensive and at times traumatic questions that would be asked of them. For this reason we also made sure we had mental health and spiritual care volunteers available to support these families through this process. We also posted these professionals outside to walk up and down the line of those waiting to enter the Center.

Because of the volume of people arriving to the center, we quickly ran out of space and later that day needed to relocate to another site. By the second day, those who had loved ones in the World Trade Center Towers likely already had their loved ones safely at home with them or knew of their whereabouts. Those that continued to show up at the center were not so fortunate and as the days progressed the pervading sentiment was "no news wasn't good news."

Over the ensuing five days, we moved the Family Assistance Center three times before settling into its permanent location at Pier 94 located on Manhattan's westside and the Hudson River.

The two weeks of my deployment and the subsequent year that I spent traveling back and forth from my home in Rochester to New York City, left an indelible mark on me. While my initial role was to coordinate the mental health response to this tragic event and provide emotional support to Red Cross volunteers and the families of those who died in the towers, my subsequent role was to work with City and Red Cross officials to plan for how to address the short and long-term psychological aftermath of this catastrophic incident.

The psychological impact I knew was big not only for those directly involved, but for people like myself that were called to respond. I had



Photo courtesy of CDC

been involved with disaster work before, but I never fully appreciated the emotional impact that disasters, such as acts of terrorism can have, even on the most experienced disaster response professionals. This was a real awakening of my own vulnerabilities.

Professionally, it became clear how important it is to prepare and train individuals to work in a disaster environment. Frankly, one of the most challenging situations of managing the response to 9/11 was managing the staff, their frustrations and grief, and their expectations for what role they would play in this response. In addition, there were thousands of mental health professionals that wanted to help. While many were well- intentioned, few were truly prepared for the roles they would take on as a volunteer.

These were unprecedented times that, in many ways, many of us still find ourselves recovering from. On this, the 10 year anniversary, it has left us reflecting on where we were at the time, what contribution we made to helping those directly impacted by this tragic event, and wondering what would happen if something similar happened again. For those of us who are disaster response leaders, it reinforces the importance of building a robust and prepared nation — recruiting, training and sustaining a workforce, both volunteer and paid, that has the capability to be at the right place, doing the right things, at the right time.



Questions/Answers: 2001 Anthrax Attacks

Anthony S. Fauci, M.D., Director, NIAID/NIH

Looking back after ten years, what stands out to you most about the 2001 anthrax attacks?

What stands out most to me about the 2001 anthrax attacks is the notion that from that point on, bioterror was a reality and no longer an abstract concept. Although discussions had been under way among public health officials in preparation for such an event, and our National Institute of Allergy and Infectious Diseases (NIAID) had a limited research portfolio in the area, the attacks really were a wake-up call.

Looking back, I am also struck by the uncertainty we all felt at the time.

Today, we know and can dispassionately describe exactly what happened. We know that of the people potentially exposed to anthrax in 2001, 22 people were infected, five of whom died. We know now that the attacks were unlikely a concerted effort by a group or organization intended to broadly affect our society and large numbers of people. We know that the attacks likely stemmed from the actions of a single individual who was probably mentally unstable. Today we know the anthrax attacks had a relatively limited and short-lived impact in terms of morbidity and mortality.

However, at the time the entire event was surrounded by uncertainty. No one had any idea who perpetrated the anthrax attacks or what the extent of their impact would be. With the timing of the anthrax attacks coming only weeks after 9/11, the uncertainty was accompanied by a gripping fear of what might happen next. People worried as they rode the Metro or shopped for their groceries that something unknown and unexpected would happen again, and that they and their families were at risk.

How would you characterize the overall response to the attacks? What were the biggest challenges you faced?

I had a dual perspective as a scientist and science administrator and as a government spokesperson. As a scientist and science administrator, I headed the effort at NIH to fund and conduct biomedical research to develop countermeasures to protect people against a range of potential agents of bioterrorism. In addition, I served as one of the primary spokespersons for the Federal government, which involved providing the public with information about what we knew and did not know as the situation unfolded day by day. As a spokesperson, it was important for me to provide information in a way that would help calm public fears.



Photo courtesy of CDC

The overall response from a biomedical countermeasures standpoint was good, though not perfect, especially given the fact that this was new ground for us. The situation had been discussed and planned to an extent, but never tested.

I would describe the overall response as a "leaping into action" on the part of scientists and public health officials. We quickly brought together leading scientific experts and developed two important paths forward: the NIAID Strategic Plan for Biodefense Research and the NIAID Biodefense Research Agenda for CDC Category A Agents, a document that describes the Institute's accelerated research plan for the most threatening bioterrorism agents. These were developed within five months after the anthrax attacks — and have since been used as a starting point for updates and progress reports for the future.

We asked the important questions in ways that I think were calm, measured, and scientific: Are there enough antibiotics? If not, why not, and how do we procure more? Where do we stand with regard to vaccines? Should we scale-up existing countermeasures? Do we need new countermeasures? Are there countermeasures on the horizon that will help us

achieve our goals or not? How do we develop new countermeasures? What are the readily available options, and what is missing?

Without a doubt, the biggest challenge we faced was to separate the science from the hysteria. We had to ensure that our focus remained on rational planning and on determining the most appropriate, scientifically based actions at the time.

What are you most proud of about the anthrax response?

One of the things I am most proud of is the fact that we were able to put the situation into perspective and maintain our focus on the scientific and public health issues that we were confronting. We understood at the time that anthrax would not be the end of the story — that preparedness and development of biomedical countermeasures should not stop with anthrax. The response to the anthrax attacks morphed into a much broader effort that encompassed not only preparedness for anthrax and other potential deliberate biothreats, but also for naturally emerging and re-emerging infectious diseases that threaten both public health and national security.

In this regard, we decided to build basic and translational science capacity, and the intellectual and physical infrastructures to develop biomedical countermeasures in response to a broad range of deliberate and naturally occurring emerging and re-emerging infectious diseases. We were able to convince government officials that even though we need to address individual agents, nature is the worst bioterrorist. Through the anthrax response, we built both a physical and an intellectual infrastructure that can be used to respond to a broad range of emerging health threats.

The result is that today we are in a much better position — from the perspective of both the research pipeline and public health preparedness — than we would have been had we addressed anthrax alone. Our improved ability to respond to emerging health threats was reflected in subsequent years as we addressed SARS, the threat of H5N1 influenza, and the 2009 H1N1 influenza pandemic.

What would you like to have been in place at the time that would have improved the response?

At the time, I would have liked to have had biotechnology and pharmaceutical companies experienced in infectious disease countermeasures research, development, and production already invested in responding to unexpected public health threats — rather than having to build that investment from scratch. Before the anthrax attacks, industry was reluctant to develop biomedical countermeasures for an unpredictable market.

What were the biggest challenges or gaps at the time? How have those changed or been addressed during the past decade?

Major gaps existed in at least two areas.

First, there were major gaps in the science. There were fundamental gaps in basic research as well as in applied science with regard to vaccines, diagnostics, and therapeutics to respond to unexpected infectious disease emergencies.

Second, we did not have a clear public health response system in place for handling unexpected public health emergencies. Before, we were completely dependent upon pharmaceutical companies, which based their strategies on products for which there were predictable markets. The challenge was getting industry to invest in biomedical countermeasures for public health threats with unpredictable timelines.

Since the anthrax attacks, we have made substantial and wise investments to address these gaps. Selected examples include:

- The NIAID National Biocontainment Laboratories (NBLs) and Regional Biocontainment Laboratories (RBLs) provide high-level biocontainment facilities for research on biodefense and emerging infectious diseases. The biosafety labs also are available in the event of a bioterrorism or infectious disease emergency to assist national, state, and local public health efforts.
- The NIAID Regional Centers of Excellence (RCE) for Biodefense and Emerging Infectious Diseases supports research focused on countering threats from bioterror agents and naturally emerging infectious diseases. Each Center is comprised of a consortium of universities and research institutions serving a specific geographical region.
- The Biomedical Advanced Research and Development Authority (BARDA), within the HHS Office of the Assistant Secretary for Preparedness and Response, helps address the need for chemical, biological, radiological



Photo courtesy of CDC

and nuclear (CBRN) countermeasures by assisting the development and purchase of vaccines, therapeutics, and diagnostics for public health emergencies.

- Project BioShield, managed by BARDA, helps enable procurement and advanced development of medical countermeasures for CBRN agents, as well as for pandemic influenza and other emerging infectious diseases. BARDA also manages the Public Health Emergency Medical Countermeasures Enterprise (PHEMCE).
- The NIAID Concept Acceleration Program (CAP) enables coordination of teams of scientific, medical and product development experts to guide investigators working on multi-use medical products for biodefense, drug resistance and emerging diseases with the goal of nurturing promising concepts that might otherwise not be pursued.

If there were another anthrax attack today, how would the response be different from 2001?

Things are very different today. Without question, if there were another anthrax attack today, our response would be significantly more coordinated. Today we have the Office of the Assistant Secretary for Preparedness and Response (ASPR), a major component of HHS. The title of this office reflects something we did not have before, a "preparedness and response" focus. Now we have a coordinated multi-agency effort that is plugged into the intelligence community, the Department of Homeland Security and, importantly, the scientific community. To underscore this point, the 2009 influenza pandemic demonstrated a substantially more coordinated public health response than we experienced after the anthrax attacks.

What are the biggest threats and challenges to bioterrorism preparedness today?

The biggest threat to bioterrorism preparedness today is complacency. If a health threat does not happen, be it naturally occurring or deliberate, we tend to make it a lower priority. The worst thing we can do is to make something a priority after it happens. After it happens is too late; you are playing catch-up. Preparedness for a threat must be a priority before it happens.

Questions/Answers: 2001 Anthrax Attacks

Senator Tom Daschle, Former U.S. Senator from South Dakota and Former U.S. Senate Majority Leader

What do you remember most about the initial response to the anthrax attacks, both nationally and from your office?

I vividly remember the first report provided to me by my Chief of Staff, Pete Rouse, and my grave concern for each of the affected staff.

I remember the agony of calling parents, spouses and families of the exposed staff to inform them of what had happened and to share what little I knew about how we would address the situation.

I also recall the somewhat chaotic environment involving the Centers for Disease Control and Prevention (CDC) and other agencies of government who had limited capacity to respond to the attack and little information about next steps.

Finally, I remember the media frenzy when President Bush made reference to the incident shortly after I informed him of the circumstances.

Fully detailing this experience is hard. I did write a book, *Like No Other Time,* that includes more information.

You and your staff were among those most affected by the attacks. Talk about your own experience. As it unfolded, what do you remember thinking, and feeling?

As noted in my book, my greatest concern was the health and safety of my staff and the others who were exposed.

We knew so little about treatment for exposure to anthrax and there were differing points of view on the appropriate antidote.

As the Democratic Leader in the Senate, I was also concerned that a plan of action be developed quickly that would include an investigation to find those responsible, a plan for evacuation of the Senate office building, cleanup and an ongoing means to share information and progress with all interested parties.



Photo courtesy of CDC

What do you think of the investigation into the attacks? In your mind, what questions remain unanswered?

Unfortunately, the investigation has been a very arduous, frustrating and controversial experience. With both early and ongoing fits and starts, it is accurate to acknowledge that the confidence level relating to assertions by the Federal Bureau of Investigation (FBI) that the case has now been successfully closed is much lower than it should be.

I am reasonably satisfied that the FBI's conclusion is the correct one, but I must also recognize the legitimate concerns and questions posed by many skeptics since the case was officially closed. Was this attack the work of a lone scientist? If so, what was his motivation? Have we done everything within our means to prevent another attack in the future?

What role should Congress play in preparing for bioterrorist attacks? What role should it play in investigating such attacks?

Congress must be a full partner with the Executive branch in every aspect of preparing for bioterrorist attacks including policy, funding, information and coordination. Its primary role in the investigations of such attacks should be aggressive oversight.

What are the most crucial factors to ensure that our country is prepared for a biological emergency?

It is imperative that Congress do four things in the aftermath of this experience. First, it must ensure that the policies of the United States reflect a high priority in both the prevention of and defense from bioterrorism threats. Second, it is essential that the Congress provide all of the necessary funding for research and development of appropriate counter-bioterrorism measures. Third, Congress should readily acknowledge that cooperation in developing appropriate strategies with other governments both within the United States and internationally is critically important. Finally, far more work on public information and education is critically important.

In the 10 years since the attacks, how has America's ability to respond changed? Are we more prepared to face a similar attack? How do we remain vulnerable?

America deserves mixed reviews in the aftermath of the attacks. We have spent trillions of dollars in two wars and the creation of new infrastructures in national intelligence, defense and the Department of Homeland Security. We have alienated a large percentage of the Muslim population and we have committed inexcusable acts in violation of even the most basic respect for human rights.

That said, over the past decade, we have improved our safety and security because of the new infrastructure and certain, established policies. We have successfully prevented a number of potential attacks and saved thousands of lives.

What bioterrorism threats are you most concerned about today? Is this threat being properly addressed on a national and state level?

While I don't have one particular threat that concerns me more than others, I am concerned about the ubiquity of the threat and our lack of ability to anticipate where and when an attack may occur.

Water and transportation systems are particularly vulnerable to catastrophic levels of harm. Our capacity to anticipate, prevent and respond to these potential threats is still not adequate.



Anthrax, Risk Communication and Crisis Leadership

By Howard K. Koh, M.D., M.P.H., U.S. Assistant Secretary for Health, U.S. Department of Health and Human Services, Massachusetts Commissioner of Public Health, Commonwealth of Massachusetts (1997-2003)

Until the fall of 2001, I had devoted four years immersed in the demands of a state health commissioner: heading the Massachusetts Department of Public Health (M.D.PH) and overseeing a wide range of health services, four hospitals, and a staff of 3,000 professionals. The work was intense, broad and traditional. Then came 9/11.

As a member of the National Cancer Institute (NCI) Advisory Board, I was in the greater Washington, D.C. area that morning listening to NCI Director Richard Klausner deliver his resignation speech. Halfway through his remarks, an aide interrupted him and whispered some information — after which, he abruptly announced that two planes had just hit the World Trade Center and that the meeting was adjourned. In fact, a third plane had also just struck the Pentagon, only several miles away. And unbeknownst to me, of the total of four planes involved in the attacks, two had departed Boston's Logan Airport that morning, as I had.

Immediately, the entire country was dazed and reeling. Then, to our utter disbelief, October 5 began the next chapter of national suffering marked by the first death from inhalational anthrax. The cases started in Florida but over a matter of weeks snaked up the East Coast to northern Connecticut, just a few miles from our state borders. It seemed unthinkable and inconceivable that bioterrorism could completely engulf our public health agenda. But this unwelcome intruder disrupted the nation for the rest of the Fall, leaving our daily lives in tumult.

The following weeks were a kaleidoscopic blur of briefings, conference calls, meetings, and press conferences. Our Massachusetts Governor immediately convened daily meetings with our state leaders, many of whom I had never previously met. In particular, I found myself connecting feverishly with officials from public safety, fire, police and even the postal service, many of whom became instant, if not unconventional, partners. As reliable information on both the national and state scenes was always elusive, we scrambled to gather accurate data through any conceivable source. For example, once, while driving to speak at a news conference, I heard New York Mayor Rudy Giuliani on the radio announcing yet another anthrax case in New York City. When I arrived, the first press question posed to me was about the specifics of that new case. There were many moments like that.

Our state laboratory officials, traditionally relegated to obscure work in underfunded and archaic facilities, were suddenly thrust into the media limelight. The laboratory was deluged with samples of white powder sent for anthrax testing. Here was a typical scenario: a jittery and unnerved town resident would discover "suspicious" white powder in his community. Immediate notification of the local police or fire department would trigger both the closing of the local post office and the sudden arrival of HAZMAT teams, bedecked in imposing space- suit paraphernalia. The teams would delicately handle the samples under the watchful eye of local media and news cameras. Then, those samples would be delivered to the M.D.PH state laboratory for analysis. A hastily-arranged press conference would feature harried state and local officials trying to explain the unfolding developments to an increasingly anxious public. And when testing in the laboratory subsequently yielded negative results for anthrax, that finding would prompt yet another round of news announcements as well. Multiply this situation by several thousand — and that was the Fall of 2001 in our state, and indeed, around the country.

As Commissioner, I was charged with leading M.D.PH through this time, interacting with other state officials, the press, health professionals, community groups, hospital leaders, advocates, among others. It soon became clear that my primary role was risk communicator- in-chief. The deluge of questions from the press and public alike seemed endless: What is anthrax? Why have we never heard of this before? How many people were infected? How many samples of white powder had been tested? How do I safely open my mail? Should I take antibi-



Photo courtesy of CDC

otics to protect myself? Is it fair that some people have access to medications while others do not? Would this situation get worse? What if terrorists use smallpox to kill people? Am I safe?

In the midst of this chaos, I understood that each interview had to focus on facts, not speculation. With each press interaction, I shared the information known and promised to share more as soon as it came available. It was important to acknowledge the anxiety without succumbing to it. It was also critical to project some sense of calm, setting an empathetic and compassionate tone. It was difficult to lack ready answers in this constant swirl of uncertainty. But I was honored to emphasize to any audience that thousands of public health professionals had stepped forward in this unprecedented time, working 24/7 on their behalf. In fact, the crisis represented a tremendous opportunity to underscore and reaffirm publicly the fundamental mission of public health: to protect people against threats — known and unknown — in a time of crisis. As a physician who has cared for patients for decades, I had had much experience delivering difficult news to anxious patients. But this situation stretched me beyond anything I had ever previously experienced. I had to leverage every possible skill as a physician, scientist and public official to uphold public trust. And across the country, I saw my other public health colleagues also giving it their all, trying to transform a moment of "no hope" to "new hope". I was proud of them — we all will forever share a bond.

When it was all over, the nation witnessed 22 anthrax cases and five deaths, none in Massachusetts; but the trauma left millions in its wake. For the remainder of my tenure as Commissioner, we dealt with the aftermath, dramatically realigning budgets to balance fragile public health programs with new preparedness demands. And when I assumed my new positions as Professor and Associate Dean at the Harvard School of Public Health, I also headed their Center for Public Health Preparedness. We focused on preparedness education and training, risk communication, integration of preparedness and prevention, building better information networks, and using drills and exercises to build a more prepared professional workforce. I brought many of those lessons with me in 2009 to the U.S. Department of Health and Human Services where I now serve as Assistant Secretary for Health.

Looking back at the first decade of the 21st century, our public health history now covers many crises previously viewed as unthinkable. In addition to 9/11 and anthrax, this remarkable litany of "low probability, high consequence" events now includes SARS (2003), Hurricane Katrina (2005), the H1N1 pandemic (2009) and the Gulf Coast oil spill (2010), among others. Through each of these episodes, as noted by Mitroff[1], we have been subjected to the predictable elements of crisis: invalidation of previous fundamental assumptions, the irrelevance of conventional thinking and conventional responses, rapid escalation of events, moral trial by compelling images in the media and tremendous technical and even ethical uncertainty. Since 9/11, our nation's ability to coordinate response has certainly grown dramatically. But the next challenge always seems to be just around the corner.

Each new crisis demands renewed leadership. As we seek to train the next generation, we must attract those who are willing and able to step forward and serve at all times and under any circumstance. They must be committed to trying to unify in times of need while acknowledging the unfamiliar and the ambiguous. They must create uncommon bonds among untraditional partners, and mobilize people to want to reach for higher aspirations. This requires not just intelligence and knowledge but also a sense of strategy, personal will and tremendous interpersonal skill. They must be willing to embrace the "public" part of public health, since we practice our craft on an open stage. In the final analysis, each crisis can represent an opportunity to create a renewed sense of community, reminding us yet again that we are all interconnected, all interdependent and we all have promises to keep.

Public Health Preparedness since 9/11

By, Nicole Lurie M.D., M.S.P.H., Assistant Secretary for Preparedness and Response (ASPR), U.S. Department of Health and Human Services

The tragic event of 9/11 and the subsequent anthrax attacks horrified the nation and the world and awakened us to the importance of health security as a shared public health homeland security priority. In the decade since these tragic events, public health preparedness has emerged not as a standalone discipline but rather as critical component of public health.

Almost immediately after these events there was an influx of funding to support preparedness for public health and medical infrastructure. Those funds have enhanced the preparedness of our nation to respond to public health and medical emergencies. Now, a decade later, it's useful to think about how far we have come.



Photo courtesy of CDC

In 2001, we weren't even sure what a prepared public health system looked like. But we knew there were big gaps. Many health departments did not even have the basics, like computers or access to the internet, and blast fax was considered a new technology. Similarly, numerous health departments lacked the ability to receive and respond to urgent case reports 24/7 or to use principles of risk communication to rapidly communicate with the public. The use of the Incident Command System was by and large a foreign, uncomfortable concept.

Looking back on the last decade, we have come a long way. Recent reports from both the Public Health Emergency Preparedness and the Hospital Preparedness programs document substantial progress, including enhanced surveillance and laboratory capacity, improved surveillance capability, and better hospital surge capacity. In fact, over 75% of hospitals participating in the Hospital Preparedness Program met 90% of pre-specified goals.

Moreover, the investments in preparedness have strengthened day-to-day public health systems. Numerous health departments now use the incident command system structure to investigate outbreaks, for example, and report that the investigations are faster and more complete. In recent tornados and floods, states have been able to handle medical needs, including hospital and nursing home evacuation, on their own, without federal assistance. Many state and local health departments report that planning and practicing for mass distribution of countermeasures made a major contribution to their ability to respond to the H1N1 pandemic, including through mass vaccination efforts.

Moreover, events since September 11 and the anthrax attacks have moved us from a focus on threat-specific preparedness efforts to the concept of all-hazards preparedness, and to the identification of, and focus on, a core set of capabilities needed for public health and health care system preparedness. The response and resilience at the community level demonstrated during recent natural disasters including the Mississippi floods in the Midwest and tornados in Alabama and Joplin, MO are testament to work that has been done at the federal, state, local and hospital level over the past decade.

Yet, we still have a ways to go, including in the development of medical countermeasures for chemical, biological, radiological, and nuclear threats. The Secretary's *Public Health Emergency*

Medical Countermeasures Enterprise Review, published last year, made a number of recommendations for strengthening the medical countermeasure enterprise, and these are now being implemented, with a long term goal of developing rapid, flexible, nimble countermeasure manufacturing capacity to respond to a novel threat, whether natural or man-made.

With tightening federal, state and local budgets, it's tempting to ask, 'are we there yet?' and to drastically cut or eliminate investments in preparedness. Maintaining and sustaining the capabilities of the people and systems involved in day-to-day public health and preparedness is a critical, continuing requirement for our nation's health security. While public health departments and hospitals have 'bought stuff' that lasts for a long time, some of it will need replacement. Staffs need continued training and practice, and there are ongoing needs to train new people as the normal turnover of personnel occurs. For me as a primary care doctor, I liken our investments in preparedness to caring for a patient with chronic diseases. There is an initial, substantial investment that has been made in the initial assessment and testing, but my patient's diabetes or hypertension is not cured after they take medicine for a month. It's usually medicine they need to take forever, and it is for them a 'new normal.' The same is true for preparedness; the threats will always be with us, and our need to become and stay prepared is our 'new normal.'

At the end of the day, preparedness will be built and maintained through strong, day-to-day systems in health care and public health. Conversely, the preparedness imperative has, and will continue to strengthen those systems.

My office, the Assistant Secretary for Preparedness and Response (ASPR) for the U.S. Department of Health and Human Services, is responsible for ensuring that the nation is prepared for, and can respond to and recover from public health emergencies. The National Health Security Strategy charts a course for doing just that. None of us wants to see another public health emergency happen. And while each event—a terrorist attack, a novel infectious disease outbreak, or a massive tornado—is thankfully rare, taken together, it's extremely likely that another emergency will happen. And we as a country need to be ready for whatever it is.



Photo courtesy of CDC

A Decade After Anthrax — A National Commitment to Leveraging Lessons Learned

By Luciana Borio, M.D.,Acting Director, Office of Counterterrorism and Emerging Threats and Assistant Commissioner for Counterterrorism Policy, Food and Drug Administration

When the anthrax attack happened in the fall of 2001, I was working at the Center for Civilian Biodefense Studies at the Johns Hopkins Bloomberg School of Public Health. It is fair to say that most public health professionals as well as governmental and other health-related organizations were taken completely by surprise. It was a time marked by considerable uncertainty with respect to the extent of the attack; the number of people who had been exposed; how best to prevent illness in those potentially exposed; how best to treat those who had become ill; and how to prevent additional exposures and illnesses.

My role in the response was primarily one of facilitating information sharing to foster more effective response activities. I, along with my colleagues, organized working groups and built informal networks to identify and share critical clinical information and, later, to disseminate lessons learned. We worked closely with U.S. government officials at the federal, state and local levels and with first responders in the medical and public health communities.

At the time it was very clear that we faced numerous challenges. There was no rapid test to help determine who needed prophylactic antibiotic treatment to prevent potential illness, there were limited supplies of antibiotics, and there was considerable uncertainty regarding how long prophylactic treatment was necessary to prevent illness. There also was a limited supply of anthrax vaccine and a lack of clarity on how best to use it in response to the attack. In addition, there was fear that subsequent attacks would ensue in rapid sequence, and we all knew that capacity at the state and local level to deliver medical countermeasures to large numbers of people was sorely inadequate.

Since the 2001 anthrax attack, preparedness has improved considerably. However much work remains to be done, and if an anthrax attack occurred today, the nation would still face many of the same challenges as in 2001. Although our nation's armamentarium of medical countermeasures to respond to an anthrax attack has been bolstered, there is still uncertainty regarding how clinicians would manage patients and how public health practitioners would manage the public health emergency. In the event of a large-scale attack, difficult decisions would have to be made on how best to use life-saving resources in a resource-constrained environment. In addition, the capacity to deliver medical countermeasures to large numbers of people and to surge medical care in a mass casualty event is still lacking in many areas.

Recognizing that our nation needs to continue to improve its capability to respond to bioterrorism and emerging infectious disease threats, this past year the President announced a new initiative to increase our capacity to respond faster and more effectively to these threats. As part of this initiative (outlined in the 2010 Public Health Emergency Medical Countermeasures Enterprise Review), the U.S. Food and Drug Administration (FDA) launched its Medical Countermeasures Initiative (MCMi) in August 2010.

I have the privilege to help lead this effort along with the dedicated professionals that I work with at FDA. The mission of the MCMi is to build on the substantive work under way at FDA to promote development of medical countermeasures by enhancing FDA's regulatory processes, fostering the establishment of clear regulatory pathways for medical countermeasures and facilitating the efficient use of available medical countermeasures by establishing effective regulatory policies and mechanisms.



The new initiatives launched as part of the Enterprise Review have put the United States in a position to begin fully leveraging advances in science and technology to develop innovative, safe and effective medical countermeasures and the systems to deliver them. These initiatives — along with the significant U.S. government investments in bioterrorism preparedness to date — have put the United States on a trajectory to achieve substantial gains in preparedness and significantly reduce the risks posed by bioterrorism and emerging infectious diseases.

The biggest challenge to preparedness efforts today is complacency. The United States will continue to face a substantial threat from bioterrorism (and emerging infectious diseases) for the foreseeable future. Indeed, bioterrorism is seen as a growing threat as advances in technology will continue to make biological weapons increasingly accessible to state and non-state actors as well as increasing their potential lethality. As such, we must continue and increase our preparedness efforts, which will require an appreciation of the long timelines, risks and high costs associated with developing medical countermeasures and the systems to deliver them; a significant and ongoing investment of resources; a broad-based effort, involving governmental entities at all levels, academia, industry and health professionals; and the continued commitment of our leadership.

This writing reflects the views of the author and should not be construed to represent FDA's views or policies.

September 11th Attack and the Intentional Release of Anthrax

Q&A: CDC AND PUBLIC HEALTH RESPONDS — 10-YEAR ANNIVERSARY

A tragedy is often marked in the lives of those who have experienced it as "life before," or "life after." The Centers for Disease Control and Prevention does the same as it reflects on the decade after the terrorist attack of September 11 and the intentional release of anthrax that followed.

Before that September attack, CDC was busy with a multitude of concerns that embody the work of public health. The headlines before Sept. 11, 2001, tracked CDC's work on potential health concerns from mosquitoes that stowed away on imported lucky bamboo to a Norwalk-like virus outbreak at two summer camps. The Task Force on Community Prevention Services had just issued a report on increasing physical activity. Internationally, CDC was answering immediate health questions during a refugee crisis in Guinea. It was doing what CDC does: work with state and local public health departments and partners across borders to find and tackle the problems that can plague individuals, communities and the world. And then disaster struck.

The following reflects portions of interviews with and reports by past and present CDC leaders and subject matter experts.

What was CDC's immediate role in responding to the Sept. 11, 2001, attacks in the United States?

Our first thoughts were, "how can we help?"

Within hours of the morning attack, CDC sent a small cadre of its public health experts from different disciplines to New York City by private jet.

CDC had previously established a unique FAA-issued priority flight designation that allowed people and materiel to be flown to New York City despite the closure of airspace over the United States.

There were many unknowns that first day, but the team's primary mission was to support the city health department. CDC expected to help in organizing for mass casualties and conducting immediate biological surveillance for infectious disease illnesses from the possible release of biologic agents.

The team arrived before nightfall and integrated with the New York City Health Department. Concerned about the possibility that hospitals could be overwhelmed with the injured, the NYC health director and CDC's team-lead agreed that CDC should send up more than a dozen Epidemic Intelligence Service (EIS) officers. In addition, the first emergency mobilization of the National Pharmaceutical Stockpile, arrived that night in New York City.



Photo courtesy of CDC

At the request of the New York City Department of Health, CDC's Strategic National Stockpile delivered a 50-ton push-package of pharmaceuticals and medical supplies to Ground Zero in New York City within seven hours of the federal decision to deploy. In addition, ventilators and their ancillary supplies and other critical medical supplies necessary for the treatment of burn and blast injuries were sent. Along with that, thousands of respirators and other personal protective equipment for response personnel were delivered to New York in the 24 hours after the attack.

EIS deployed to emergency departments

The additional EIS officers boarded a plane bound for New York. CDC sent epidemiologists, occupational health specialists, industrial hygienists and other professionals to support the city's response. The EIS officers deployed to emergency departments in sentinel hospitals to identify unusual disease symptoms or outbreak clusters. Their job would be disease and injury surveillance to help identify the types and amount of medical resources needed.

The expectation was that large numbers of people had been injured by the crash and collapse of the buildings. When the sad realization was that hospitals would not be receiving injured survivors because most victims had perished, the CDC team's attention was also directed to occupational health. Eye injuries and respiratory distress ranked high. Soon attention turned to environmental health concerns such as air quality, food and water safety, and rodent control. Days later, more EIS investigators were deployed both to New York City and to Washington, D.C. to help establish a disease surveillance system.

What was CDC's role in responding to the anthrax attacks?

The nation as a whole was still reeling from the terrorist attack of September 11th when public health officials identified a case of inhalation anthrax in a Florida resident, the first such case since 1976 in the United States. As the Department of Health and Human Services' lead agency for bioterrorism response, CDC had a much more central role for the federal government in the anthrax attack response compared to the terrorist attack on September 11th.

In 1998, CDC had begun to earnestly develop a strategic plan for addressing bioterrorism. Public health was the lead for increased vigilance and preparedness for unexplained illnesses and injuries. There were five components to the plan: preparedness and prevention, surveillance and early detection, diagnosis, response, and communication. These required integrated training and research.

CDC was making incremental progress to define, develop and implement a set of public health capacities at the local, state and federal level to respond to deliberate biologic or chemical attacks on the health of U.S. citizens. In 1999, the CDC had begun providing selected state and local public health jurisdictions with federal funds to develop their public health infrastructure and response capacity. The New York City Department of Health was one of the first city departments funded under this program. In addition, CDC began participating in terrorism response exercises with local, state and federal agencies. Internally, CDC had created the Bioterrorism Preparedness and Response Program. Importantly, CDC established a national repository of emergency drugs and medical equipment, which later became the Strategic National Stockpile.

Public health leads

Ready or not, the Florida anthrax event thrust public health and bioterrorism to the front of the line. A CDC-trained laboratorian in the Florida Health Department isolated *Bacillus anthracis* from a patient and alerted his health director and CDC according to protocol. The national Laboratory Response Network was created specifically to ensure the nation had sentinel experts who could correctly identify unusual bacteria from patient specimens and sound the alarm. It worked.

CDC and public health as a whole had limited science or past bioterrorism experience to draw upon beyond basic laboratory and epidemiologic understanding. There was great uncertainty about what the nation was dealing with and the magnitude of the event. The days and weeks that followed saw a quick escalation along the East Coast.

On October 4, anthrax was confirmed in the first patient and a second patient from the same media company reported being ill. Three days later, a Sunday, CDC confirmed *B. anthracis* from the office keyboard of the first patient — there was no doubt it was intentional because the organism would not naturally be found in an office setting.



Photo courtesy of CDC

In the weeks that followed, cases accumulated in New York, New Jersey, Washington, D.C. and Connecticut. CDC deployed teams of epidemiologists, occupational health experts, industrial hygienists and environmental health professionals in response. In addition, it gathered nearly a third of its workforce at the headquarters to aid in the response. The response was staged in an old auditorium at the Atlanta headquarters set up on metal tables marked by paper signs, according to their mission.

Epidemiology and Surveillance Response

Suspicious envelopes sent on September 18 were meant to reach media company AMI and NBC, ABC, CBS and the New York Post. Envelopes mailed on Oct. 9 were sent to Senator Daschle's and Senator Leahy's offices. Four days after the September 18 envelopes were mailed, the first cluster of nine cases began. The second cluster began five days after the October 9 envelopes were mailed.

Officers from CDC's EIS were deployed to establish surveillance, track exposed individuals and collect epidemiological data to identify risk factors for exposure.

Public health uses specific tools to define the extent of an outbreak. The team at CDC headquarters responsible for characterizing the event created a line list of patients with case descriptions, a database of clinical and environmental specimens from field teams and multiple reports.

The team created an epidemic curve that showed the date of onset of illness for 22 cases of bioterrorism-related anthrax. Two distinct case clusters were noted, with a 13-day period between the clusters in which no cases were reported. A single case of inhalational anthrax was noted in Connecticut 20 days after the second cluster of cases. The epidemiology team mapped out the flow of mail in these areas and identified the positive environmental samples, confirmed anthrax cases, and suspected cases.

Soon, CDC epidemiologists created a field tool kit to guide investigations. The learning curve was steep and the urgent requests for support unrelenting. To capture what was being learned in real time about how public health should respond to an anthrax event, the team created a "tool kit."

The tool kit included 250 items meant to reduce the learning curve for investigations that followed by health departments and CDC. This practical tool kit included patient handouts, diagnostic and treatment algorithms, prophylaxis clinical materials and guidance, consent forms, training materials, templates for logs, shipping and lab protocols, and helpful hints learned along the way.

Environmental Response

CDC collected nearly 10,000 environmental samples to test for the organism's presence which aided in determining agent sources and exposure pathways. Environmental sampling helped determine the extent and degree of contamination necessary to create risk assessments and support medical treatment and clean-up decisions. Environmental sampling also helped to guide decisions about reoccupying locations.

Laboratory Response

In 1996, CDC had only basic microbiology expertise with anthrax. By 2000, CDC had a highly trained but small cadre of laboratorians who could isolate *B. anthracis* and do the molecular subtyping, which became critical in the criminal investigation. Fortunately, CDC had also developed and trained the Laboratory Response Network so others across the country could isolate and identify anthrax bacterium.

They could identify anthrax bacteria by simple tests such as susceptibility of the anthrax bacteria to lysys by the gamma phage, or by using a more sophisticated approach such as direct fluorescent-antibody staining. Their laboratory capacity also included finding evidence of the organism's DNA by polymerase chain reaction (PCR) from specimens from a patient's affected tissue or site.

The first night after samples arrived at CDC, its anthrax laboratory processed 300 clinical and environmental specimens. Molecular subtyping confirmed that this strain was identical to the Ames strain.

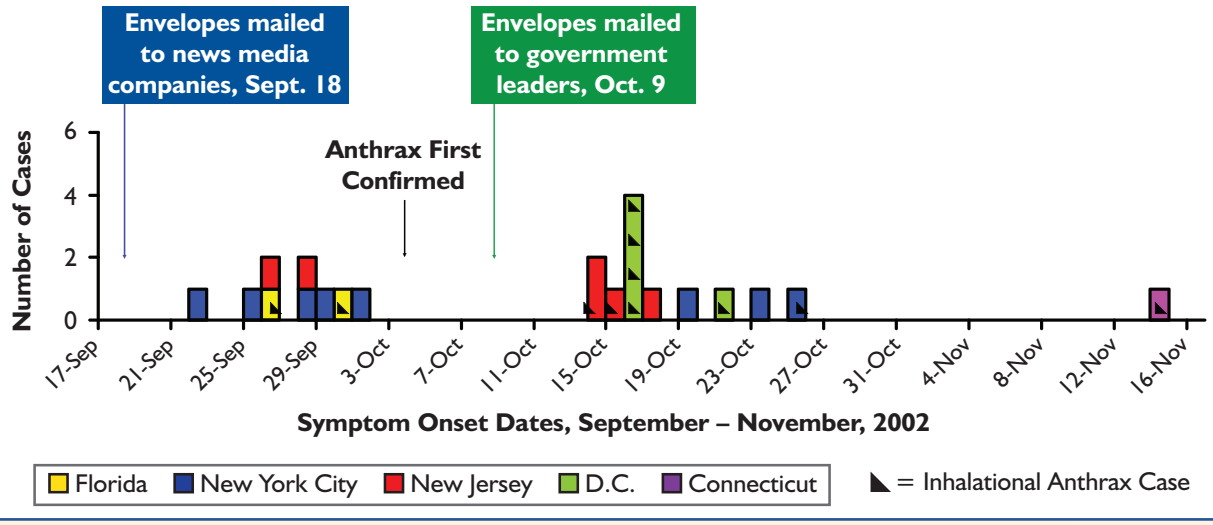
Thousands of clinical and environmental specimens were processed by the CDC anthrax lab without a single miss in diagnosis. Isolating the anthrax bacterium from clinical or environmental specimen is not simple. The culture plate used was non-selective and could grow thousands of other bacteria present in these samples, making finding the specific organism a challenging hunt. At CDC, *B. anthracis* isolates were found on the four suspect envelopes, in 17 clinical specimens and in 106 environmental samples.

Across the nation, the laboratory response network tested an estimated 350,000 environmental samples and clinical specimens over an extended period. The results were used in site characterization assessments, post decontamination clearance and forensic investigations.

Interventions

Through a combination of environmental sampling and case-cluster investigation, CDC recommended 10,300 peo-

Figure 1. Epidemic Curve for 22 Cases of Bioterrorism-related Anthrax, United States, 2001





Photos courtesy of CDC

Cutaneous Anthrax Inhalational Anthrax

ple receive antimicrobial prophylaxis for 60 days. An estimated 32,000 began antimicrobial prophylaxis. A small number of persons requested vaccination also. CDC's Strategic National Stockpile supported hundreds of rapid shipments of antibiotics around the country.

As the investigation progressed, EIS officers helped administer antibiotics, performed logistics management, and helped with risk communication. More than 100 EIS officers were in the field during the anthrax investigations.

Educational materials and counseling was initiated in small groups and health fairs were held to encourage people to continue the full course of antibiotics. CDC monitored for adherence and found that those who perceived the risk to be higher were more likely to finish the course of antibiotics. Importantly, no case of anthrax developed among the more than 10,000 people who received a course of antibiotics as a precaution based on their exposure risk.

Information Response and Partnership

Information sharing in the response became as essential as oxygen is to life. The demand for news and guidance at all levels of government, media, and a concerned public was crushing. Between September 11 and the end of November 2001, CDC issued more than 175 updates on the response reaching an estimated 7 million health professionals and the public.

HHS and CDC worked extensively to reach out to various groups within the health delivery system to inform them of what they knew. In addition to updates in the *CDC MMWR*, CDC sent notifications through its Health Alert Network and Lab Alert Network to state and local health departments.

How did CDC work with state and local health departments during the anthrax response?

In 2001, CDC had more than half a century of experience collaborating with state and local health departments and it knew their value during any outbreak response. CDC is not a regulatory agency and is invited by states and local health departments to work with them. During an event of national importance CDC's footprint may be larger, but the need to collaborate remains.

No one knows a community or population better that the public health officials who serve them. However, a strong, integrated national public health infrastructure is critical to protecting the public's health during large events. In 2001, CDC was not yet there, although it had been working to increase local capacity in critical response areas. The work state and local health departments did with the limited resources they had was immense. Naturally, the chaos of an event of this magnitude strained capacities and relationships. Overall, CDC tried to share what it knew as quickly as it knew it with all of those involved. In reverse, CDC saw its local and state partners strive to do the same.

The anthrax cases in Florida provided a good example of how CDC worked with state and local officials. After the first case resulted in death, CDC moved quickly to confirm the case of the second victim early on the evening of October 7. The CDC, HHS, FBI, DOJ, Florida Governor's Office, Florida Public Health Department, and a local public health department quickly formulated a plan that got the word out overnight to the affected employees that they needed to come to the clinic for medicine and testing that very next morning. CDC shipped medicine to Florida overnight so it was there when the people arrived in the morning. And CDC and Florida officials issued a joint release at 11 p.m. on October 7 notifying the media and public of the second case. It was a good example of local, state, and federal officials working together to get out a message, send medicine and mobilize people to come get treatment — literally overnight on a Sunday evening.

How would CDC characterize the response efforts? What were the most difficult aspects to respond to?

The response efforts were unprecedented. CDC, public health, and the nation faced a silent enemy with unknown capacity. Uncertainty permeated the environment in which local, state, and federal governments along with private medical-care systems and organizations bravely and incessantly went to work. Collectively, public health and medicine had very little science or past bioterrorism experience to draw on as well as an out-dated, weakened public health infrastructure just beginning to get its footing in bioterrorism preparedness.

We took every available public health tool and adapted it to this new situation. Public health was innovative, dedicated, and relentless in working to stop the threat from this intentional release. We did it alongside new federal partners and under intense scrutiny. We disseminated public health information promptly and delivered medicine to people who needed it. As a result, five people too many lost their lives and countless others were saved. Deaths in this outbreak were far below expectations in that the fatality rate for inhalation anthrax was thought to be around 80 percent. The fatality rate in these attacks was about 40 percent.

Nonetheless, the desire is always to do more, better.

What were the biggest challenges or gaps? How have these changed or been addressed during the past decade.

CDC was challenged by the magnitude of the event and the weight of demand for information and recommendations. Situational awareness became more and more difficult and people did resort to informal ways to find out what they needed.

Our local and state partners were frustrated by "watching the sausage get made" at CDC as information changed and guidance changed with it. Information never flowed fast enough and completely enough for all of the stakeholders involved, including the public.

CDC had not yet adopted the incident command system and had challenges in forming systems to move vital information in multiple directions.

There were gaps in knowledge or gaps in the number of people with needed knowledge. For example, the fact that the first cutaneous cases were unrecognized in clinical settings demonstrated the challenge when preparing to respond to unusual diseases.

There were gaps in laboratory protocols, regulatory requirements and procedures to alert local and state health departments.

CDC has had a decade of events on which to hone its preparedness skills. From anthrax it moved on to respond to SARS, monkeypox, Hurricane Katrina, H1N1, Haiti earthquake and cholera outbreak, the oil spill and recently the Japan disasters.

CDC has come a long way from attempting to respond to 9/11 at a few tables in a conference room. Today CDC applies the incident command system with modifications to allow us to collaborate and communicate more efficiently. CDC has created the Office of Public Health Preparedness and Response that includes a Division of Emergency Operations which stands ready to assemble the teams necessary and scale up as required for any public health emergency. These functions now operate in a state-of-the-art facility that serves as a 24/7 command center for monitoring and coordinating CDC's emergency response to public threats across the nation and abroad.

CDC laboratories and the National Laboratory Response Network are more proficient in detecting a range of biological agents that could be used as a weapon. CDC also has greatly increased its oversight of the safety and security of dangerous biological agents (such as the agent that causes anthrax) and toxins. In addition, CDC experts have worked with states to develop their plans for receiving and distributing antibiotics and other medical assets from CDC's Strategic National Stockpile during a public health emergency including a bioterrorist attack. All 50 states now have these plans in place.

During the anthrax response, CDC learned that the linkages forged between clinical and public health communities are strong and these linkages saved lives by detecting illness early. We learned how to shorten the time lag between acquiring new knowledge, communication and action. We confirmed that close collaboration of local, state, and federal public health personnel builds confidence in local response. We have modified recommendations, refocused investigations and are quicker to adapt new scientific information into our response.

If there were an anthrax attack today, do you think the response would be different? How?

That's a natural question to ask on a milestone anniversary. The simplest answer is CDC has multi-disciplined experienced and trained professionals now supported by a emergency operation center that could provide the surge capacity and evolving support needed if another anthrax event were to occur. CDC's scientists and public health professionals have done exhaustive follow-up research and published extensively what they learned during and after the anthrax response in 2001. As such, CDC's approach for communicating to the public and partners in a crisis has changed. CDC has added laboratory protocols and operating procedures for sampling and shipping specimens. It has refined safety training and conducted joint exercises for biologic agents. CDC has developed an environmental microbiology framework to identify threat agents, determine the risk of infection, and evaluate methods to reduce risk. CDC has described the reasons people may reject public health recommendations and treatment and developed educational materials to address their concerns.

CDC plays a key role in preparing the nation for all types of public health threats, including natural, biological, chemical, radiological and nuclear incidents. When a disaster occurs, CDC is prepared to respond and support national, state and local partners to save lives and reduce suffering. CDC also helps these partners recover and restore public health functions after the initial response.

CDC's Office of Public Health Preparedness and Response (OPHPR) provides strategic direction, support, and coordination for CDC's preparedness and emergency response activities.

Protecting the public from health threats involves *public health preparedness* as well as *medical preparedness*. Both are essential for national health security and, hence, to the overall preparedness of the nation.

- **Public health preparedness** is the ability of the *public health system, community, and individuals* to prevent, protect against, quickly respond to, and recover from health emergencies, particularly those in which scale, timing, or unpredictability threatens to overwhelm routine capabilities.
- **Medical preparedness** is the ability of the *health care system* to prevent, protect against, quickly respond to, and recover from health emergencies, particularly those whose

scale, timing, or unpredictability threatens to overwhelm routine capabilities. Medical preparedness generally is the responsibility of agencies other than CDC.

Emergency preparedness requires attention not just to specific types of hazards but also to steps that increase preparedness for any type of hazard, including training and exercises. CDC developed an emergency preparedness exercise toolkit intended to guide local public health agency staff in developing, implementing, and evaluating emergency drills and exercises, and facilitating the public health aspects of larger, multiagency emergency exercise events. The toolkit provides essential guidance including templates, checklists and forms to assist with every stage of the exercise process. Emphasis is on identification of objectives during the planning phase, a critical step for ensuring a meaningful post-exercise evaluation.

The resources below reflect the increasingly robust resources available from CDC to support the public health response.

- **The Health Alert Network (HAN)** HAN is a strong national program that provides Health Alerts, Health Advisories, Updates and Info Service Messages to state and local health officers, public information officers, epidemiologists and HAN coordinators as well as clinician organizations.
- **SNAPS: Snap Shots of State Population Data** SNAPS provides local-level community profile information nationwide. It can be browsed by county and state and searched by zip code. SNAPS serves as a valuable tool when responding to public health emergency events at the state, tribal, and local levels.
- **Surveillance** CDC has multiple resources for case definitions, illness recognition and detection, planning and systems.
- **Training & Education** CDC offers support and best practices for risk communications, public health and clinical training, and laboratory training.
- **Clinician Outreach and Communication Activity (COCA)** CDC's COCA establishes partnerships with national clinician organizations to communicate information about disease outbreaks and terrorism events.
- **Healthcare Facilities** CDC has specific resources for individuals at healthcare facilities tasked with ensuring that their facility is as prepared as possible for an emergency.
- **Labs** CDC provides guidance on testing, agent identification, biosafety, specimen collection and shipping.

Collectively these and thousands of other steps have made CDC better prepared. While outcomes can't be promised, CDC can promise it has learned what did and did not work during the anthrax attack and has held itself accountable for being as prepared as possible for future known and unknown threats to public health.

To learn more about CDC preparedness for anthrax and other hazards, visit http://emergency.cdc.gov/cdc/

What do you think are the biggest threats or challenges to bioterrorism preparedness today?

A potential threat may be the misguided belief that preparedness is a thing, something you create once and simply take off the shelf when you need it. Being prepared is an ongoing process and a collective mindset among all public officials and citizenry to the degree they are willing to invest time, resources and attention.

Our society is interconnected and accessible from anywhere across the globe. New technology and ill purpose can wreak havoc without notice.

Preparedness means good public health with an ability to deal with day-to-day disease threats, including detecting and responding to unusual diseases, having the capacity to diagnose rare illnesses, the laboratory acumen to know what you have, and the insight to know what it means to our citizenry's health. Collectively, these things and the means to respond swiftly are the foundation of preparedness against acts of bioterrorism.

Because of its unique abilities to respond to infectious, occupational, or environmental outbreaks and events, CDC plays a pivotal role in public health preparedness for catastrophic events. CDC focuses on strengthening response capabilities within the agency as well as externally by providing resources to help strengthen preparedness at state, local, tribal and territorial levels. Many preparedness activities occur on a daily basis, such as monitoring for real or potential public health emergency threats. These and other types of activities can be expanded to respond to emergency scenarios such as pandemic influenza.

National emergency preparedness requires a coordinated effort involving every level of government as well as the private sector, non-governmental organizations and individual citizens. CDC's work in preparedness supports the Department of Homeland Security, which has overall authority for emergency response activities as laid out in the National Response Framework.

CDC is committed to working with other federal agencies and partners as well as state and local public health departments to ensure the health and medical care of our citizens. The best public health strategy to protect the health of civilians against biological terrorism is a strengthened public health system including public health laboratory capacity, increased surveillance and outbreak investigation capacity and education and training at the local, state and federal level.

CDC works 24/7 saving lives, protecting people from health threats and saving money through prevention resulting in a more secure nation. CDC puts science and prevention into action to make the healthy choice the easy choice. CDC helps people live longer and healthier to lead productive lives.

To learn more about CDC public health emergency preparedness and response, visit: www.cdc.gov/phpr.



Photo courtesy of CDC

Questions/Answers

with James M. Hughes, M.D., President of the Infectious Diseases Society of American and Professor of Medicine and Public Health at Emory University; Former Director of the National Center for Infectious Diseases (NCID) at CDC and Rear Admiral and Assistant Surgeon General in the U.S. Public Health Service.

What was CDC's role in responding to the 9/11 tragedies?

Consultation and support for NYC and D.C. health departments in numerous activities; deployment of National Pharmaceutical Stockpile (NPS) pushpack to NYC.

What was CDC's role in responding to the anthrax attacks?

National surveillance; epidemiologic investigations in collaboration with state and local health departments; support for state public health labs through the Laboratory Response Network (LRN); laboratory diagnostic support through the Rapid Response and Advanced Technology Laboratory (RRAT Lab), Anthrax Laboratory, and Pathology Laboratory for case confirmation; clinical consultation; professional and public education; advice on postexposure prophylaxis; deployment of antimicrobial agents and supplies through the Vendor Managed Inventory of the NPS; consultation on environmental decontamination; development of treatment recommendations.

How did the CDC work with state and local health departments during the response efforts to 9/11 and the anthrax attacks?

Deployed field teams to Dade County, NYC, NJ, Washington, D.C. and CT to assist state, local and district health departments in ongoing investigations of cases, surveillance and outbreak control. Staff from CDC Ft Collins, CO assisted state and local authorities in the investigation of a suspect case there. Assisted LRN laboratories in the assessment of numerous powders. Received and processed numerous clinical and environmental specimens and provided reference diagnostic services. Assisted in coordination of epidemiologic and law enforcement investigations.

How would you characterize the response efforts? What were the most difficult aspects to respond to?

Response efforts were generally effective, given resources available at the time. Major challenges related to uncertainties regarding who was in charge at the national and local levels, dealing with the 24 hour news cycle, staying ahead of CNN in release of information, maintaining situational awareness (worked best in NYC), keeping the clinical and public health communities informed, communicating clear and consistent messages, characterizing powder preparations associated with cases (including concerns about indicators of weaponization), sharing information among many agencies involved in the investigation.

What were the biggest challenges or gaps? How have those changed or been addressed during the past decade?

Initial lack of an Emergency Operations Center and experience with incident command structure and operations. Maintaining situational awareness in all involved areas. Risk communication. Responding to 24 hour news cycle and staying ahead of media in release of information. Meeting the "need to know" requirements of numerous individuals and organizations. Meeting need for rapid development of recommendations for post-exposure prophylaxis. Maintaining relationships with Department, White House, and law enforcement. Expanding CDC laboratory capacity. Coping with fatigue and burnout. Considerable progress has been made in addressing each of these issues though challenges remain.

Looking back, has your perception of the attacks or the response changed from how you saw them 10 years ago?

Anthrax attacks ushered in a new era in outbreak preparedness and response at national, state, and local levels. CDC and the nation are much better prepared to respond today. The attacks drove home the reality of the threat posed by terrorism and the need to be prepared to address the unexpected. Numerous challenges remain, two of which are lack of surge capacity of the healthcare system in today's just in time economy and vulnerability to cyberterrorism.

If there were another anthrax attack today, do you think the response would be different? How?

Greater familiarity with clinical and epidemiologic features of the disease (old dogma would be ignored). Situational awareness, coordination among agencies, incident command, emergency operations, risk communication capacities much improved. Management of complexity of social media environment and timely provision and administration of medical countermeasures would be challenging.

What do you think are the biggest threats or challenges to bioterrorism preparedness today?

Complacency (10 years have passed without another major incident) leading to funding reductions which negatively impact state and local preparedness efforts. Lack of healthcare surge capacity and medical countermeasures including new antimicrobial agents to address the threat posed by genetically engineered organisms which is markedly increased today compared with 10 years ago. Just in time economy introduces additional preparedness challenges.

What remains to be done to make sure that we can respond effectively to bioterrorism attacks?

Maintenance of political will. Strengthened national and global biosurveillance capacity to ensure early detection and situational awareness. Continued support for medical countermeasures development Elimination of barriers to sharing of critical information including etiologic agents during emergency responses. Strengthened biosecurity and biosafety programs internationally. Support for effective implementation of IHR 2005 in all countries, including the US.

SUMMARY OF THE INVESTIGATION INTO THE ANTHRAX ATTACKS

Centers for Disease Control and Prevention, a series of articles:

The real question was, "Will this hurt someone?"



Photo courtesy of CDC

Not many people can bring up the risks from inhaling anthrax spores, microwave popcorn flavoring and nano particulates in the same conversation. CDC's **Ann Hubbs, DVM, Ph.D.,** is that person. Hubbs was selected to respond to the 2001 intentional release of anthrax, in part, because she had a unique professional background. As a veterinary medical officer working in occupational safety and health, she had studied anthrax in livestock as part of her basic DVM education in Texas. Her studies and research went on to include respiratory disease lung pathology and then toxicology.

People absorbing volumes

"I rotated into the anthrax response and it changed my perspective of CDC, public health, and my job," she said. "The pace was so fast and the energy level was so high. I saw people absorbing volumes of data and making decisions about risk probability in unbelievably tight timeframes."

While information and discussions swirled around the topic of spores released and envelopes at the Senate's Hart Building, Hubbs was working to answer questions about occupational health. "I saw the value in diverse people working together to make the best possible decisions based on the information at hand," she remembers. "People cared, really cared and the burden to get it right weighed heavily on everyone. At that time I had worked for CDC in Morgantown for nine years. I was physically removed from Atlanta. This response let me see the big picture. I understood public health in a new way."

Hubbs explained that while numbers were important, when talking about inhaling anthrax spores, the real question was, "Will this hurt someone?" Being part of the team trying to answer that question left her with a different perspective when calculating risk.

Science can predict risks

"Science is imperfect, but it can be useful. Science can predict risks, some from known sources and occasionally from new sources. The value is in detecting the risk early and doing something about it," she continued.

When Hubbs discusses new sources of risk she is referring to her research involving an emerging lung disease among food manufacturing workers. The illness stems from butter flavoring vapors used on microwave popcorn, commonly known as Popcorn Worker's Lung. She was part of the team that identified a component of the vapor implicated in the respiratory hazard. "We learned that the very thing that gives it the buttery taste is potentially harmful in some workplace conditions," she explained.

Safety of nanotechonology

Her energy is now also directed at exploring the safety of nanotechnology. Nanotechnology is the means to change matter on an atomic scale to create structures that can be formed into new products. This new technology involves the tiniest known manufactured products and is revolutionizing the science, medicine, and cosmetic industries. "Nanotechnology is an economic force and, as exciting as that is, it's important we use these first-generation products of nanotechnology safely. We missed the opportunity when asbestos was first introduced to understand how best to use it. As a pathologist, I want us to use this new technology safely," she said.

The common denominator between anthrax, popcorn flavoring vapors and nanoparticulates is lung safety. For Hubbs, they all remind her of public health's demand to do more and the wonderful feeling that more can be done.



Photo courtesy of CDC

The learning never ends: Disease detectives follow every lead

By the fall of 2001, **Daniel Jernigan, M.D., M.P.H.,** knew his way around respiratory disease investigations. As a seasoned epidemiologist, with CDC since 1994, Jernigan liked the hunt — who was getting ill, was there a cluster of cases, what relationship did patients have with each other, how long were they ill, when did symptoms begin, what was the attack rate.

In 1994, as a new CDC Epidemic Intelligence Service (EIS) Officer, he helped successfully identify the source of infection for an outbreak of pneumonia. Cases of Legionnaires' disease had been popping up in adults along the East Coast.

"What made this outbreak investigation unusual was that it was a respiratory disease and, yet, we were able to trace it back to a point source. Typically respiratory outbreaks can't be traced back to an original point of infection — that's the type of experience you get with foodborne or waterborne investigations, not airborne," Jernigan explained.

Applying detection methods

Applying their epidemiologic detection methods, the public health investigators identified legionella in whirlpool spas on the cruise ship Horizon as the source. It turned out that the Legionnaires' disease cases occurred from nine separate week-long cruises to Bermuda. Exposure to whirlpool spas on the ship was the common thread among those who became ill compared with those who did not.

On Oct. 4, 2001, the first case of inhalation anthrax in the United States since 1976 was identified in a media company worker in Florida. Three days later, Jernigan was asked to lead the CDC epidemiology team based in Atlanta. Once again, he was in the unusual position to investigate a respiratory disease outbreak that could ultimately be traced to a point source.

"Right away we needed to determine the source. This was complicated — we later found out — by the fact that two different sets of letters were mailed. We were using data collected by public health investigators as we tried to answer, who was affected, what were their characteristics, and were they related to each other in some way. These questions were meant to help us identify interventions and stop additional disease transmission," he said.

Unprecedented outbreak

The investigation expanded over the weeks as more cases were found. "This was an unprecedented outbreak investigation. It challenged us in the traditional sense of finding out how the disease organism was being transmitted and the volume of data analysis that was required, but also in shear scope. We would 'birth' a new team for each new location where anthrax cases were found. We had CDC teams working with Florida, North Carolina, New York, New Jersey, and D.C. We also had a postal team. They were working with public health and other agency officials on the investigation response," he recalled.

Through the exhaustive weeks of that response, Jernigan and his colleagues, wittingly or not, were applying all that they knew about investigations using an outbreak model while their approach, by necessity, began to incorporate the incident command model of response. "We learned that the outbreak model must persist, but in extraordinary outbreaks, the incident command model is vital too. We needed greater situational awareness, beyond the scope of outbreak data collection. We needed better systems to communicate and interact with partners, elected officials, the media and public," he said.

What he learned from a cruise ship outbreak he poured into the anthrax response. Next, Jernigan took everything he learned from the anthrax attack — and subsequent responses such as West Nile, SARS and Katrina — into his role as the Epidemiology and Laboratory Team Lead for the H1N1 pandemic influenza response.

Absolutely critical to response

"What we learned from the anthrax response was absolutely critical to our pandemic response. Anthrax taught us the value of having laboratory processes in place, the need for rapid diagnostics, how to communicate uncertainty and the importance of collaboration with others."

Jernigan is "paying it forward" as he continues to help refine public health emergency response. "It was validating to see how extremely well the pandemic response went. We had public health labs ready and trained. Diagnostic tests were created and the mechanisms and surge capacity were in place to distribute tests and reagents to all health departments and partner labs."

Value of consequence modeling

"We learned the value of regulatory preparedness. We must work with USDA and FDA to identify and manage regulatory obstacles that can come up in a response. We also learned the value of consequence modeling — a capacity we did not have during anthrax."

"Consequence modeling allows us to take many bits of information and analyze them to predict outcomes. Even with a range of expectations, we can use the information to drive interventions and help leadership make decisions. It allows us a level of confidence in the way we organize and make recommendations," he said.

After cruise ships, anthrax letters, and pandemic viruses, Jernigan, currently the Deputy Director of the CDC's Influenza Division, is still on the hunt. The answers are out there if we know how to look for them. We are determined to intervene where we can and stop the spread of disease — that's public health.

Anthrax response in D.C.: Very Intense



Photo courtesy of CDC

Rima Khabbaz, M.D., led the CDC field team to the nation's capital during the public health response to the anthrax attacks of 2001. "I would characterize that time as very intense, we were acutely aware that we were dealing with an intentional attack, and focused on doing all we could to try and mitigate the consequences and save lives," she explained. "A few of us from CDC arrived in D.C. just hours after anthrax was confirmed in the letter that was opened in Senator Daschle's office. By the end of the first week the team grew to close to 100 staff, and more than double that at the peak of the response."

How they did it was a feat of agility and flexibility — there was no guidebook for responding to a bioterrorist event that affects politicians, postal workers and media. "Public health had identified anthrax as a potential agent so we had some expertise, but there were gaps in our scientific knowledge. What happens in nature and what happened in an intentional release can be very different," Khabbaz noted.

Requests seemed endless

While Khabbaz and her team tried to understand the layout of the Hart Building and respond to the many concerns from congressional members and staff, the requests for briefings seemed endless. "Recognizing that we were dealing with very important people, I wanted to be responsive to all, but at some point all I would have been doing is talking on the phone or going to meetings. I learned quickly to delegate even some high-profile meetings. We had to answer questions about exposures and make decisions on prophylaxis."

A confusing element of this response was the question of who had authority where in the District, including for example at the Capitol and in the different Federal facilities. "We worked very closely with the Washington, D.C., health department but they did not have jurisdiction at the Capitol. Straightening that out was important," she said.

When the outbreak investigation took them to the Brentwood mail facility, the environmental sampling took on a whole new meaning. "People can easily understand where to swab in an office if a letter is opened, but understanding how mail moves in an oversized open warehouse on machinery that could sort envelopes at incredible speed was something else. It was difficult for people to imagine. We had our investigators all over that facility, mapping out the logistics," she explained. "We needed to be able to follow the path of the letters."

Investigators used swabs, HEPA vacuum filtration and air sampling. Sampling was used to determine the presence and extent of contamination. The investigators also sampled postal facilities that received mail from the Brentwood facility.

Controversy and regret

A point of controversy and regret was the perception that postal workers and people working at the Capitol were being responded to differently. "We started prophylaxis with Ciprofloxacin first because we did not know whether the anthrax from the envelopes was susceptible to Doxycycline. As soon as we confirmed that Doxycycline was effective, we switched to using it because we had it in the Strategic National Stockpile. The message that they were equally effective did not get through clearly," Khabbaz shared.

"It is so important that people understand the steps that are being taken and why we recommend what we do. I'm glad CDC has a new approach to communicating to people in a crisis. To this day, I feel angry and very sad that people lost their lives from this attack, but I believe our providing timely prophylaxis to a large number of exposed people likely prevented more illnesses and deaths," she said.

Khabbaz understatedly calls the experience she had in the anthrax response "very intense." That means something coming from a professional who has also responded to outbreaks of Nipah, Ebola, West Nile virus, SARS and monkeypox. Dr. Khabbaz is the Deputy Director for the Centers for Disease Control and Prevention and Director for Infectious Diseases.



Photo courtesy of CDC

Vision, duty and confidence creates a no-miss laboratory

Few stories cast the laboratory scientist in a leading role. However, laboratorians across the nation led in the response to the intentional release of anthrax through the mail in 2001. This crisscross of highly prized experts was trained to be able to detect anthrax in lab specimens with uncompromising precision by CDC's **Tanja Popovic, M.D., Ph.D.**

In 2001, the laboratorian who detected the first case of inhalation anthrax in the United States since 1976 was trained by Popovic. "Phil Lee from the Florida Health Department laboratory called to tell us he had an anthrax case. This was incredible news. My word of confidence that Phil had it right was an important component of CDC's leadership to quickly send the CDC team to Florida, even without the final laboratory confirmation at CDC," Popovic said. "I spoke with him and was confident that he knew what he was doing."

Five years of intense work

That confidence stemmed, in part, from nearly five years of intense work and vision to get the United States laboratories prepared to respond to a bioterrorism attack using anthrax. "I view Brad Perkins [M.D.] as the key visionary who, in 1996, recognized CDC did not have the laboratory expertise it needed with anthrax. He asked me to put a lab together that could do work with anthrax and develop a standardized protocol that could be used throughout the country to identify this bug," she credits.

However, this accomplished scientist and physician, who immigrated to the United States from Croatia with her husband and two young children in 1989, had mixed feelings initially about the new assignment. "Anthrax was not on the tip of everyone's tongue. Some wondered what I had done wrong to get this seemingly insignificant task. It was a dead end they thought. But when Brad explained what was at risk, he was so convincing. I saw his vision too," she said.

CDC leadership asked Popovic to create a state-of-the-art lab at CDC and then to teach what she knew to a network of laboratories across the nation. "This was about preparedness. We were building overall capacity for multiple agents, anthrax, brucellosis, tularemia," she explained. Popovic wanted to teach lab techniques that could be used for anthrax, but also could be used for other possible threats. "If you learn how to do PCR [polymerase chain reaction — a simple tool that can take a portion of DNA and copy it billions of time so it can be detected] for anthrax, you have that knowledge and it can be modified for other diseases, in a suspicious situation or not — that way the overall level of public health laboratories is strengthened. That was the key."

Just six months before

Popovic and her small team of experts completed training a national network of laboratorians just six months before the anthrax letters were mailed. The seasoned scientist brushes off questions of "what if" and concentrates on what did happen. "This did not come from luck. This came from the vision of some dedicated people to whom we all owe a lot."

"We were ready. I was confident, very confident of our microbiology. I never doubted what we did and our conclusions. And we never missed. I never had to come back and say our lab got it wrong," she declared.

The stress was not in questioning what they were doing — the stress came from other places, like creating protocols "on the fly" for environmental sampling. "In the first days of the investigation, we settled on using moist swabs to collect the environmental samples in this event. At times we also brought the entire sample to CDC; for example, an air vent filter," she said. Also stressful were the constant demands for information and the interruptions of the lab work they caused before the formal chain of communications was established.

We didn't go home for weeks

"We set up cots in our conference room and our team rotated between the lab and sleeping. For weeks, some of us went home only for a brief shower and change of clothes," she recalls. While some might lament the upheaval in their lives from the weeks of unrelenting demands, Popovic sees her work as a tribute to her nation, public health and CDC. "I had the opportunity to see what CDC does from a front row seat. The CDC laboratory community wanted to contribute to protecting this country, and we were really damn good."

From the moment her lab confirmed anthrax from a swab that was swept over the keyboard in the office where the first anthrax patient had worked, Popovic knew it was not a naturally occurring event. "This was intentional. We didn't know who, but we knew we needed to find the source. We needed to determine where the exposures occurred," she said.

Her work on anthrax did not conclude after the last specimen collected was tested. In the first year following the response, Popovic co-edited a special publication with 32 scientific papers on what the public health community did and learned.

However, her lasting lesson is the importance of vision and the willingness to invest for the future — to resist slipping into complacency. Popovic wishes more than anything to clear the path for scientists who do public health research. "We have obstacles that should be removed to make it easier for our scientists to do their work," she challenges. Popovic seems undaunted by the prospect of confronting these obstacles — not surprising from someone who took a "dead end" assignment not so long ago that, in turn, helped protect a nation.



Photo courtesy of CDC

How do you talk to people when the unthinkable happens?

A trip to Hong Kong in 1997 set CDC's **Barbara Reynolds, Ph.D.,** on a quest to answer the question, "How do you talk to people when the unthinkable happens?" The attack of September 11, 2001, and the subsequent intentional release of anthrax made answering that question a priority for CDC and public health.

In the late 90s, CDC had declared the world "past due" for a pandemic, just as the Avian Influenza H5N1 outbreak in Hong Kong was killing healthy young adults, reminiscent of the 1918 influenza pandemic. The severity of the outbreak ignited the people of Hong Kong and the world to ask tough questions of its public health leaders.

Magnitude of loss not seen in our lifetime

"How do you prepare people to manage loss at a magnitude we had never seen in our lifetimes? At the time, CDC was projecting that a severe pandemic could mean one million Americans would die from influenza. It was truly unthinkable," Reynolds said.

When the dual tragedies of 9/11 and anthrax consumed the nation and public health, Reynolds saw the challenges that can descend when responding to the information needs of multiple stakeholders. "The need for information was voracious during these events. The public and affected population groups wanted answers, reassurance and consistency in what they were being told," she recalled.

In 2002, with funding from the Department of Health and Human Services, Reynolds developed the Crisis and Emergency Risk Communication (CERC) framework. "What we have learned from previous events, including the anthrax event, is that the public can withstand ambiguity if they are allowed to follow the process health officials are using to find answers. The key is to tell the public, from the very beginning, what we know and what we don't know. We must continue to explain that 'things can and do change.' A big dollop of humility and openness is crucial to effective communication," she said.

Threats perceived on a personal level

"People perceive threats on a very personal level. When people become aware of a new threat, they ask themselves 'What does this mean to me? What does this mean to my loved ones?' While we have their attention, we should share what we recommend and where to go if they want to know more now, or later," she said.

Reynolds characterized the initial phase of the crisis communication lifecycle and described the five most common mistakes made in emergency communication to the public and how to counter them.

Expect the public to immediately judge the content of an official emergency message in the following way: "Was it timely? Can I trust this source? and Are they being honest?" However, Reynolds points out that there are five common mistakes in crisis communication:

- Mixed messages from multiple experts,
- Information released late,
- Paternalistic attitudes,
- Not countering rumors and myths in real time, and
- Public power struggles and confusion.

"You can help to avoid these mistakes by using the six principles of crisis and emergency risk communication, or CERC," she said.

Be First: If the information is yours to provide by organizational authority — do so as soon as possible. If you can't, then explain how you are working to get it. Don't sit on factual information. If you do it will leave a vacuum that may be filled by people who do not have the public's best interest at heart.

Be Right: There is a natural tension between being fast in sharing information and being accurate. The answer is to give facts in increments. Tell people what you know when you know it, tell them what you don't know, and tell them if you will know relevant information later. Release accurate information quickly and be comfortable with the idea that people can tolerate getting reliable information in pieces.

Be Credible: Tell the truth. Do not withhold to avoid embarrassment or the possible "panic" that seldom happens. Uncertainty is worse than not knowing — rumors are more damaging than hard truths.

Express Empathy: Acknowledge in words what people are feeling — it builds trust. For example, one may say, "We understand this is worrisome." Expressing empathy is the ability to "put yourself in someone else's shoes and then acknowledging what they are feeling in specific words. It is not "I know how you feel," it is a statement that captures, in words, the emotion they are feeling.

Promote Action: Give people things to do. It calms anxiety and helps restore a sense of self-control. Give people things to do that they can actually carry out.

Show Respect: That means treat people the way you want to be treated — the way you want your loved ones treated. Avoid being paternalistic in your communication to the public.

These best practices and more are included in a free 250-page course book called, *Crisis and Emergency-Risk Communication (CERC)*. "It was first and foremost a practical guide meant for communication professionals at all levels of public health and emergency response to help them empower the public's decision making in a crisis. I wanted it to be accessible, down to earth, and still based on good science and research," Reynolds said.

In the decade following the back-to-back crises of September 11 and anthrax, the CERC framework has taken hold across the spectrum of public health and emergency response. "CDC was committed to sharing the framework as widely as possible. Today, it is an accepted foundation for risk communication during disasters of any magnitude," Reynolds said.

Today, thinking the unthinkable and preparing for it is the vital work of many. It's helpful to know that there is now a shared pathway to communicating to people if the worst does happen.



Photo courtesy of CDC



Photo courtesy of CDC

"Please tell me, is it safe to go home?" After 9/11, science offers comfort

The listening skills honed years earlier at a kitchen table on Long Island helped **Rear Admiral Sven Rodenbeck, Sc.D.,** recognize the comfort his science could offer the people of Lower Manhattan following 9/11.

On September 11, 2001, the collapse of the World Trade Center's twin towers created a thick cloud of dust that blanketed the neighborhood in gray. "The environmental sampling being done was outside on the streets. But, anyone who lived there knew that a fine coat of grime seeped into apartments of Lower Manhattan," Rodenbeck explained.

"There was so much to attend to for the nation — our security, getting Wall Street back up and running — it was understandable that the response didn't immediately focus on indoor living conditions," he explained.

But there was a group of scientists poised to hear the community's plea to answer whether it was safe to return to living in their apartments. "ATSDR [CDC's Agency for Toxic Substances and Disease Registry] was experienced in hearing community concerns about environmental health and responding. It was a natural fit for us to look into residents' concerns in collaboration with the New York City Health Department."

Having led teams for 90 public health assessments in communities across the nation, Rodenbeck combines the analytic mind of an engineer with the empathetic ear of a counselor, an exceptional bridge between the technical and the emotional.

"Before 9/11, I remember coming to a community on Long Island where some of the citizens were highly upset about a potential cancer risk. One community leader in particular was very vocal. I sat down at his kitchen table and over a cup of coffee I listened. I simply asked, 'what questions do you want answered?' We discussed every question and I explained what we could and could not answer. Technical answers mean very little if you don't first relate on an emotional level," he said.

Asbestos was the question on the minds of most residents in Lower Manhattan after 9/11. "There had been some outdoor sampling that did detect asbestos in pockets. People wanted to know if it was widespread and if it had seeped indoors," he explained. "People were reporting irritation in their throat. They wanted answers. Asbestos was a big concern."

When he recognized no one was systematically addressing the concern, Rodenbeck directed the sampling in the apartments and condominiums in Lower Manhattan. Less than two months after the attack, the team tested 30 residential buildings in Lower Manhattan and four others above 59th street for comparison.

Significantly, Rodenbeck's team pushed for the analysis to be done by scanning and transmission electron microscope procedures instead of the more common light microscope. "We pushed the science forward on how to analyze environmental samples. At the time, the electron microscope procedures were not the standard of practice for analyzing environmental samples," he said. "The analysis using the electron microscope procedures found primarily fiberglass fibers as the irritant, not asbestos."

The light microscope could detect the presence of fibers, but it could not answer the question whether it was asbestos fibers or something else. However, the electron microscope procedures could detect the difference between asbestos and fiberglass fibers. "Asbestos versus non-asbestos was a huge consideration for residents in their clean up and health concerns," he recalled.

The analysis was shared with residents and they were encouraged to continue to conduct frequent cleaning with HEPA vacuum and wet mop methods of their apartments and condominiums. "We knew they were concerned. I'm grateful we had the expertise and resources to address their immediate concerns."

The expertise for Rodenbeck included a doctor of science degree in environmental health but it also included the vision to listen to concerns voiced by a community. The resources included an electron microscope, but it also included the wisdom found sometimes at a kitchen table.

"CDC-1, cleared for approach" — Drop-in surveillance on 9/11



Photo courtesy of CDC

What started as a clear, sunny day in Atlanta for CDC's **Captain Tracee Treadwell, D.V.M., M.P.H.,** ended in smoke, soot and tension in New York City.

"I was at work when the planes struck the towers and many of us congregated in an office with a TV," she said. Soon after, Treadwell and her colleagues on the main CDC campus in Atlanta were evacuated because of evolving threat concerns expressed by the FBI.

CDC leadership met in an alternate site and began to develop the response. Treadwell was assigned to lead a team to respond to New York City.

Before that day, she had been working on bioterrorism preparedness projects at CDC. In 1999, she had served as a team leader for surveillance and response activities at the World Trade Organization Ministerial in Seattle. In 2000, she did the same at the Democratic and Republican Convention cities. "We were doing 'drop-in' surveillance in high profile events, looking for unusual disease clusters or symptoms being reported within the population," she explained.

Early warning system

The value of this "drop-in" surveillance, at the time, was it could serve as an early warning system and supplement what was being done by local and state health departments.

Despite the closure of airspace over the United States, Treadwell and three others raced to a local airport to board a small corporate jet. CDC had previously established a unique FAA-issued Priority Flight Designation that allowed people and materiel to be flown to New York City. They would be looking for suspect pathogens in the city.

While on the flight up to New York City, Treadwell started to organize her team's activities, anticipating what support the health department might need. "There was a lot of tension because we knew we were truly under attack," she said.

They called us CDC-1

Nearing the city, the pilot invited Treadwell to come up to the cockpit. "It was early dusk, night was approaching. Suddenly, in the distance was a black dot in the sky and it was moving rapidly toward us. Of course, my mind jumped straight to someone is shooting us down," she admits. In seconds, she saw a fighter jet come up near the plane. "They were so close I could clearly see the face of the pilot. They did a wing wave and moved on. We were the only civilian plane in the sky. They called us, CDC-1."

With that welcome to New York, the team landed. While in the movies everything works smoothly, this was real life. They found themselves hampered by spotty phone service and difficulty determining just where they needed to meet up with the city health director. A sheriff finally got them where they needed to be.

"The city health department was fairly close to ground zero. There was smoke and soot in the air. A little past midnight we hammered out what was needed for the bio-surveillance. The concern was about what agents might be dispersed. We developed case definitions and created a rudimentary system of surveillance and assessment. We were assessing hospital capacity and clinics. We expected to be overwhelmed with injuries. It was clear this was going to be labor intensive," Treadwell remembered.

CDC should send more

They decided the first night that CDC should send more Epidemic Intelligence Service (EIS) officers to New York and more than a dozen arrived within days. Worker safety at the site became a primary concern. Treadwell assigned her team across hospitals in the city to collect information about the types of illness

and injuries being seen in the ERs. "We wanted to ensure medical supplies and personnel got where they were needed and to see what sort of public health recommendations and health education would be needed onsite."

The days for Treadwell may have blurred one into another, but not the scene outside the temporary site of operation for the health department: it remains starkly vivid. "We were across the street from Bellevue Hospital. The refrigerated trucks for the bodies being removed from the site were next to the hospital. The constant noise from the motors, the rumble of the refrigerator cars and the sirens were reminders of the magnitude of loss. It defies description," she admits.

I was going to turn back around

Treadwell had little time to adjust to her involvement in the 9/11 response, when she was thrust into the response to the anthrax letters. "I needed to return to CDC briefly for a specific task and I traveled back to Atlanta thinking I was going to turn back around to New York the same night. Again, it was late at night and I drove up to the CDC campus — the lights were out [CDC had experienced a temporary blackout on the campus] and it felt so strange. The weather was still warm and I walked up to someone and they welcomed me back," she said.

However, Treadwell did not get back on that plane. She was again tapped, along with Jay Butler, M.D., to co-lead the state liaison team. This was the first team that received all of the calls from state health departments or private physicians concerned about a possible anthrax case. The team would literally start the investigation over the phone and, if needed, form the team to visit the site in person.

Treadwell has not left emergency preparedness. Today she is the associate director for infectious disease preparedness in the CDC center responsible for emerging and zoonotic diseases. "I'm proud to have been a small part of an agency that dealt with a crisis of this magnitude with dignity and dedication," she said.

When revisiting her early drop-in surveillance work, she cautions, "we have created some sophisticated systems, but surveillance is best done by supporting the capacity at the state and local level. No one knows a city and county better than the people who live there. We need to invest in them."



Photo courtesy of CDC



Photo courtesy of CDC

From forest fires to terrorism: A champion for structure within chaos

Rear Admiral Scott Deitchman, M.D., M.P.H., actually is able to see the forest for the trees and has diligently championed more coordinated emergency response at CDC since his work with forest fires in 1988.

"I was a second year EIS [Epidemic Intelligence Service] Officer working in occupational health at CDC/NIOSH. We were investigating smoke inhalation risks to firefighters at the Yellowstone forest fires. To work in the fire environment, we had to attend Wildland Firefighter Training and there I was introduced to the incident command system. I saw the organization it brought to the response," he said.

Deitchman went on to investigate occupational illnesses and deaths in diverse workplaces. On the morning of September 11, 2001, this medical officer returned from a morning run in Wyoming to see images of the burning Twin Towers on televisions in the hotel lobby.

Didn't want to be out of touch

"I was attending a National Emergency Management Association conference. We had a number of FEMA staff out there," he said. While the FEMA staff caught a military plane back to D.C., others at the conference were scrambling for available cars to drive back. "I was on telephone and laptop with CDC and was helping from there. I didn't want to be out of touch for a three-day drive back to Atlanta, so I stayed."

The occupational health veteran helped craft recommendations for workers, including the use of personal protective equipment and respirators. "It was important to take the worker's perspective and understand the conditions in which they were responding," he noted. During the anthrax response that started soon after, he led the working group that addressed both occupational and environmental health issues including worker protection, environmental sampling, and building clearance.

Ultimately, Deitchman led CDC's first program to ensure the safety of first responders and other workers responding to acts of terrorism and other diseases. His path was set as he went on to lead the environmental and health work for terrorism and emergency response, preparing for chemical and radiological disasters. He also collaborated with infection control specialists at CDC to develop worker safety measures against TB, SARS, monkeypox, smallpox, and plague.

No formal protocols

When the anthrax response started at CDC, Deitchman knew we had no effective emergency management system in place. "People did exceptionally well with what they had, but we soon saw information overload and no formal protocols for responding to the demands," he said.

"At the time of the 9/11 attack, CDC had a small operations center at Chamblee focused primarily on environmental health response. CDC had to build a makeshift operations center in the old Building 1 in Auditorium A, with specialty teams working at side-by-side tables in the classrooms beneath Auditorium B. It was so noisy you had to step out to make a cell phone call," he recalled. Anthrax also exposed weaknesses in CDC's efforts to communicate with its public health partners and the public. CDC was criticized for its failure to communicate vital information to health-care workers and the public.

"We had to accept the chaotic nature of disasters and the need to have effective protocols in place to coordinate and communicate with others," he explained. "We finally modernized and found a permanent place for an emergency operations center. Based on the incident command system, it provides an infrastructure to support specialized teams that can disseminate timely and reliable information."

A penchant for calmly managing

Deitchman discovered, as did his leadership, he had a penchant for calmly and effectively managing large public health responses. He has been designated as the incident manager for CDC during a number of high-profile events, including the Asian tsunami disaster, Hurricane Katrina and the more recent oil spill and Japan disasters.

Since 9/11 and anthrax, much has changed at CDC in emergency response. "Compared to 10 years ago, the way we think is as different as night and day. I can see that our scientists here get it. We understand the 80-percent solution. We may not have statistical certainty when we make a decision and, yet, we have to recommend something and be willing to modify it later if the information warrants it. It's better than doing nothing at all," he said.

Deitchman perceives himself as a "generalist," with experience that spans environmental and biological health threats — useful for someone managing complex and overlapping health concerns in an emergency. What Deitchman may actually be is a unique public health pro who can see the forest and the trees.

NYC's Response to 9/11 and Anthrax: An excellent example of dedication, commitment and caring.

By Sara T. Beatrice, Ph.D., Assistant Commissioner, New York City Public Health Laboratory

The New York City (NYC) Health Department's Public Health Laboratory (PHL) first began to participate in the city's bioterrorism response planning in the late 1990's. This process established links between it and members of NYC's Office of Emergency Management (OEM), Fire Department (FDNY), Police Department (NYPD) and the FBI. NYC's Health Department was represented at citywide planning meetings, trainings and drills. PHL staff conducted biological trainings focused on helping the FDNY HazMat team identify anthrax, at the time using rapid field tests, becoming key members of their response teams which were activated whenever a suspicious package or letter was discovered. It wasn't unusual to receive a cell phone alert at the lab, be picked up by a first responder within minutes, and go to the potential bio-threat site (often a women's health facility that received hoax letters). All of this was in place years before September 11, 2001.



Photo courtesy of CDC

The laboratory, located in midtown Manhattan, was close enough to witness the attacks on the World Trade Center Towers, yet far enough north to avoid personal evacuation. The role of the lab became one of support. The avenue in front of the laboratory was a main route for tens of thousands of people evacuating lower Manhattan on foot. We set up a "decon" site on the front steps of the building to assist individuals covered in fine powdered dust returning from Ground Zero. The laboratory opened its doors to assist other government agencies; we set up a makeshift dormitory for children being housed by the NYC Administration for Children's Services, brought in computers and phone lines and provided space for NYPD Missing Persons detectives, and became the early site for people looking for missing loved ones. The wide, one-way avenue in front of the building became a two-way main route for emergency vehicles transporting the victims to the medical examiners offices for months to come; an escort with sirens announced the transport of each of the hundreds of uniformed fatality that passed the building. Days after, PHL staff assisted in collecting environmental samples at Ground Zero.

Our building also became the back-up emergency operations center for the Health Department, whose headquarters were just blocks from ground zero and forced to shut down until deemed safe to reoccupy. The Department's Incident Command Structure was in full activation with many of the agency's staff involved in response to the aftermath of the attacks.

One of the newest units at the PHL was our Bio-Threat (BT) Response lab, which occupied spaces shared within our molecular microbiology laboratory. Two technologists were funded through an Emergency Preparedness Cooperative agreement with the Centers for Disease Control and Prevention (CDC). Some lab equipment, testing reagents and protocols were also supplied by CDC. The technologists and space were assigned to other public health responsibilities when they were not working on BT specimens. Prior to October 2001, an Anthrax hoax letter was received every couple of months. On October 12, 2001, we received our first Anthrax laden letter which was mailed to the office of NBC News here in NYC. The ensuing investigation and media coverage resulted in our PHL receiving thousands of clinical specimens and environmental samples for anthrax testing.

The PHL's anthrax response took on a life of its own. Space needs expanded from one lab to 10 labs, including moving from BSL Level 2 into a BSL Level 3 lab belonging to a research institute located in our building. We established a separate law enforcement entrance and specimen intake area with a decontamination station, locked evidence rooms and we developed an interagency Chain of Custody protocol enforced by Health Department police officers. The Department of De-

fense (DOD) set-up three labs within our building and sent their scientists to do on-site rapid testing. These laboratories were fully operational in hours of arrival. Our virology staff went home on Friday when it was business as "usual" and came in on Monday to massive security checks because two of the three DOD labs were using classified assays. CDC also sent us scientists who were trained in Biosafety Level 3 (BSL-3) protocols and airlifted in six tons of supplies to the PHL. We went from two people working part time on anthrax to 75 people working on various components of accessioning, testing, reporting and monitoring biosafety protocols. Our 7-hour/5-day work week extended to a 24/7 schedule. We worked in unison as a single team. It was an excellent example of selfless dedication, commitment and caring.

As a group, we continued to receive many samples — coffee tables from a department store, suitcases from the airport, dollar bills that had been rolled up, you name it. A sampling protocol was developed to standardize and simplify the collection and transport process to ensure the safety of staff at all links in this incredible chain from the field to the laboratory. The entire response was a lesson on how to reshape our public health laboratory. Originally, our lab had subject matter experts who were responsible for their unit, staff and specific testing mission, i.e., the tuberculosis (TB) lab only did TB testing and the Retrovirology lab only tested for HIV; that is until the week after the NBC letter, then we set up a more unified response. The PHL became one cohesive unit: the chemists did the molecular testing; the HIV folks — who were doing enzyme immunoassay tests and Polymerase Chain Reaction (PCR) tests — became BT PCR responders; and our microbiologists, who were classic bacteriologists, did the BT micro work; all were now identifying a weapon of mass destruction — Anthrax.

The response certainly showed what kind of people work in public health because everyone willingly put in very long hours doing tasks that had often little to do with their regular jobs. Unknown to the public outside of the PHL, their personal lives were put on hold for months.

In the years since 9/11 and Anthrax 2001, much has happened to strengthen the NYC Public Health Laboratory. We set up a more robust laboratory that included a BSL-3 component for bio-threat response, ultimately, expanding this capability to an entire floor. We also created a cross training program that prepared staff on how to undertake various surge responsibilities. Working under the unified Laboratory Response Network (LRN) of CDC, protocols, state of the art equipment and funding for staff became available. Initially ample funding was available, which has eroded over time.

In 2006, we put all of this into action responding to an interstate case of human anthrax. Trained responders were deployed who could triage the collection of potential bioagents and decide which samples needed to come to the lab and which did not. Sampling and testing were focused and the PHL didn't get overrun with submissions.

Now, if there are outbreaks or emerging pathogens, the network is in place to send out blast communications to link the local medical and laboratory community to the Health Department; like we did for the 2009 Influenza pandemic which erupted in the schools of NYC and spread through the nation within weeks. We ramped up in a few days to cross-train staff, validated testing systems and successfully set up our incident command system. It was a remarkable difference from 2001.

I can not state enough how willing and able the public health world is to handle potential biothreats. However, that doesn't mean we aren't vulnerable.

The biggest threat is a sustainability of funding — it's just not there. So much of the response was driven and made possible through federal resources. Unfortunately, these federal grants have consistently been cut so that even service contracts for equipment purchased under the grants can't be maintained.

Funding is also tied to the workforce. Federal grant support for staffing is decreasing annually for initiatives relating to PHL emergency preparedness, as well as existing and emerging diseases. In addition, challenges to hiring staff compromise our ability to cross-train staff for surge responses and, ultimately, our readiness. The laboratory community is an aging population and fewer people are going into this field. Budget cuts and non-competitive salaries with the private sector are some of the biggest challenges we face, not just for emergency preparedness but for maintaining high quality laboratory systems. Commercial, university and hospital laboratories will not "risk" their mission and operations to perform the services of your local, state and federal public health laboratories. With bare resources, the public health community can respond to whatever comes its way for a short period of time. We need to ensure the resources and people continue to make it into these vital jobs. As first or last responders in a health related emergency, your public health laboratory is your only laboratory whose mission and staff are dedicated and trained to handle these responsibilities.

The Anthrax Events In Florida

By Phil Lee, MSc FIBMS, Biological Defense Coordinator, Molecular Biology, Florida Department of Health Bureau of Laboratories

In March 2000, I accepted the newly created position of Biological Defense Coordinator at the Florida Department of Health (DOH), Bureau of Laboratories (BOL) in Jacksonville. I had worked for the BOL for almost five years as a microbiologist in the virology, tuberculosis and molecular biology laboratories. In response to a growing concern for bioterrorism, the Centers for Disease Control and Prevention (CDC), the Federal Bureau of Investigation (FBI) and the Association of Public Health Laboratories established the Laboratory Response Network (LRN) in August 1999 with the mission to provide a robust laboratory infrastructure to detect agents of bioterrorism. In 2000, three of the five Bureau of Laboratories' locations (Jacksonville, Miami and Tampa) became LRN reference laboratories. Pensacola was later added in the summer of 2005.

In October 2000, I participated in the first training course at CDC to identify agents of bioterrorism. The week-long course covered the organisms of greatest concern, including *Bacillus anthracis*, the causative organism of anthrax. Almost a year to the day we received a call late in the afternoon from a clinical laboratory in Fort Lauderdale, Integrated Regional Laboratories (IRL), that they were sending us a patient's specimen that they could not rule out *B. athracis*. In the previous months the BOL had trained clinical laboratories, including IRL, on the microbiological methods used to rule out bioterrorism threat agents and the referral procedures in the event that they could not rule out such an agent. I received that specimen around noon on October 3, 2001. I immediately started the analyses that I had been taught at CDC. At that time, LRN reference laboratories had the capability to confirm the identification of biothreat agents using only conventional microbiological techniques, which involve culturing and growing the organism. This can take up to 24 hours for *B. athracis*. Rapid molecular methods, such as real-time PCR, that detect DNA specific to the organism were not available to us at that time. However, CDC had already performed a multi-center validation study for *B. athracis* DNA detection and released the method to the public health LRN laboratories mid-October 2001, only then allowing detection of the organism in less than six hours.



Photo courtesy of CDC

Without the benefit of the rapid molecular methods, two key conventional microbiological methods were required to identify *B. athracis*, one of which required overnight growth of the organism in culture. Throughout the afternoon and evening of October 3, I ran the one key test and obtained a positive result for *B. athracis* a little after 10:00 p.m. that night. During this time, CDC arranged the transfer of the specimen to Atlanta for additional testing and characterization. I left the laboratory at 11:30 p.m. and returned the following morning to read the results of the second key test. At 8:30 a.m. on October 4, 2001, I confirmed the identification of *B. athracis* in the index patient who had been admitted to JFK Medical Center in Atlantis, Florida, and whose specimen had been submitted by IRL. The sample was flown to CDC on October 4.

During my training as a Biological Defense Coordinator, I had learned that a typical bioterrorism scenario could involve an intentional release of an organism in a localized, highly populated area, such as a football stadium. In such an event, numerous patients would be expected from a small geographical area. Since this followed so closely the tragedy of September 11th, the Florida Department of Health sent an alert to all hospitals and physicians within the state requesting immediate notification of any patient exhibiting symptoms of anthrax. One additional

patient was identified that had been hospitalized since October 1. Because only one additional patient matched the criteria rather than hundreds, I was hopeful that these were naturally-acquired infections, not an act of terrorism. However, the fact that anthrax is not endemic in Florida was more than a little concerning.

In addition to surveillance for new cases of anthrax, the DOH Bureau of Epidemiology investigated both cases identified. They obtained samples from areas where the patients had been prior to hospitalization, including their workplace. These samples were sent to the BOL — Miami. A nasal swab of the second patient was also tested by the BOL. Both this nasal swab and a sample taken from the index patient's computer workstation tested positive for *B. athracis*. Since the second patient was a coworker of the index patient at American Media Inc. (AMI) and the index patient's computer at AMI was contaminated with *B. athracis* spores, it then appeared that this was an intentional release at the workplace. Further laboratory testing on samples collected by the Environmental Protection Agency (EPA) confirmed this.

Following a press release, on October 8, 1,114 people who worked in or had visited the AMI building during the previous 60 days presented at the Palm Beach County Health Department (CHD) for prophylactic ciprofloxacin. Palm Beach CHD collected 1,076 nasal swabs and submitted them for testing at the BOL — Miami. One additional AMI mail worker tested positive, but never developed symptoms of the disease.

The additional laboratory testing determined that the AMI mail room and company mail van were grossly contaminated so it was assumed that the source of the *B. athracis* spores was possibly via the U.S. Postal Service. Once this was communicated through the media to the general public, people felt they were potential victims and started seeing mail and common spilled household white powders (flour, corn starch, etc.) as potentially spore-laden materials.

On October 10, 2001, we started to receive these suspicious materials at the BOL. The first such sample received was delivered by our FBI Weapons of Mass Destruction Coordinator. It was a Federal Express package of film slides and negatives sent to a Jacksonville business from the AMI photographic editing department. Thankfully, the presence of *B. athracis* was able to be ruled out, to the relief to the business owner and the employees.

The following day saw a steady increase in the numbers of such samples received and it soon became obvious that help was needed. Fortunately, the BOL — Jacksonville laboratory is one of the largest tuberculosis testing laboratories in the United States. TB laboratories are high containment facilities, designated biosafety level 3 (BSL-3), with engineering controls and special microbiological practices, including the use of respirators, designed to ensure the safety of laboratory personnel and prevent release of organisms into the environment. BSL-3 laboratories are also required to safely handle and work with *B. athracis*. With such facilities, including many biological safety cabinets and isolation rooms, and many staff trained to work in them we were able to manage the increased workload. Employees volunteered and were reassigned with everyone having a role to play. At BOL — Jacksonville, we had 18 microbiologists from the TB and General Bacteriology laboratories participating in the analyses of samples; Yvonne Salfinger, Microbiology Laboratory Administrator, organized staffing; Susanne Crowe, Virology/Serology Laboratory Administrator, managed the sample database; Dr. Dean Willis, Chief of Infectious Diseases and Clinical Services, facilitated laboratory operations and logistics and was media liaison; Dr. Ming Chan, Jacksonville Laboratory Director and Bureau Chief, coordinated the activities of all BOL sites and communicated essential information to the Florida Department of Health Secretary and Governor. In addition, a plethora of support personnel were involved in sample receipt, data entry, ordering and receiving supplies, financial management, information technology support and results reporting. At the height of the crisis, the laboratory operated 18 hours per day, seven days a week, with staff work hours staggered to optimize availability to manage the workload.

As the crisis escalated with additional anthrax victims identified in other states, the work volume remained high for several months. Between October 2001 and June 2002 the BOL — Jacksonville, Miami and Tampa LRN laboratories processed 10,690 samples for *B. athracis*. This included both clinical patient specimens from our hospital sentinel laboratory partners as well as environmental samples, including many hoax threats. One of the more concerning of these was perpetrated by Clayton Lee Waagner. Waagner, at the time one of the FBI's 10 most wanted fugitives, mailed letters and Federal Express packages to more than 250 abortion clinics nationwide. The packages contained powder laced with high concentrations of *Bacillus thuringiensis* spores. *B. thuringiensis*, an insect pathogen used as a biological insecticide, is genetically closely related to *B. athracis*, but is not harmful to peo-

ple. Between October 15 and 17, 2001, BOL — Jacksonville received and tested seven such letters mailed to Planned Parenthood Clinics in Florida and an additional seven Federal Express packages received November 8 through 10, 2001. These tested positive for *B. thuringiensis* and negative for *B. athracis*.

The types of environmental samples received were variable to say the least. From the obvious bulk mail from post offices, suspicious mail from homeowners and powder samples (including powdered doughnuts), to the more obscure airline seat covers, dead birds, body bags, teddy bears, disposable underpants, a Marilyn Monroe effigy and residential mail boxes together with post and concrete anchor. It seemed nothing was too bizarre, but each presented a new challenge, not only to those of us in the laboratory attempting to safely handle and provide quality testing, but also to the first responders collecting and packaging such items for delivery to the laboratory.

The partnerships we had begun to develop with the first responders during the previous year were solidified. We worked so closely with a multitude of agencies, such as local, state and federal law enforcement officers, postal inspectors, fire department hazardous materials (HazMat) teams and police bomb squads, that we knew each other on a first name basis. The same can be said of our clinical partners in the hospital sentinel laboratories and county health departments. Over the past ten years these partnerships have continued to strengthen. With the direction of Associate Bureau Chief and BOL — Tampa Director, Dr. Phil Amuso, and the University of South Florida's Center for Biological Defense, we provide environmental sample collection training to all HazMat and first responder personnel in Florida and sentinel laboratory biological defense training to all clinical microbiology laboratories.

Despite the increased workload and extended working hours, throughout the entire anthrax event, the BOL continued to deliver all daily public health services. Each day thousands of specimens were received and tested for tuberculosis, HIV, hepatitis viruses, sexually transmitted diseases, rabies, influenza, food borne illnesses, genetic disorders of newborns and many others.

Throughout the anthrax events the BOL LRN laboratories proved to be essential to both the public health investigation as well as the FBI's criminal investigation. The laboratory confirmed *B. athracis* as the cause of infection in the index patient; identified other exposed persons by isolating *B. athracis* from the nasal swabs of the second patient and an asymptomatic AMI mail worker; ascertained a workplace exposure to spores; and together with the EPA determined the mechanism of dissemination of the agent via the U.S. Postal Service.

The foresight that went into the establishment of the LRN was phenomenal. Before the inception of the LRN, the majority of state public health laboratories were not able to quickly and definitively identify *B. athracis*. Cultures would have to have been sent to CDC for identification. The decentralized LRN approach gave state and local public health laboratories the capability to identify many bioterrorism threat agents. A key part of the LRN is a CDC comprehensive training program for biological defense personnel such as me, on which I have been an instructor since 2005, as well as sentinel laboratory outreach performed by the public health LRN laboratories. Without the LRN, the 2001 anthrax events could have taken a very different path, likely delaying initial patient diagnosis and almost certainly lengthening the turnaround time for environmental sample testing due to the overwhelming number of samples to be tested at CDC. The major consequence in delaying diagnosis, particularly with organisms such as *B. athracis*, which can be fatal if not recognized early in the course of infection, could have been a much higher incident of clinical cases and resulting mortality.







Photos courtesy of CDC

The lessons learned from the anthrax events of 2001 and the subsequent injection of additional state and federal funding has greatly increased Florida's capability and capacity to respond to public health emergencies, whether due to terrorism, natural disasters, or outbreaks or emerging infectious diseases, such as SARS and 2009 H1N1 Influenza.

Jim Pearson, Dr. PH, BCLD, Virginia Department of General Services Deputy Director for Laboratories, Consolidated Laboratory Services During 9/11 and Anthrax

While it appeared that the 9/11 and anthrax tragedies were unforeseen and caught the country totally unprepared, public health departments and laboratories had been planning for disaster for years.

For public health laboratories, the coordinated national response framework began with the formation of the Laboratory Response Network (LRN) by the Centers for Disease Control and Prevention (CDC), the Federal Bureau of Investigation (FBI) and the Association of Public Health Laboratories (APHL). This national resource became operational in August 1999 and continues as a collaborative effort among the founding partners. That early framework has been strengthened by the infusion of federal preparedness funding in the decade since the events of 2001, but support is eroding and new challenges face the network.

When the planes hit the World Trade Center towers, the LRN steering committee was meeting at CDC. The first crisis driven action of the LRN was the preparation and distribution of a message reminding member laboratories to consider the risk of secondary attacks and to be on the alert for unusual packages and samples. The LRN planning provided the contact information needed to quickly send critical information to every state and major city public health laboratory.

The initial planning, development, distribution and use of common laboratory assays, training of personnel and consistent use of those procedures prevented total chaos when anthrax spores were dispersed through the mail in 2001. Laboratories would have cultured those 'white powders' and other environmental specimens and used unfamiliar testing protocols to identify the organisms that grew. Misidentification would have happened and the credibility of the state laboratories would have been challenged.

Hitting Home

The people in Virginia who contracted anthrax survived. Part of the reason for the positive outcome was the responsive infrastructure developed through the LRN.

One patient went to an emergency room and was discharged after having a blood sample drawn for culture. When the blood culture developed growth, the hospital sent the lab the positive bottle. Within 40 minutes of receiving the specimen, the LRN polymerase chain reaction was reactive for *Bacillus anthracis*. The patient returned to the hospital and was successfully treated with the appropriate antibiotics. The LRN provided the assay, the equipment, the reagents and the training. Having that laboratory infrastructure available prevented deaths, and having consistent, reliable laboratory testing available in every state and major city helped calm the hysteria after it was determined that anthrax was being sent in letters through the postal system.

The Division of Consolidated Laboratory Services (DCLS) avoided inundation with low or no priority samples because relationships had been built. District Health Departments, local police departments, fire departments and hazardous materials teams coordinated sample collection and triage to assure that only credible samples reached the laboratory. The system didn't always work, but the laboratory wasn't completely overrun with samples. Still, the laboratory ran out of space to secure samples before and after analysis. People worked 16-hour days to keep up with the workload; white powders and other samples were tested for anthrax and timely reports were issued to the submitters. And the laboratory system learned from the experience.

A Decade of Progress

Still the relationships weren't perfect. When anthrax hit, hazmat teams and many local responders had not identified DCLS as their laboratory. They do today and they know how to access and use DCLS. While the early response was good, the interactions today between the local first response communities and the lab have improved dramatically. First responders train with laboratory per-

sonnel. Procedures now instruct first responders to split the sample and send a portion to DCLS before exhausting the sample with field assays. Priority and high profile samples are split and a portion is sent to DCLS for a definitive analysis.

In 2001, DCLS was in an old building that didn't have secure evidence storage for samples before testing. Locks were put on the conference room to secure the 'evidence.' Shelves were added. Someone stood at the building entrance to log samples and assure chain-of-custody and integrity of packaging was intact. Without a Laboratory Information Management System (LIMS) everything was logged, analyzed and reported on paper. Samples were placed in red bags and moved to the pre-analytical evidence room. The lab did not have an evidence storage facility for samples that had already been tested. An unused firing range in the basement was retrofitted for post-analytical evidence storage.

Retrospectively, the attacks proved to be a great training exercise. The ability to respond has been improved by the Public Health and Emergency Preparedness cooperative agreement. That surge of funding helped restore the failing public health infrastructure and provided staff, new equipment and a far more robust training mechanism.

The preparation/capability/infrastructure is eroding — state and local salaries have not kept up with the times; we lose good people to positions in other laboratories or to other careers. Routine equipment maintenance agreements are essential to assure timely service and preventive maintenance on critical equipment, yet those agreements are expensive. A maintenance agreement on a $150,000 piece of equipment can cost $20,000 or more per year.

Unfortunately, aging of the existing laboratory infrastructure isn't the country's only vulnerability. Currently, the country has very limited capability and capacity to test environmental samples for chemical weapons materials, and few laboratories have the equipment and expertise to test human samples for radiation. If someone in the United States was exposed to Polonium, similar to the event that occurred in England, our total country-wide laboratory capacity would be overwhelmed in hours. Radiation testing equipment is expensive and trained personnel are in very short supply. Ramping up laboratory capability and capacity after an attack would be incredibly difficult if not impossible.

My view of laboratories and their relationship to public health might be different than others because of the way the Virginia laboratory is structured. We are not just a state public health lab charged with providing support for the Virginia Department of Health. DCLS also provides laboratory consultation and support for the Department of Environmental Quality, the Department of Agriculture and Consumer Services, the Department of Labor and Industry and many other local, state and federal Agencies.



Photo courtesy of CDC

The laboratory is a Division in the Department of General Services, an agency that does not use DCLS testing. Consequently, the laboratory had to build strong relationships with various government agencies, law enforcement groups and others to ensure the pipeline of samples and other responsibilities flows efficiently.

We moved into our new building in May of 2003. A training lab was a priority in design. We knew that access to laboratory training was essential to having a robust laboratory system in Virginia. Science changes and the laboratory must adapt. Laboratory space was designed for maximum flexibility to accommodate change without renovation. The events of 2001 provided many insights into how that flexibility might be needed. LIMS now support critical laboratory functions. We are better staffed. We have much more capacity and more equipment.

If a similar attack occurred today, the laboratory would be far more capable of providing timely and accurate laboratory support.

Connecticut's Anthrax Experience of 2001: A Public Health Laboratorian's Perspective

By Diane Barden, Bioterrorism Response Laboratory Supervisor, Connecticut Department of Public Health — Public Health Laboratory

In March of 2001, I joined the State of Connecticut Department of Public Health as a Bioterrorism (BT) Coordinator in the Public Health Laboratory. My primary responsibility focused on training hospital microbiology laboratory staff to spot potential bioterrorist threats.

My role would drastically change in a matter of a few months, after Ottilie Lundgren, a citizen of Oxford, Connecticut, became the last known victim of the anthrax attacks in November of 2001. Instead of focusing on training, I became an integral part of the investigation and response team. At the time, the late Dr. Katie Kelly was the Laboratory Director. She had previously been the Chief of the Laboratory Practice Training Branch at the Centers for Disease Control and Prevention (CDC) and had participated in bioterrorism preparedness. She was instrumental in coordinating the laboratory response to the anthrax mailings in Connecticut.

In just a short time, the training conducted in Connecticut hospitals paid off, as we quickly identified *Bacillus anthracis* from specimens of the suspect anthrax case. CDC flew to Connecticut to pick up our samples for further testing, which confirmed our results and worst fear — a Connecticut resident died due to inhalational anthrax.

The Connecticut Department of Public Health quickly became part of a multidisciplinary response team that included representatives from public health, CDC, law enforcement, the U.S. Postal Service and others working together to determine the source of the anthrax and prevent further contamination and infection.

How Ms. Lungren was exposed was a mystery then and now. Our epidemiologists scoured Ms. Lundgren's home and the places she frequented such as her church, beauty salon, a restaurant and even the cars she had traveled in, taking hundreds of samples. These samples were transported to the Public Health Laboratory for testing. The death of a nearby Connecticut resident was investigated and it was concluded that he died of natural causes, however, the laboratory tested mail recently received by the deceased and it was positive for *B. athracis*.

This led the investigation to the local postal distribution center, where we found anthrax in the processing machines. Subsequently, 450 postal employees had nasal cultures performed to ensure no one else was exposed to the deadly anthrax spores, all of which tested negative. Once we determined which machines were involved, decontamination was necessary. Using validation methods available at the time to confirm decontamination, there were no additional traces of anthrax recovered. However, in April of 2002, we found anthrax had remained in the facility and a more extensive building-wide decontamination was done.

After we offered testing to the public, the public samples started flooding in to the laboratory. We accepted new samples from 8:00 a.m. to 9:00 p.m. Samples included everything from grocery store floors to confetti, packing peanuts and white powder contained in malicious letters. We also processed postal samples from New York and New Jersey and uncovered yet more positives. In all, we processed 50 or more samples a day, every day for several weeks.

My staff was great, working long hours under great pressure. We had six staff that performed the testing and virtually the rest of the entire laboratory staff provided support services for everything else. I will always remember the Thanksgiving dinner we shared that year in the Public Health Laboratory. One of our administration staff and his wife cooked a turkey for us with all the trimmings. It was not exactly where I wanted to be during Thanksgiving, but it was one that I'll always remember.



Photo courtesy of CDC

We learned how to manage this crisis as we went along, and realized we needed some additional expertise. For example, we hired an evidence control officer to manage chain of custody control and associated law enforcement issues. He taught us how to receive samples correctly and preserve evidence. He also helped develop and deploy the emergency response kit that is in every emergency room in acute care hospitals in Connecticut today for the collection of biological, chemical and radiological samples.

Looking back over the past 10 years, we have come a long way in regard to our ability to respond to a bioterrorism event. Biosafety Level 3 laboratory space was not a standard feature in state public health laboratories, as it is today. We built a modern Biosafety Level 3 laboratory, significantly increasing our capacity to process potentially weaponized samples. We train regularly with first responders and law enforcement, and have systems in place to properly manage and preserve evidence. In all hospitals in the state, laboratory staff receive annual proficiency training to recognize select agents and emergency rooms receive training on what to do when they encounter a suspect bioterrorism agent.

In 2007, there was a naturally occurring case of anthrax in Danbury, Connecticut. This time, our response went much smoother than in 2001. We knew how to correctly process the samples, had state of the art testing methods and the necessary reagents and had strong relationships with law enforcement and other partners.

When I came to the Department of Public Health in 2001, I didn't think I would be on the front lines of responding to a major bioterrorist incident, and I hope I don't have to go through a similar experience in the future. But I'm proud of our response and the work we've done since 2001 to enhance Connecticut's capacity to respond to future threats.

Lab's Lab: How Missouri's State Public Health Laboratory Helped the Public Survive Anthrax

By Eric C. Blank, DrPH, Senior Director, Public Health Systems, Association of Public Health Laboratories

On September 7, 2001, I broke my leg. On September 11, 2001 a senior scientist ran down to the lower floor of our lab with the most shocked look on her face I have ever seen. Much like my leg, that was the initial feeling (or lack thereof): numbness. We had prepared for something like 9/11 and the anthrax attacks that followed — but we could never really imagine something like that until it happened.

In 1997, we began working with law enforcement to put in place protocols should a biological attack occur. By 2001, we had a level of understanding with the Federal Bureau of Investigation (FBI) and I, as head of the Missouri state lab, had met with the FBI weapons of mass destruction coordinators to create protocols for how to process suspected biological agents. Because of these relationships, it was much easier to coordinate with local law enforcement and draw resources from our state health department to ensure first responders knew how to process potential biological agents.

Consequently, we had the authority to exercise more control over what was submitted to the laboratory and what we had to test. This saved us from being completely overrun with samples like some other states. This groundwork proved to be invaluable.

As head of the Missouri state laboratory, I knew my job was to keep things running as close to normal as possible. This meant efficiently testing all the powders and other oddball things that came in, but also ensuring that we were meeting our routine obligations such as the newborn screening, since babies were still being born. In short, we had to handle the influx of samples while not cutting vital services to Missourians.

Immediately after 9/11 we enacted our emergency response plan which included specific measures for microbiological attacks. We extended work hours and set up rotations to handle the massive amount of samples. Instead of working 8:00-5:00, we worked 6:00-8:00 and had people on call 24 hours a day. But I made sure we rotated people through so as not to burn them out. Given the shock of the events, we had to be careful not to over-stress people more than they were already. In total, we ran around 500 samples over the course of about five weeks — with most coming during the first three weeks. We also processed a hundred or so additional samples for the Centers for Disease Control and Prevention (CDC) because a pallet wound up in Kansas City that was originally in New Jersey.

In total, we had done a pretty good job preparing for some sort of tragedy — we knew there would be a massive influx of work. However, what we didn't account for nearly enough was the need to help the public work through these tremendous tragedies.

Lab's Lab

In a sense our lab staff was lucky. With security heightened, our building was determined to be a possible target so we were given guards. Our security detail was pulled from the state fire marshals office and with him came his Labrador retriever. Quite simply, the dog helped our workers. If the marshal and his dog were there to greet them in the morning, they knew all was well. The dog would greet every person with a wag of its tail. The dog was calming and reassuring — it was something normal during a time that was anything but. We rechristened the dog "the Lab's lab."

I knew that we had to try and provide the same level of comfort to the public.

As the head of the lab, I took it upon myself to be the front end of the response and shield my staff from the media so they could perform the real and potentially life-saving tasks. Since the media knew where the suspect anthrax samples were coming, I worked with the health department administration and became the spokesman because I knew what to say, what not to say and that I could give the right amount of information succinctly — so I spoke with media across the state

for about a month — almost nonstop. It was crucial to place myself at the center of the information because there were so many rumors circulating and it was difficult to coordinate within all levels of the health department.

That said, I don't know if there was much we could do to completely ease the public's concerns. Nevertheless it's vital to work with the public and disseminate clear, concise and consistent messages. I think this is overlooked as a critical element in response to any tragedy.

As we tried to calm the public, samples came in less frequently, eventually returning to the norm of two to three environmental samples per month.

Lessons Learned

Aside from the learning curve involved with informing the public, the biggest challenge we had was that no one was really battle-tested when it came to operating the incident command center concept. This concept is "a set of personnel, policies, procedures, facilities and equipment, integrated into a common organizational structure designed to improve emergency response operations of all types and complexities" according to the United States Center for Excellence in Disaster Management and Humanitarian Assistance.

Once samples stopped coming in, we immediately worked to get people trained in incident command. With the funding from the Public Health Emergency Preparedness (PHEP) agreements, Missouri and other states were able to stand up their emergency response operations, specifically utilizing incident command principles. This represented a major shift in how labs prepared for potential attacks.

By the time H1N1 rolled around, there was a dramatically improved ability to quickly stand up emergency response centers — a capability we didn't have in 2001. This really represents the big change in the last decade. While we incorporated some of these response strategies in 2001, we were slower to get there and it wasn't under one unifying umbrella. Now with all the training and certifications, it can be stood up much quicker.

Quite simply, with incident command, we can better respond on a broader front as a health department and lab to the public and are better equipped to organize the response to the event itself.

We Need to Keep Going

The current budget situation and economic climate has started to erode the response capability and capacity in public health laboratories and



Photo courtesy of CDC

agencies. I'm not trying to overstate this but the PHEP agreements have been diluted by funding more activities with the same amount, or less money. States have laid people off, reduced services and lost people who have the response expertise and experience.

We have worked hard to build incident command and expanded the number of labs with information management systems. However, my real fear is that now that we can take lab data and zip it from state-to-state and get it to providers and public health agencies, there won't be anyone in the labs to do the tests and in the health agencies who know how to act on the information. I am truly concerned that what we have built up to respond to these events (which worked for H1N1) is eroding significantly.

If you said to me that tomorrow we'll have another event, I'd think that you'll see states scramble to be able to respond. We are probably victims of our own success because the H1N1 response went so well that the laboratory role is taken for granted and undervalued by policymakers and our public health colleagues.

My concern is not abstract. When you think about what is happening in Japan with their nuclear plants, it reminds me of the situation in Chernobyl in the late 1980s. Back then, the United States had many sites throughout the country monitoring air. Yet now we are looking to just state capabilities on the west coast to monitor air quality and possibly standing up 10 more labs to monitor air quality across the country. If there is a release, we need to know more than just what is dropping on the west coast. What about the central part of the country? The east coast? With this recent event in Japan and our experience 10 years ago, we know a biological event requires a country-wide response, yet we haven't maintained that capability and there doesn't seem to be the interest or will to restore it.

A decade after the Anthrax Attacks we are better prepared but can we maintain Laboratory Preparedness activities at this level?

By Victor Waddell, Ph.D., Bureau Chief, Arizona Public Health Laboratory, Arizona Department of Health Services

Just before September 11, 2001, I joined the newly formed BioEmergency Response Section at the Arizona State Public Health Laboratory. As a public health scientist, I was one of only a few people in this section, but we rallied together to tackle all the challenges — from location and space to staffing and supplies.

Prior to the first confirmed anthrax attack and in preparation for a potential bioterrorist attack, we had to ensure the BioEmergency Response Lab would be fully functional to serve the needs of Arizona. This was incredibly difficult as we had an older facility which made bringing on new programs a challenge. Before purchasing new equipment and instruments, we had to make sure the footprint of the equipment would actually fit in the lab. We looked at every inch of available space and used it as best we could.

At the outset of the anthrax response, we were basically operating out of a closet. We built a makeshift lab in an unoccupied office — this became our BioEmergency Response lab.

While our group was small, we had great support from staff in other sections of the lab. This was incredibly important as we watched our sample volume increase rapidly. In fact, we received over 1,000 samples in the six months that followed the attacks. We worked morning, noon and night, every day, including Thanksgiving, Christmas Eve and Christmas with three shifts every day. We tested everything from letters to full suitcases that had been rubbed against drywall — try getting those types of objects into a biosafety cabinet.

In addition, the resources we needed posed a significant challenge, especially since the testing demand was greater than anyone could have imagined. Further exacerbating the issue, real-time polymerase chain reaction and specific fluorometry tests were in their infancy in our public health laboratory. We had to perform all tests with culture or biochemical methods, which could take up to 72 hours before you could see growth of anthrax if it was present in the sample. We met the testing demand, but we would have faced difficulties if the samples kept flooding in at such significant numbers.

As we responded to the attacks, we began to work closely with the Emergency Preparedness and Response Bureau at the Arizona Department of Health Services, the Department of Public Safety, Federal Bureau of Investigation (FBI), local health departments and law enforcement agencies to develop protocols for bringing samples to the lab for testing, maintaining chain of custody requirements, and protecting those individuals handling and shipping the samples from any hazards.

In addition, we started coordinating at the national level with the Association of Public Health Laboratories (APHL) and Centers for Disease Control and Prevention (CDC) Laboratory Response Network (LRN). APHL became a great conduit for information exchange which helped us deal with questions and calls from the news media; something we had never had to deal with on this scale before. Samples were flooding in and phones were ringing off the hook.

In the decade since the anthrax attacks, things have changed dramatically. While we still perform the culture testing methods, we also use real-time polymerase chain reaction methods which provide preliminary results in a 4-6 hour timeframe. As a fledgling program, originally we could only test for anthrax and a few other select agents, now we can test for many more agents and toxins.

The anthrax attacks demonstrated a weakness in our Public Health Laboratory infrastructure in Arizona. We recognized the restrictions placed on us by the existing laboratory facility,

which then was more than 30 years old. This laboratory severely lacked space and appropriate equipment to meet the surge in anthrax testing while maintaining other critical public health testing such as rabies, influenza and Tuberculosis. As a result of this desperate situation, the Arizona State Legislature approved close to $25 million in 2002 to construct a new laboratory facility. We now have a state of the art lab with 15 biosafety cabinets and 22 chemical fume hoods. Recognizing and responding to this weakness allowed us to put in place the necessary infrastructure with significantly more qualified trained personnel to respond effectively to the surge in sample testing volume during the 2009 H1N1 pandemic.

We have come a long way since the anthrax attacks 10 years ago, with much improved communications between the lab and all parties involved in response to a Bioterrorism event. All of this could not have happened without the influx of funds from CDC and the state of Arizona. Are we better prepared today? Certainly we are, however six months from now my answer to this question might be different as we continue to see reductions in both federal and state funding. Still, make no mistake; it has been a dramatic improvement.

With federal funding for Biological Laboratories from the Public Health Emergency Preparedness grant gradually dwindling after hitting its apex in 2002, we've scaled back some capabilities, and given the current economic downturn, maintaining capabilities has become an even greater challenge.

In addition, we continue to struggle with the challenges of finding and hiring qualified laboratory staff. One way to cope with fewer people is to automate the testing process, and rather than manufacture lab testing supplies in-house, we now rely heavily on CDC and private companies to provide us with these supplies. While this may be more cost effective, it leaves us vulnerable. When you lose workforce skills for those basic lab necessities, you end up competing for the same source of lab testing supplies nationally if not internationally. This happened during the 2009 H1N1 pandemic and could also happen in the event of a large scale bioterror event across multiple states. To truly be prepared, we need to have qualified, trained staff and there needs to be dedicated funding for lab testing and reagent stockpiles.

There are still some weaknesses in our nation's laboratory preparedness, particularly in regard to radiological testing capabilities. I fear this could be the case if we experience a radiological attack or nuclear event such as what happened in Japan in March. Across the nation, there aren't enough radiological testing labs with response capabilities. But we should not build up radiological testing capacity at the expense of our current response capabilities in both Biological and Chemical testing areas. We've spent a lot of money to be prepared for another bioterrorist attack; those skills and capabilities cannot be replaced overnight if we let them lapse.

I believe we've come a long way in our state. We will handle any potential attack much better than we did a decade ago. The question is whether we'll be able to maintain the important capabilities the public deserves. Currently it's a legitimate fear that we may not be as prepared one, five or 10 years from now.

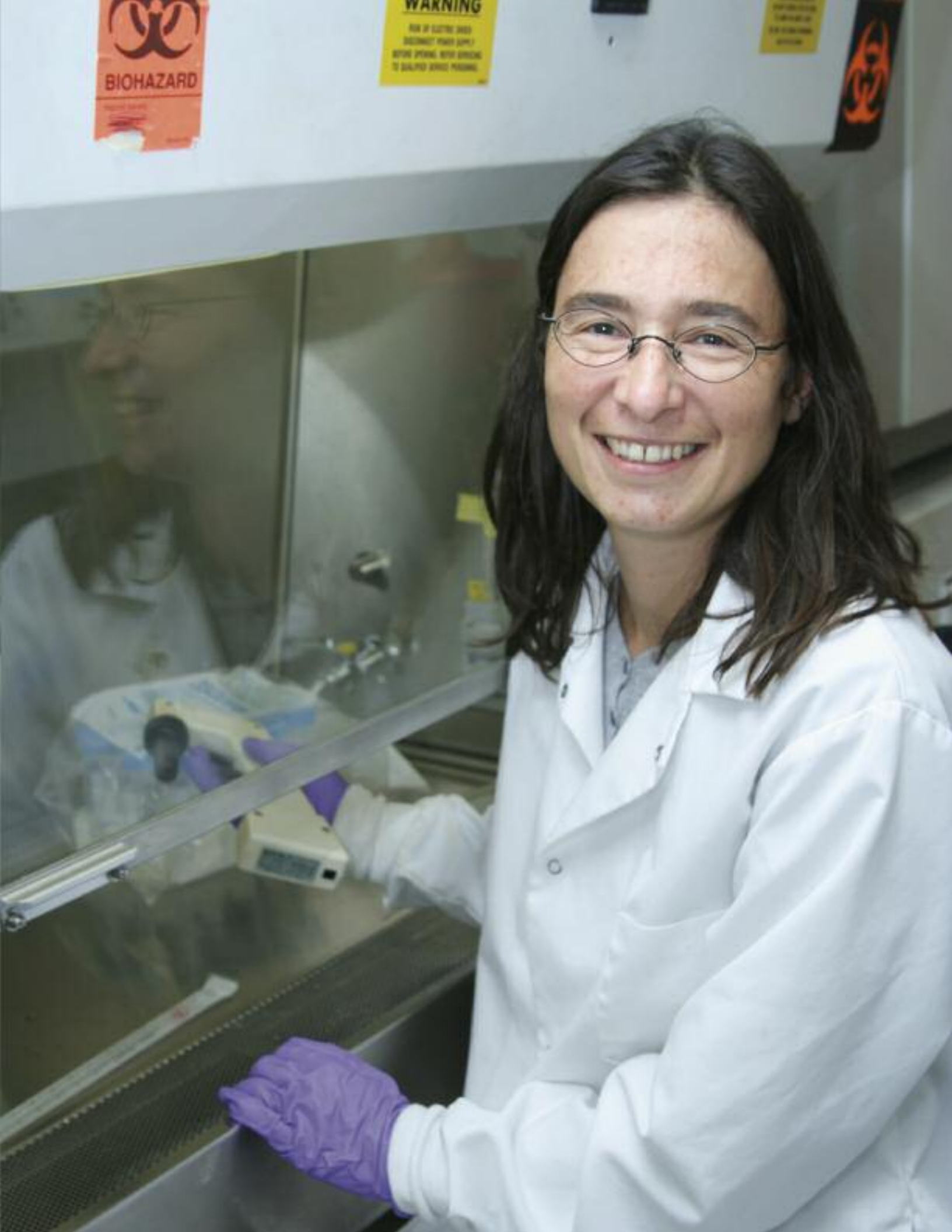


Old Laboratory, *Photo courtesy of Victor Waddell*



New Laboratory, *Photo courtesy of Victor Waddell*

"In sharp contrast at one point we had to make sure the footprint of a new instrument would fit in the old lab, now the new lab is incredibly flexible preparing us for anything that might come our way."


BIOHAZARD
WARNING



Public Health Staff: Unsung National Heroes

By Segaran P. Pillai, Ph.D, MSc, SM (AAM), SM (ASCP), Chief Medical and Science Advisor, Science and Technology Directorate, U.S. Department of Homeland Security

In 2001, I was the director of the Florida State Public Health Laboratory in Miami which responded to the first anthrax attack in the history of the United States. In that capacity, I was one of the lead investigators and worked in collaboration with members of the Centers for Disease Control and Prevention (CDC), Federal Bureau of Investigation (FBI), United States Postal Inspection Services (USPIS) and the Palm Beach County Health Department.

As such, I was involved in the entire response to anthrax, from sample collection to testing and aiding the criminal investigation. In addition, I also helped create the process for medical countermeasure dispensation to the employees and visitors of the American Media Inc (AMI) building where anthrax exposure occurred.

During the response, I worked 18-20 hours a day for several weeks with my Assistant Director Dr. Peter Shih and other members who performed shift duties from the laboratory (notably Ms. Jody Dielmann, Ms. Romy Erase, Ms. Rosy Cortes, Ms. Elsa Merlo and Mr. Marc Diamante, Ms. Aurora Garcia, Ms. Christine Pillai (volunteer) and Mr. Dwight Frazier) as well as members from the Miami Dade County Health Department(notably Mr. Pablo Gonzalez, Mr. Walter Livingston, Mr. Gabriel Garcia and Mr. Robert "Sterling" Whisenhunt) and the FBI WMD coordinator, John Bellamy. We worked tirelessly to ensure the public health mission was met. At times, when I headed back home to catch a nap, I would receive a call a couple of hours later relating to a high priority sample that required immediate testing. After a few instances, I and my Assistant Director Dr. Shih decided to catch little naps when possible at the office. We operated 24/7 because samples were coming in at all times throughout the day and laboratory testing was being conducted as they arrive. My lab processed a total of 14,244 samples (12,687 Environmental Samples and 1,557 Clinical Samples) over a period of two years between September 2001 and August of 2003 as a result of the 2001 Anthrax attack.

The hardest part of dealing with the anthrax attack in 2001 was the lack of resources and personnel to support the excessive number of samples that ended up in the laboratories. This was due to the challenge for the First Responders to perform appropriate hazard assessments in the field to determine true potential threats. Most of these samples required immediate testing because of the fear associated with a biological threat agent that had a very high mortality and morbidity rate. In addition, the lack of robust laboratory processes and mechanisms to support high volume testing, the lack of appropriately trained laboratory scientists, the lack of available Biosafety Level-3 (BSL-3) laboratory space to conduct high volume select agent testing, the lack of appropriate technology, assays and reagents and the lack of appropriate sample collection and processing methods and procedures to support investigations contributed to the complexity and difficulties to the response.

At the time, laboratory funding was inadequate to support a response — the CDC focus C grants, which help laboratories enhance their preparedness capabilities, had not been created. Under these grants and state funded efforts, we now have fully trained laboratory scientists who can conduct high complexity tests on select agents. The grants also went toward creating BSL-3 space that support the testing of biological threat agents in a safe and secure manner. In the 10 years since the attack, 160 public health laboratories have become part of the CDC Laboratory Response Network (LRN).

In 2011, we now have the appropriate technology and assays to support rapid detection and high volume testing and have developed sample collection and processing methods that incorporate epidemiological investigation methods.

We've also better trained those on the front lines, including primary care and infectious disease physicians and nurses. I am confident they can recognize a disease associated with select



Photo courtesy of CDC

agents rapidly and effectively. In addition, they are able to safely and quickly handle and ship samples to LRN laboratories.

All aspects of the response to a bioterrorism event have been strengthened in the last 10 years. In fact, we saw incredible improvements in just two years. In 2003, a joint investigation between FBI and CDC was initiated to understand the level of contamination of the AMI building; this resulted in approximated 6,500 samples. The Florida State Public Health Laboratory in Miami assembled sample collection kits and performed all the testing. The lab operated 24/7 for two weeks to analyze each and every sample. As with the initial anthrax response, there was no compensation for the incurred overtime, but that wasn't a problem. Those who join the public health community realize that we don't do what we do in anticipation of compensation. In other words, public health staffs are the unsung national heroes who give time and risk their lives to ensure the safety and security of the public.

The anthrax attacks also brought the public health, medical, law enforcement and first responder communities together. Quite simply, no single agency, office or team is capable of handling, responding or mitigating a biological attack. As such, the success stories of the 2001 anthrax attacks are the collaboration and coordination of activities among state and local public health members with law enforcement, first responders and the federal government. Even though we were extremely challenged in 2001, information was shared in a timely manner with all the critical members.

Today, the nation is better prepared to prevent an adversary from acquiring a biological threat agent, protect the critical infrastructure, rapidly detect an attack through robust surveillance and respond and recover from a potential biological attack.

Biological attacks can be devastating. A biological attack can result in high morbidities and mortalities if we are not prepared to handle it effectively and swiftly. The economic impact associated with a biological attack can be significant. We need better methods for decontamination and clearing a facility for re-occupancy. We need better assays and technology to support rapid detection and surveillance. We need better medical countermeasures and better and faster methods for distribution and dispensation of these medical countermeasures to potentially exposed individuals. We need better tools to support laboratory diagnostics to differentiate and identify infected individuals early to initiate rapid clinical interventions. We need better methods to protect the biological select agents so that our adversaries are not able to acquire them. We need to explore innovative approaches to conduct biosurveillance, public health surveillance and biomonitoring to prevent an event or to acquire advance/early warnings about an attack. We need better methods for assessing credible samples versus non-credible samples prior to subjecting to laboratory analysis.

My biggest concern is that the country is getting complacent and we might be losing focus on the importance of being prepared. We, as a nation, invested in building an infrastructure to ensure that the public health program is better prepared to respond to a biological attack. As time passes without an event and the budget continues to shrink, so does our ability to be fully prepared. The failure to maintain the infrastructure we have built can result in reverting us back to where we started. It will cost significantly more to get up to speed if an event were to occur, than it would to maintain the infrastructure we have and continue to build. Terrorists are still out there and they have every intention to attempt to cripple the country again. Although we have made significant progress in comparison to 2001, we still have a lot more to do.

THE ANTHRAX ATTACKS IN FLORIDA

First Case

- 63 year male photo editor employed by AMI.
- Onset 9/30/01: Symptoms included fever, fatigue, sweats, and an altered mental status.
- Early 10/2/01: Admitted to JFK Medical Center.
- 10/3/01: State Public Health Lab — Jacksonville — received isolate from Integrated Regional Laboratories and presumptively identified it as *B. anthracis* by DFA; isolate was also forwarded to CDC BRRAT Laboratory.
- 10/4/01: CDC BRRAT Laboratory confirmed the isolate to be *B. anthracis* virulent strain by RT-PCR and contacted the Florida State Public Health Laboratory- Miami. Dr. Segaran Pillai initiated syndromic- and laboratory-based surveillance.
- 10/5/01: Index patient expired.
- 10/5/01: Dr. Pillai and his team along with members from CDC and FBI collected environmental samples from various sites visited by the index patient to determine if this was a bioterrorism event. These samples were brought to State Public Health Laboratory in Miami, Florida at approximately 2 a.m. by Dr. Pillai.
- 10/6/01: Collected samples were subjected to testing immediately at the laboratory by Dr. Pillai and Dr. Shih. Samples from the AMI building tested positive for *B. anthracis*.
- 10/7/01: Planning for intervention was initiated collaboratively with CDC, Palm Beach County Health Department members, Florida Department of Health State Epidemiologist and Dr. Pillai.
- 10/8/01: Dr. Pillai helped set up the booth and worked with CDC and Palm Beach County Health Department to initiate intervention at the Delray Beach County Health Department by administrating prophylaxis and performing nasal swabs to determine exposure.
- 10/9/01: Nasal swabs were subjected to testing at the Florida State Public Health Laboratory in Miami by Dr. Pillai.

Second Case:

- 10/5/01: 73 year old AMI worker was admitted to Cedars Medical Center due to pneumonia with left pleural effusion.
- 10/5/01: The attending Physician contacted Dr. Pillai on his way to the AMI building.
  - Dr. Pillai requested the attending physician collect two citrate tubes of blood, two nasopharyngeal swabs, and bronchial washes for submission to the Florida State Public Health Laboratory in Miami for laboratory analysis.
  - Dr. Pillai and Dr. Shih performed real-time PCR analysis and culture on blood and bronchial washes which yielded negative results. But: Nasopharyngeal swabs were positive for *B. anthracis* and so were the Bronchial washes using time resolve florescence immunoassay.
  - A Trans bronchial biopsy was conducted by CDC Chief Pathologist for Immuno Histo Chemical Staining which confirmed that the second case was a true positive anthrax case. Further investigation by Dr. Pillai by reviewing the hospital records revealed that the reason for negative results associated with the PCR and culture, was due to sample collection after the patient was placed on antibiotics.

– Provided by Segaran Pillai

Questions/Answers: 2001 Anthrax Attacks

Isaac Weisfuse, M.D., MPH is Deputy Commissioner of the Division of Disease Control of the New York City Department of Health and Mental Hygiene

What do you remember most about the initial response to the anthrax attacks, both nationally and from your office?

It all happened on October 12, 2001, one of the most remarkable days in the long history of this health department. I remember working at NBC at Rockefeller Center that first day. There were many leaders of NBC, NBC news, and later on General Electric (parent company of NBC) present. The first meeting was with Mayor Giuliani, and CDC (on the phone). This meeting focused on the anthrax biopsy result from an NBC employee and what it meant. After that came a meeting with NBC nightly news staff, where Tom Brokaw spoke eloquently to his staff, informing them of the diagnosis in one of their coworkers. Thereafter there was a meeting with staff from one of their investigative reporting shows that was tense. I was on the firing line for questions on anthrax and many were difficult if not impossible to answer. It didn't help that the HVAC system was shut off, and it was hot in the room. Later that day we held probably the first point of distribution for antibiotics, and that too became chaotic, with NBC staff who worked an early morning shift still waiting to get antibiotics that night. We didn't finish at Rockefeller Center until the early hours of October 13, 2001. Having done outbreak investigations in some dire settings (such as refugee camps) I will say that the physical space and amenities at NBC headquarters were far beyond what I had ever experienced in any other outbreak investigation! The surroundings were luxurious with an in house TV station and other technological capabilities. By the next day, I was assigned a personal 'shadow' by NBC who followed me everywhere to better understand what our issues were, and I suppose to brief higher ups about what was going on in their building. I had several heated arguments with NBC usually on the turn around time for lab specimens, or on the speed of our investigation but all in all they were thankful for the health department's contributions.

What was your and your agency's role in responding to the anthrax attacks?

We were responsible for the epidemiologic workup of cases, oversaw environmental sampling, environmental clean up, and provided prophylaxis to those at risk. Once letters were confirmed to have had anthrax in them, we had to map out the flow of the letters starting in the mailroom and throughout the building. We even had to map out the flow of garbage at Rockefeller Center.

How did you work with CDC and other state and local health departments during the response efforts to the anthrax attacks?

CDC EIS officers were already in NYC working on World Trade Center issues. We had great support from CDC laboratories in making diagnoses, as well as expert support in the epidemiologic investigations.

How would you characterize the response to the attack(s)? What were the hardest parts of the response to the attack(s)?

First we started out exhausted by our response to the World Trade Center disaster. We had communication problems because of damage to NYC's phone system downtown. The nasal swabs we took of potentially exposed people were particularly troublesome. In all the chaos the swab results were frequently delayed, tough to track down, but yet always wanted immediately for press announcements. Lab staff worked extraordinarily hard under difficult circumstances: their lab was contaminated on October 12, and some staff were exposed to anthrax and put on prophylaxis. All of the initial cases were high profile, in part because of anthrax, in part because they occurred in staff from some of the most influential corporations in the United States. Coming after the WTC, there was also a sense of not knowing what was going to happen next.

What were the biggest challenges or gaps at the time? How have those changed or been addressed during the past decade?

Many issues have been addressed; lab facilities have been expanded, and staff cross trained. Surveillance for bioterrorism is certainly more robust today than it was in 2001. We've better instituted an incident command system to streamline our response, as well as developed communication back up plans.

What did the country/you learn most from the successive attacks? What was the biggest take away?

First the obvious is that we are vulnerable to bioterrorism, which I don't think people took that seriously prior to 2001. It also pointed out that public health is a vital part of an emergency response. We also need to do a better job in communicating with the public and give them information on what individuals, families and communities can do to keep themselves safe.

If there were another anthrax attack today, how do you think the response would be different?

Better communication: we have developed and stockpiled information sheets and frequently asked questions on a variety of types of emergencies.

More efficient laboratory response: we built a level three bio safety laboratory, cross trained our staff, and have better computer systems at our public health lab.

Better plans for providing countermeasures: we now have a system of pre-selected sites for points of distributions (PODs), pre-staged equipment for these PODs, and have done extensive staff training.

What are the most crucial factors to ensure that our country is prepared for a biological emergency?

Assuring an adequate workforce, support of the strategic national stockpile, development of better mechanisms for rapid distribution and administration of antibiotics and vaccines, creation of environmental clean up standards.

Charlotte-Mecklenburg's Brushes with Anthrax, October 2001

By Stephen R. Keener, M.D. M.P.H., Medical Director, Mecklenburg County Health Department, North Carolina

In the wake of the attack of anthrax letters in October, 2001, Charlotte-Mecklenburg County (North Carolina), like many other jurisdictions, was besieged with so-called "white powder incidents," in which anxious citizens reported unnecessary testing of a variety of granular compounds such as salt, sugar, ash-tray sand and tile grout. In addition to these incidents, however, Charlotte-Mecklenburg experienced two potential actual brushes with anthrax.

On Thursday, October 4, the Mecklenburg County Health Department was notified that Robert Stevens, a photo editor at American Media, Incorporated in Boca Raton, FL who was stricken with inhalation anthrax the previous week, had died. He had spent five of his last seven days in North Carolina; visiting his daughter in Charlotte, sightseeing in the Chimney Rock area, and traveling to Durham, North Carolina. At this point, the hypothesis was that Mr. Stevens had acquired anthrax from a naturally-occurring source.

Staff from the Health Department visited Mr. Stevens' daughter's apartment, looking for clues that might point to such a natural source — pet food and accessories, HVAC filter, vacuum cleaner filter, sinks and plumbing, etc. Staff also visited two restaurants in Charlotte where Mr. Stevens and his family dined. Later that evening, to the amazement of curious neighbors, military personnel in full protective gear entered the apartment again to obtain specimens for culture. Fortunately, none of the cultures grew.

The following week, hospitals in Mecklenburg County and several other counties in North Carolina were asked by the Centers for Disease Control and Prevention (CDC) to review results of laboratory cultures that could have been Bacillus species, records of inpatients with undiagnosed illnesses during the prior three months and records of patients who were directly admitted to ICUs. This process, which took approximately two weeks, revealed no evidence of other anthrax diagnoses in North Carolina, and when the first anthrax letters were discovered, the focus of the investigation shifted from epidemiology to law enforcement.

At least two of the letters postmarked 10/09/2001, were processed at the Brentwood mail facility in Washington, D.C. On October 21, one of the postal workers became ill, and that worker and another died the next day from inhalation anthrax. Two other workers became ill and survived. Postal workers and public health officials feared for their safety, and the Brentwood facility was closed. In addition, letters that had been processed at Brentwood were believed to be the source of contamination of other government and postal service buildings where anthrax was detected.

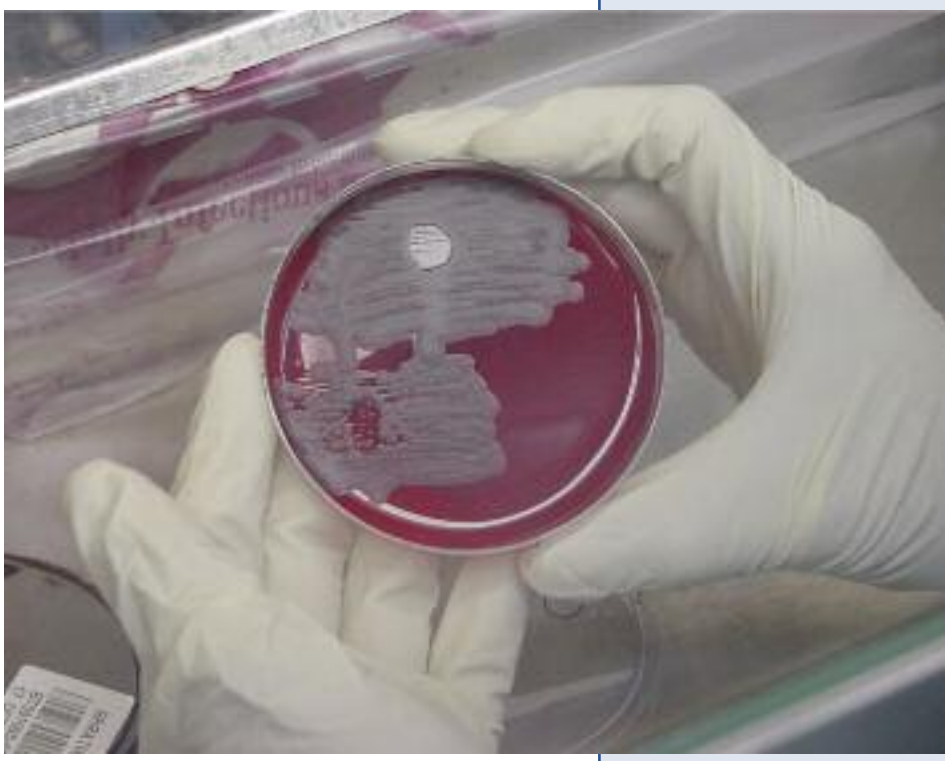


Photo courtesy of CDC

Later in the week, the Mecklenburg County Health Department received a telephone call with concerns from the headquarters of a North Carolina based bank. The bank maintained a bill processing center in Charlotte, where approximately

300 employees processed envelopes containing payments to the bank. This facility received a daily shipment by courier of bag mail containing up to 100 letters directly from Brentwood. Bank executives, having heard about the Brentwood employee's illness, were legitimately concerned about the health and safety of their workers.

Health Department officials and Charlotte Fire Department's HazMat team, supported by law enforcement, responded to the site within an hour and were given a tour by managers. In consultation with colleagues at the North Carolina Division of Public Health (NC DPH) and CDC, environmental samples were collected from some of the letters, the letter-opening machinery, and an air filter in the main work room. The samples were submitted to CDC for testing.

When the deaths of the two Brentwood employees were reported the next day, CDC and NC DPH made the recommendation to offer prophylactic antibiotics to the bank facility employees. The Health Department quickly gathered its inventory of ciprofloxacin and Doxycycline (used in the Sexually Transmitted Disease Clinic), and borrowed an additional supply from a partner hospital. Important information sheets about ciprofloxacin and Doxycycline were developed by the Health Department's pharmacist. Health Department nurses were mobilized to distribute a 10-day supply of antibiotics to second and third shift workers that evening and through the night under a prescription order from the medical director. At the same time, NC DPH requested additional antibiotics from the CDC Vendor Managed Inventory, which was delivered early the next morning. By the time the first shift arrived, a sufficient supply of antibiotics was available to distribute 10-day supplies to the remainder of the workers. The duration of the response was approximately 36 hours.

Subsequently, all environmental laboratory tests for anthrax revealed no anthrax, and it was not necessary to distribute any more antibiotics. To our knowledge, none of the employees of the facility became ill, nor suffered any untoward reactions to the antibiotics.

These two incidents were the impetus for Mecklenburg County Board of Commissioners to allocate local funding to create a county electronic active surveillance system for communicable diseases which utilized a pre-existing emergency department syndromic disease surveillance system and a school absentee reporting database. This system was replaced by a statewide syndromic surveillance system several years later. The incidents also pointed out the need for enhancements in local public health department capability and capacity to respond to all types of public health emergencies, and launched the Department into the modern era of public health preparedness.



Photo courtesy of CDC

In Today's World, Biological Agents Can Turn Up Anywhere

By Karen Spargo, M.P.H., MA, RS, Director of Health, Naugatuck Valley Health District, Connecticut

Right after September 11, 2001, we implemented our response procedures but no one really thought an attack would reach our part of the country. On November 19, 2001, the Monday before Thanksgiving, I was in an emergency management meeting and the talk centered on how our small towns would never face a bioterrorist event. In the back of my mind, I was thinking yes we could.

That very same day, my health district, in Naugatuck Valley, was asked to transfer a specimen from a local hospital to the state lab — a somewhat simple and ordinary request.

Going to work at 7:30 a.m. on November 21, I heard on the radio that local postal workers and citizens were receiving antibiotics in response to a potential anthrax case in the area. I immediately thought of the specimen from two days ago and wondered who was giving the antibiotics to the workers.

When I got to my office, I received a call asking our health district to administer the antibiotics. By 2:00 p.m., we had a clinic up and running and dispensed antibiotics to approximately 80 postal workers and family and friends of Ottilie Lundgren, who was the last person to die from the attacks. We also took nasal swabs of everyone who may have come into contact with Ms. Lundgren or letters that contained anthrax.

Right after Thanksgiving dinner, the Connecticut Department of Public Health asked our district to host a meeting for the entire community on Friday — giving us just a few hours to prepare.

At the meeting, it was surreal to look out at the largest community gathering I had ever been a part of and see my family, friends, neighbors and press from all over the world (as far as Japan). It was just five days, one work week, yet it forever changed our district.

From November 24 to December 3, we performed surveillance to see if additional people contracted anthrax. Meanwhile, the Centers for Disease Control and Prevention (CDC), the state of Connecticut, the Federal Bureau of Investigation (FBI) and the United States Postal Inspection Service recovered a letter in another home in our town that tested positive for anthrax. This became the first documented case of cross contamination of anthrax spores.

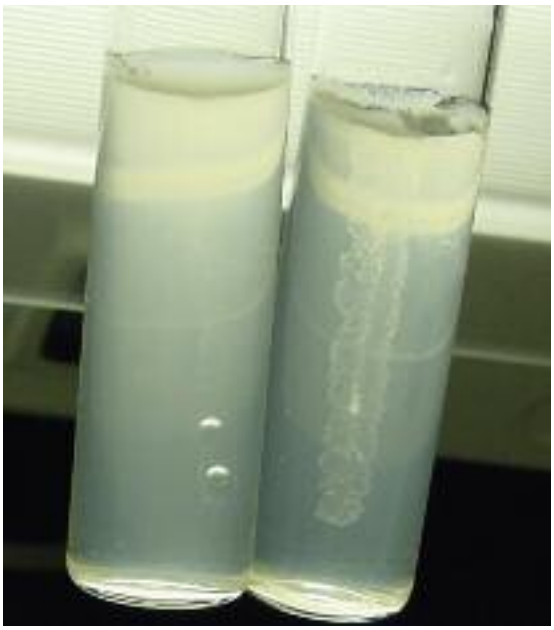


Photo courtesy of CDC

Now we know that the world is a much smaller place (and growing smaller) and everywhere is connected. If another attack occurred, we'd be less surprised and more prepared.

The importance of communication

Looking back, one of the most taxing aspects of the tragedies was receiving and disseminating information — what we knew, thought we knew, and could and could not communicate. It doesn't seem like that long ago, but we had to rely on faxes — e-mail wasn't nearly as prevalent. We received information from CDC or our state health department at 8:30 a.m., and would send those guidelines to physicians. Frequently, just 30 minutes later, we would get a "stand by" for new guidelines and then we'd send out the new guidelines. We didn't have a mechanism to send a blast fax either, so everything was done manually. It was the 21st century, but communication was light years behind where we are now.

In addition to the shear quantity and frequency of communications, because it was a criminal issue, the FBI was involved. This was completely new to our world. But we learned quickly how to work with them. A few months after the attacks, I was doing a presentation about our response at the University of Connecticut. One of the FBI agents was in the audience and began waving his hand during my presentation. I immediately stopped because I thought I passed along sensitive information. In actuality, he was swatting a fly away from his ear. So I think the FBI trained us well!

While intra-government communication was important, it was vital to calm the public. Looking back, what stands out in the forefront of my memory is how calm the postal workers remained. In our district we had a lot of respect for them and could meet individually or in small groups to allay their fears. They were an incredibly brave group. The main sentiment was that they hoped people would simply pick up their mail — a return to normalcy.

Better Prepared in 2011

The pace of change in the world is amazing. Since the tragedies, technology — when it comes to communication, testing and scientific analysis — has improved dramatically. In addition, we are much better connected to partners.

When the attacks occurred, we unearthed municipal response plans and found they dated back to World War II and the Cold War. While our current plans can't always keep up with the times, we have certainly made vast strides.

That said, there are still threats in this world. Perhaps our biggest threat is complacency. We responded swiftly and successfully to H1N1 without the public being affected. So it's been 10 years since we've had a massive public health emergency. Unfortunately, to be truly prepared requires continual training and staffing. With complacency comes an erosion of the public health infrastructure which could send us all the way back to the Cold War. Quite simply, I don't have any more staff in 2011 than I did in 1972 and the pristine plans we've created might start to gather dust. Without consistent funding, we cannot continually drill, so the next generation could be back where we were a decade ago.



The 2001 Terrorist Events Radically Transformed "Public Health"

By Alonzo Plough, M.A., M.P.H., Ph.D., Director of Emergency Preparedness and Response, Los Angeles County Department of Public Health Board of Director, Trust for America's Health

In Seattle, the morning when the towers came down, there was a sense of trauma. I went to my office and walked the floors and there was this sense of shock amongst everyone.

As director and health officer for the Seattle and King County Department of Public Health, I had to spearhead the response to ensure the public was safe. The public heath implications of the 9/11 attacks were instantly clear. We had to identify what might be next. At the time, any city that had a significant landmark could be at risk and there were all kinds of rumors that iconic architecture symbols were on the list.

Once it became clear the 9/11 attacks were isolated to the east coast, our role shifted to focusing on the mental health needs of the public.

The events were highly transformational — something had fundamentally changed in the public health field after 9/11. It was, in a way, almost similar to AIDs and HIV in the 1980s in that public health was being taken in a completely new direction and would have to serve new functions.

This was nailed home when the anthrax attacks occurred. Quite simply, never in the history of public heath had diseases we thought were in the past been reintroduced as a weapon.

Even though we had been thinking about bioterrorism in Seattle since we hosted the World Trade Organization (WTO) conference in 2000 and had a syndromic surveillance system, these public health attacks were unprecedented. We had thought that our senses were heightened to bioterrorism, but, in reality, our focus wasn't that high. September 11, 2001 pumped it up high and anthrax took it to new heights. It was a frenetic period.

Because of the WTO conference, we were able to, somewhat, reassure the public that the city was prepared. We had a syndromic system that would give us pattern recognition if there was anything going on in our vicinity.

So our response to anthrax was mainly one of surveillance and risk communication. We had to keep public concerns at a level commensurate



Photo courtesy of CDC

to the actual level of risk. We were able to do this, but not without a lot of effort. I mean we were getting press calls about whether people should steam iron their mail.

While the public was our main concern, we quickly discovered that we had no relationship with the intelligence community. We were saying things that the intelligence community knew not to be the case. At one point the public health department was on record saying anthrax hadn't been weaponized, when law enforcement knew that it had been.

We also had to build relationships with the first responder network. One day, I looked out the window (we were across the street from the regional Federal Bureau of Investigation (FBI) building) and saw fire trucks and tape all around it. I spoke with the fire chief who said there had been a white powder scare, yet they hadn't thought to contact anyone in public health. Clearly, we had a major and immediate need to work better together, especially during the flurry of white powder scares.

As the crisis went on, we worked with law enforcement and first responders to allay public fears and educate. As director, my main role became to interface with the public and government and take on the risk communication function.

When I look back on that frenzied time, the biggest gap was the lack of a relationship between public health and intelligence. Now, through Homeland Security, we jointly perform combined threat assessments. I have a security clearance. If anthrax happened now, we would be doing two-way surveillance, intelligence assessments and have real-time knowledge of the threat. This was entirely missing in 2001. In addition, we are able to pass correct information to the public — during the initial response to anthrax, the information we had was wrong.

As a nation, we took a lot away from this. In the aftermath, we were one of the first groups to work with the Centers for Disease Control and Prevention to form what would become the Public Health Emergency Preparedness (PHEP) cooperative agreements, which now support preparedness nationwide in state, local, tribal, and territorial public health departments.

With the agreements and lessons learned, we've come a very long way. I think about H1N1 and how quickly and successfully we were able to respond — that response was totally based on the funding and knowledge that had been built coming out of the PHEP agreements. Bioterrorism programs had evolved to include pandemic and all-hazards programs. I think that, appropriately, the field has moved from just a single concern of bioterrorism to focus on a variety of low-probability, high consequence events.

Currently, as the director of emergency preparedness and response for the Los Angeles County department of Public Health, I know my job is a lot easier now. We have biowatch monitors, which can identify the top five bio agents that could be used in an attack. We have fusion centers with FBI, Homeland Security and first responders. In addition, there are specific protocols in place that determine when intelligence becomes actionable during a particular scenario. We can also do pattern recognition and early detection for bioagents. In LA county, we fund hospital preparedness programs — 102 hospitals are trained to respond to terrorist events. None of this existed during 9/11 and the anthrax attacks.

It's clear, we're much more prepared now than at any time before. Yet it requires a lot of juggling to remain this prepared. There are oscillating funding streams that peak up when there is a problem and are cut when things appear to be quiet. But we need to view preparedness the way we view the fire department. There will be something in the future — it's true. As we get 10 years away, there is just complacency that bioterrorism attacks might not be probable — that's not true. Every major study says that this isn't true.

As a country, we need to think about the incredible times in 2001 and ensure we are better capable to respond in 2011, 2021 and on.

Bioterrorism: A Public Health Responsibility

By Diana T. Yu, M.D., M.S.P.H., Health Officer, Thurston and Mason County, Washington

On March 11, 2011, I watched, horrified, as the news of the Japan earthquake and tsunami unfolded. Within days, the potential radiation exposure escalated to the point that, in Washington State, 5,000 miles from the nuclear reactor, we were fielding calls from citizens, health care professionals and the media.

The events in Japan left me feeling the same as the anthrax incidents on the east coast in 2001. Both incidents posed a true human health threat, not for Washington residents, but for individuals far away. In both instances, the community concern was elevated and internet information was readily accessible and not always accurate. It was our responsibility to develop and coordinate a local and statewide response quickly — doing so before the federal government was able to provide guidelines.

Emergency preparedness requires careful planning before an incident occurs. Having written plans agreed upon by partners in preparedness helps ensure a more controlled rather than a chaotic response. As the public health officer for Thurston County, Washington, which includes Olympia and the State Capitol, I worked to build plans and protocols to respond to bioterrorism with some of our response partners for a number of years. However, until October 11, 2001, many of us did not believe that a bioterrorist event would really happen.

The news about possible mail exposure to anthrax spurred me into developing mail handling guidelines, which included input from the Federal Bureau of Investigation (FBI), community physicians, citizens, and public health department staff. After 12 years of being the health officer of this community, I was able to anticipate some citizen concerns. My main fear was that our staff alone would not have the resources to handle all the "what if" situations.

After meeting with the disaster management group and the unified law enforcement group, which included all city police chiefs, sheriffs and state patrols, I refined the guidelines for handling suspicious mail. This was used as a template for a triage protocol for our local 911 center so that the entire community would have a unified response. The information was discussed, agreed to, widely distributed and shared with all crisis lines and hospital consultation lines.

With everyone on the same page, our response was clear and consistent. Still, we encountered problems — some expected and some that seemingly came out of nowhere. For the most part, suspicious mail was not accompanied by a credible threat. It quickly became apparent that potentially contaminated mail was going to be turned in by the hundreds and we would not have the capacity to deal with all of the samples. On the rare occasion when we did encounter a credible threat, there was a clear lack of personnel trained to handle hazardous materials.

- September 11, 2001 – disaster rocks the country
- October 4, 2001 – possible bioterrorism reported in Florida
- October 11, 2001 – alert from CDC re: anthrax in New York
- October 12, 2001 – I developed mail handling guidelines for health department staff
- October 15, 2001 – The guidelines were shared with county disaster response teams during a bioterrorism emergency management meeting
- October 16, 2001 – Thurston County law enforcement chiefs held joint meeting to formulate plan, procedures and guidelines for community bioterrorism response
- October 17, 2001 – We revised mail handling guideline based on new information
- October 25, 2001 – CDC releases guidelines for handling mail

In addition, some members of the public were disappointed with our response because we used "threat assessment" to triage which items were tested and which were discarded. With Olympia being the seat of state government, the guidelines included "persons of importance" in government as potential targets for threat. To some, this implied that citizens were not as important as government officials. The situation worsened after deaths in New York and Connecticut were published in the media, because their source of exposure was never really determined. So, the risk of casual or accidental exposure became more of a concern.

For some reason, calling this bioterrorism instead of communicable disease control gave the impression that this was something new and exotic. The reality is that epidemiology is a cornerstone of public health practice. Disease control and surveillance are part of everyday public health functions. Some doctors and hospital practitioners responded with an "I don't know what to do" even when they had handled similar situations in the past.

While our guidelines were not perfect and we faced problems, our response was successful because we established relationships in the community, created mutual aid agreements and had a history of working cooperatively with all stakeholders. It definitely helped to have all agencies deal with situations in similar ways. In reviewing the guidelines we developed, and comparing those to subsequent published guidelines, it is clear that our information was good and our guidelines were written in a more "prescriptive" manner to fit our community needs.

Over the last 10 years, our public health emergency preparedness response has been fine-tuned. Public health leaders have emerged as very credible sources of information. We have also become excellent risk communicators, understanding the needs of our individual communities, so that we can tailor messages locally. The public health, health care, law enforcement and emergency management systems are closely linked and work well together.

That said, the biggest threat to bioterrorism preparedness is the lack of stable funding for the public health system. Preparing to handle a disease outbreak is one of the fundamental day-to-day activities of a local public health agency. As funding has gotten tighter, the cutbacks in the public health workforce remove a huge number of people who have experience and expertise in dealing with disease outbreaks. A bioterrorist threat is one we are capable of recognizing and responding to, but we may soon reach a point where we will have no capacity (in terms of resources and staff) to do so.

Responding to bioterrorism is a public health responsibility. We need a constant stream of resources to remain vigilant in our preparation.



Communicable Disease Bureau — Anthrax 2001

By Jan Tenerowicz, Arlington County Public Health, Virginia Communicable Disease Bureau Chief (ret.)

Before 9/11 and anthrax, the Arlington County communicable disease bureau's primary concerns were HIV, sexually transmitted diseases and Tuberculosis control. In fact, screening and other communicable diseases were much smaller efforts and managed by part time staff.

Then, in October 2001, the Arlington community — still reeling from the attack on the Pentagon — was in the middle of one of the biggest public health emergencies the country had ever faced. We wondered if this new threat was part of a general assault on the United States and we didn't know what else could be coming.

Our immediate priorities were heightened monitoring and surveillance, external and internal communications and establishing partnerships with local emergency responders and medical care providers. We were charged with protecting the community and preventing the spread of disease. The public expected us to keep them safe and we had never before experienced this kind of public health emergency.

Staff already had demanding workloads and now were being asked to work extra hours and maybe even place themselves at unknown risk. In addition, resources were limited and we had to find additional staff from other programs and quickly train them. Everyone assigned to the anthrax emergency worked long hours including week-ends. Staff was "on call" 24 hours a day.

Monitoring and surveillance for individuals who had possible exposure was critical. All calls, reports and stories had to be evaluated and investigated. We also provided 24 hour a day disease surveillance at local hospitals by reading selected patient records to find anything related to the signs and symptoms of anthrax exposure. This information had to be analyzed, reported and recorded.

Communications both external and internal were a top priority. We maintained direct and frequent communications with the State Health Department and the regional staff. County officials, especially emergency response departments, needed regular updates from our health director. Hospitals and community physicians were important partners and all had to receive timely CDC information which had been sent to us through the state health department. We soon learned about "blast fax" — as it was important to give regular briefings to all public health department staff. We also had to create or find anthrax informational materials for public distribution and then produce them on a massive scale.

Questions and concerns came from everywhere. Physicians, first responders, hospitals, businesses and offices, mailrooms, schools and individuals all needed information all at once. We received as many as 200 calls each day at the height of the event. One memorable phone call came from someone who had found a powdery substance in a napkin dispenser at a shopping mall — this wasn't the only "mysterious white powder" call. Another came from a large mail sorting center fearful that their mail sorters, who were disabled workers, were at increased risk. Local physicians were seeing increased patients concerned about possible exposures and their questions had to be resolved. All calls required evaluation, information, entry into a tracking system and sometimes additional follow-up.

At the same time, we weren't sure that appropriate post exposure medication would be available to medicate large numbers of people if we needed it. Identifying resources for these medications and then considering options for distribution was another issue.

When the anthrax event was over, it was time to review what we had learned and to identify more and better ways to meet these new kinds of public health emergencies. Our department soon hired a public health emergency planner and much progress has been made over the past 10 years. While strategic plans are in place and critical partnerships have been established, we must not be complacent as new and different kinds of public health emergencies occur.

SECTION 5

When Disaster Strikes, Public Health Responds

By John R. Lumpkin, Senior Vice President and Director, Health Care Group, the Robert Wood Johnson Foundation and former Director of the Illinois Department of Public Health

September 11, 2001 was to be a signature day for public health in Illinois as we looked to launch our state oral health strategic planning process with a meeting engaging experts from Illinois and the nation at the University of Illinois School of Public Health. I was driving down Chicago's Western Ave, a straight shot from my home to the meeting site, when I heard reports of first one then another plane crashing into the World Trade Center. When I arrived at the conference, I realized how much our world had changed when the television in lobby showed the first tower going down. The soon to be cancelled conference would have to go on without me.

I was trained in Emergency Medicine and began preparedness work in 1978 while still at the University of Chicago. After my appointment as Director of the Illinois Department of Public Health (IDPH) in 1990, I got directly involved in our disaster planning work. Springfield, Illinois, the state capital, was over 200 miles from my home in Chicago, but we had contingency plans if a major event occurred. I proceeded to the City of Chicago Emergency Operations Center where a desk in the control center was reserved for me. I was in constant contact with the State Emergency Operations Center and IDPH staff as the day progressed. I still remember the surrealistic scene watching the looping replays of the collapse of the Twin Towers on the five giant screen televisions and looking out at the Sears Tower, suddenly the tallest building in America. I remember the anxiety wondering if that huge building would be next.

As a nation, we got through that day and all of us assessed what our post 9/11 would be like. The next day, I drove to Springfield to coordinate our on-going response as we all wondered what would be next. Immediately, IDPH was placed on the Public Safety Sub-Cabinet where I joined discussions with the State Police and National Guard about how to arm police officers protecting our nuclear power plants. Days passed as we reviewed and re-reviewed our public health response plans. Illinois is a state that has suffered a number of natural disasters from the major Mississippi river floods in 1993 to periodic tornados. We had planned for the impact of a magnitude 8 earthquake in the nearby New Madrid fault and for acts of bioterrorism. Back in the 1990s, when we formulated our bioterrorism plan and started our molecular biology lab, we believed that we would activate our earthquake plan before we would see an act of terrorism on our soil. We also felt that it was important to plan for all hazards regardless.

Three weeks after the fall of the Twin Towers, our nation was again rocked as headlines announced that we faced another attack. This one was much more insidious because it came to its victims via the U.S. Mail. Alerts were sent out to emergency departments across the state detailing the symptoms and treatments for suspected anthrax cases. While we had plans in place to handle a mass exposure or a mass casualty event, we were not prepared for thousands of "white powder" calls to police and local health agencies. Protocols were developed on the fly with the State Police, the FBI and the Emergency Management Agency. Our laboratory was put on overdrive as the two-year-old equipment was run at full capacity. While some of the calls seemed frivolous, like the calls about white powder at a changing station in a day-care center and white powder at a counter where powdered donuts were consumed, all of the calls reflected the fear and uncertainty of the time. Each day, we implemented additional systems and procedures that are still in place today. The improvements in the state laboratory prepared us for the huge demand when West Nile hit Illinois in 2002 leaving four dead and 71 sickened.

Some good things came out of this time of trial including a much stronger relationship with the Illinois Emergency Management Agency whose director, Mike Chamness, declared that every disaster had a public health component and public health needed to be at the table. Our nation realized once again how important our public health system is to our health and well being and placed a priority on funding.

I look back on that time with mixed emotions, remembering the fear, uncertainty and the satisfaction that the IDPH was up to the task. I also look back with regret as I realize that once again our country has forgotten the lessons of the past. Health departments across the nation are being ravaged by budget cuts and layoffs. I wonder that should we face the challenges that we faced in September and October 2001 today, will our battered, underfunded, public health community be able to respond?

How Public Health Preparedness Changed in North Carolina after Anthrax

By Steve Cline, Assistant Secretary for Health Information Technology, North Carolina Department of Health and Human Services Office of Health Information Technology, North Carolina Department of Health and Human Services

When the first case of intentional anthrax occurred, I was the North Carolina State Epidemiologist. I received the phone call from the Centers for Disease Control and Prevention (CDC) as soon as there was suspicion of terrorist activity and the potential for further exposure/cases of inhalational anthrax. Coincidentally, the NC Governor's Terrorism Task Force was meeting that day.

We, at public health, shared the development with members of the task force including Federal Bureau of Investigation (FBI) agents before they heard of it through their own channels. This further established the lead role of public health for this event in NC.

Based on what we knew about anthrax at the time and the travel history of the index case, it was believed that the exposure occurred in North Carolina. Therefore, the state was at the center of this public health emergency. I was tasked with leading the public health response along with the State Health Officer, Dr. Leah Devlin.

Our history of natural disasters (floods and hurricanes mostly) provided a strong base of experience for organizing the State Emergency Response Team (SERT) and partnering with local responders. Consequently, the framework for organizing the response was similar to other emergencies.

Of course, it differed dramatically in scale with the whole state potentially at risk and with the fear of the unknown. In a hurricane, we can see it coming, track the flooding and devastation and then organize the clean up and recovery efforts. With anthrax, we did not know who the enemy was, if they were going to attack again and we couldn't see the weapon. This meant that FEAR ruled the day and public communications were critical. During the response we established a "battle rhythm" of regular communications with 1), our local response partners; 2), our national response partners; and 3), the media to keep the public appropriately informed.

The attack created many challenges for the public health and emergency response system throughout government. In addition to communication, there was a lack of public health infrastructure. One area where this was keenly acute was in the lack of electronic systems for public health surveillance. Since the attacks, North Carolina has made tremendous progress in this regard. Instead of having to wake hospital infection control staff in the middle of the night to pull charts and track down lab results, we now have a near real time electronic emergency department surveillance and reporting system in every hospital that allows us to do public health surveillance much more efficiently.

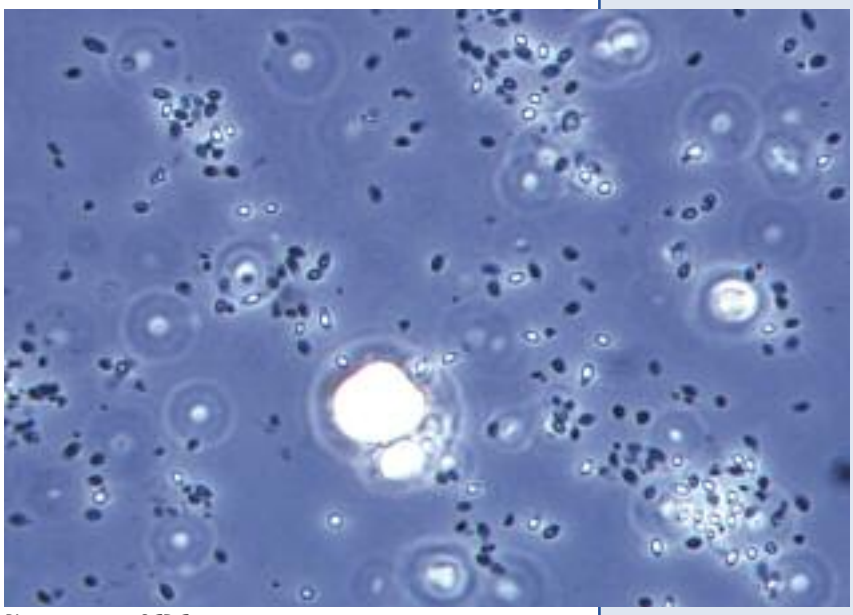


Photo courtesy of CDC

Ultimately it became known that North Carolina was not the site of the powder drop. However, we made incredible public health improvements in the decade since the attacks.

MAJOR INFRASTRUCTURE DEVELOPMENTS IN NORTH CAROLINA PUBLIC HEALTH PREPAREDNESS AND RESPONSE SINCE 9/11/2001

Strengthening Local Preparedness Statewide

- Provided funding and guidance to all (85) local health departments and the Eastern Band of the Cherokee Indians to establish public health preparedness and response programs, including a smallpox vaccination plan, a Strategic National Stockpile (SNS) distribution plan, and other plans.
- Established seven Public Health Regional Surveillance Teams (PHRSTs) in strategically located local health departments to provide statewide public health preparedness and planning capacity. PHRSTs consist of a physician, a medical epidemiologist, an industrial hygienist, an administrative assistant, and an affiliated field veterinary officer.

Providing State Level Leadership and Expertise

- Established a state level Public Health Preparedness and Response (PHP&R) team to build expertise and response capacity at the state level.
- Appointed the Public Health Preparedness and Response Advisory Committee to guide efforts around state and local preparedness.
- Created the Public Health Coordinating Center (PHCC) in accordance with the NC Emergency Operations Plan to provide space and equipment for key public health operations response personnel to come together during a public health event to enhance effectiveness. The PHCC has been activated for multiple public health events, including Hurricane Isabel, Charley, Frances and Ivan; SARS; the Apex Chemical Emergency and the influenza vaccine shortage.

Creating Necessary Legal Authorities

- Sought passage of two new laws by the NC legislature in the June 2004 session and one in 2008. One mandates reporting by hospitals of Emergency Department data for NC DETECT. The other extended isolation and quarantine authority to better respond to practical needs. Public health isolation or quarantine orders can now be given for duration up to 30 days.
- Secured new legislation to allow access to medical records when an emergency or potential environment risk is occurring.
- Sought passage of major legislation to include reporting of zoonotic diseases from the state veterinarian to public health.
- Secured legislation to give embargo authority for state environmental health specialists for contaminated food.

Developing And Exercising The Plans

- Developed numerous state level plans including the Public Health All-Hazards Plan as a part of the NC Emergency Operations Plan, developed a SARS Response Plan, Smallpox Plan, a plan to dispense the Strategic National Stockpile, a Chempack Utilization Plan, and the Avian Influenza Plan.
- Developed the first FEMA approved mitigation plan for infectious disease and zoonotic agents which will allow for federal reimbursement for corrective measures to minimize damages incurred as a result of an outbreak.

Assuring Earliest Detection: Surveillence

- Initiated the development of the North Carolina Public Health Information Network (NC-PHIN), an enterprise level information technology infrastructure to integrate key state and local public health data systems. Key components within NC-PHIN include the NC-Health Alert Network, a statewide disease reporting and surveillance system that is compliant with the National Electronic Disease Surveillance System (NEDSS), the NC Hospital Emergency Surveillance System (NCHESS), and a pre-hospital emergency medical services data system called PreMIS, the Laboratory Information Management System (LIMS), and the NC Immunization Registry.
- Created the NC Hospital Emergency Surveillance System (NCHESS) which receives emergency department data from NC's hospitals to assist state, regional and local public health professionals in disease surveillance efforts.

- Established NC-DETECT (North Carolina Disease Event Tracking and Epidemiology Collection Tool) which receives, compiles, and analyzes data from a variety of sources with public health implications. Data currently being collected includes hospital emergency department data, reportable diseases and conditions, poison control center, pre-hospital management information system, and NC Wildlife surveillance.

Improving Communications

- Established the North Carolina — Health Alert Network (HAN), a highly secure and fully redundant communication system that is designed to immediately alert key state and local health officials and care providers to acts of bioterrorism, emerging disease threats, and other public health emergencies.

Identifying The Agent Early

- Developed the NC Laboratory Response Network (LRN) in the State Laboratory of Public Health, which is designed to respond to acts of bioterrorism or other public health threats and emergencies. SLPH doubled its Biosafety Level 3 (BSL-3) capacity in Raleigh and established three new strategically located regional BSL-3 labs.
- Created the first statewide registry of biological agents in the nation which allows for tracking and improved security of agents of bioterrorism.
- Developed the white powder protocol used by all first responders, provide laboratory testing for white powders while maintaining the appropriate chain of custody.
- Secured $101 million from state legislation to build a new state of the art public health laboratory.

Learning from Real Life Experiences

- Established and operated shelters in Wake and Mecklenburg counties for hundreds of Hurricane Katrina and Rita evacuees in NC. These shelters initially focused on providing for the basic public health needs of these evacuees. State, regional, and local public health staff conducted surveillance studies to assess pre- and post-event health and social issues, and then assisted with assimilation of these evacuees into the communities. Other hurricanes in North Carolina such as Isabel in 2004 provided additional real life experiences including the use of GIS and handheld technology to identify people in need and target resources accordingly.
- Investigated and contained one of the eight laboratory confirmed cases of SARS in the country in 2003. This investigation included the use of quarantine and isolation, public health directives to the families, health care workers and the employer — a major university system.
- Managed the distribution of limited flu vaccine available during the 2004 flu season. This effort included issuing legal orders to providers of all types limiting vaccine to high-risk groups, communicating with the public and providers, coordinating with long term care facilities, hospitals, health departments, private distributors to maximize the use of the vaccine and providing follow-up evaluation.
- Continue to respond to suspicious substance ("white powder") incidents. Local, regional and state Public Health response teams responded to 15 suspicious substance calls that required interagency analysis and response.
- State and local Public Health teams responded to a Department of Defense environmental detector alarm for tularemia.
- Local, regional, state and federal teams responded to a threatening passenger on an incoming flight. The passenger was threatening the other passengers with a substance he identified as smallpox.
- State Public Health investigated potential toxicity from a dietary supplement with high levels of selenium in a multi-state incident.
- Local, regional and state Public Health has investigated at least four large multi-state food borne illness outbreaks.
- Local and state Public Health teams provided critical expertise on re-entry of a community after evacuation for a chemical plant fire (2007).
- Responded to statewide emergencies including Drought 2007, and the Pocosin Lakes Wildfire 2008.

– Provided by Steve Cline

Better Safe than Absolute Certainty: The New Jersey Public Health Response to Terrorism

By Dr. George DiFerdinando, Jr., M.D., M.P.H., FACP, Director, New Jersey Center for Public Health Preparedness at UMDNJ-SPH Co-PI, New York-New Jersey Preparedness and Emergency Response Learning Center Adjunct Professor of Epidemiology, UMDNJ-SPH

On September 11, 2001, almost 700 New Jerseyeans lost their lives in the World Trade Center. Yet, as New Jersey is often seen as a crossroads between New York and Philadelphia, many do not recognize the huge impact 9/11, and the subsequent Anthrax letters, had on our state and how involved NJ's public health personnel were in the response.

I had been named acting commissioner of the NJ Department of Health and Senior Services (NJDHSS) less than a month before the attacks. We held our first staff meeting the morning of the 9/11 attacks. While the attacks were on New York soil, the interdependence between NYC and NJ made it clear that our response would need to be as supportive to the region-wide public health needs as possible.

On 9/11 itself, we spent most of our time attempting to gain situational awareness of any injured survivors, and to mobilize health resources — vaccinations, blood products, and burn unit beds — that might be needed. With the Department of Human Services in the lead, NJ immediately set up a support area at Liberty State Park, which is little over a mile from Ground Zero, across the Hudson River. This location was chosen based on the presumption that there would be many injured people and we'd need a triage area to take care of those injured before transport. We needed contingencies if hospitals became overwhelmed and thousands of people needed blood, wound treatment, or even tetanus shots. Sadly, all these needs became moot as it became clear that the nature of the disaster had led to many deaths, but few others severely injured.

The Liberty State Park site, not needed for the injured, was rapidly 'repurposed' as a support site for the social and immediate psychological needs of survivors and family members of those who had died. Less dramatically, and yet just as supportive, was the development of a 'paperwork' support network, to process documents for survivors and families of the dead in a situation where documentation of death was missing.

On the day of 9/11, and in the weeks that followed, the simple public health functions — registrations, surveillance, documentation — assumed new importance for the public, and required many hours of 'routine' but critical work.

The transition between this supportive role, during 9/11, and a leadership role during the October anthrax exposures, was oddly imperceptible. As one of our public health reactions to 9/11 was the set up and maintenance of phone banks for citizens to call in with any types of questions, a direct connection between NJDHSS and NJ public health staff and the public was almost constant. Still, as call volume tapered off near the end of September, we decided to decrease those assigned to the phone banks.

At that same time, the first Florida anthrax case was found, and we, of course, were placed on alert, but at a distance. Even when we received notification from the NYC Department of Health that cases were appearing in media outlets in Manhattan, the threat in NJ seemed remote. Still, as many New Jerseyeans worked at the media centers in NYC — such as the famed 30 Rockefeller Plaza Building — we reactivated the phone center, anticipating calls from citizens regarding their risk. On Saturday, October 13, we reopened the phone bank.

On that same day, my team participated in a conference call with all the health officers in the United States. At the end of the call, it was mentioned that the anthrax likely was delivered by mail and probably came from somewhere in New Jersey. Then the call ended. My team looked at each other, perplexed at the casual way the origin



Photo courtesy of CDC

of the letters was handled, almost as an afterthought. Although the first (at that time only) known batch of letters were apparently processed in NJ, a few miles from our office, we were assured that 'mere' processing was not a public health concern. Basically, the consensus interpretation of the available data at the time was that, if a letter is sealed and it goes through postal processing, it was not a threat until formally opened.

Stunningly, while we were being reassured on that call, data was coming though our phone bank that would shortly forever overturn that consensus. Two perceptive local NJ physicians, having read new reports of the NYC cases, and the NJ postal center origin, called our phone banks to report unusual, persistent skin illnesses in two postal workers from that center. The physicians calling were 'sure' these cases were most likely to be a spider bite, but they wanted to be safe rather than sorry. Similarly, the highly competent but still junior staff who took the calls was almost apologetic in passing the reports on, but wanted to make sure all information was available to the Department's leadership.

I immediately informed the Federal Bureau of Investigation (FBI) and began the process of obtaining permission to test the samples the private physicians had. As I did this, the FBI seized the samples and sent them to Atlanta for anthrax testing.

The following Monday, just two days later, there were confirmed anthrax letters in Washington, D.C. We were still waiting on our samples to be processed, however we knew that they came from the Hamilton postal facility. By Wednesday, when one of the two NJ suspect cases was confirmed as a case of cutaneous anthrax, the FBI shut the processing center down to do a thorough but rapid crime scene investigation. After a few hours of processing evidence, the FBI let us know that the building was ours.

We met with the post office staff well into that evening and eventually I decided that, since the building was closed and occupationally related anthrax had already occurred there, I couldn't deem the building safe unless I was offered some rapid testing method to show it 'clean.' I was assured that this could happen within 72 hours; my response was, then we'll reopen in 72 hours.

It turned out it was over three years before that building was deemed safe to reopen.

After another worker developed cutaneous anthrax that following Friday, we began operating on the premise that any worker at that site was potentially exposed, and we decided to immediately propose post exposure antibiotic prophylaxis. Unfortunately, the Centers for Disease Control and Prevention (CDC) didn't agree that

the cases here demonstrated exposure at a distance, and did not support our decision to treat, and discouraged my request for materials from the Strategic National Stockpile. I still regret not pushing my Governor to demand SNS deployment anyway, as a way to force CDC's hand.

Without CDC support, NJDHSS scrambled to find Cipro and a place to deliver the medication. At that time NJ didn't have an Emergency Health Powers Act, so there wasn't a specific law that gave the public health commissioner direction or powers to organize such a mobilization of private resources on short notice. Today, a NJ Health Commissioner, with gubernatorial support, could do things like work directly with pharmacies and pharmaceutical distributors to get the necessary antibiotics, and with local facilities like hospitals to immediately use their facilities to dispense medicine.

While our unilateral decision to keep the facility closed and to treat early led to much debate in our state press, it clearly prevented further exposure in a grossly contaminated building. It also probably saved exposed workers from developing disease — if not from dying of anthrax. And, even while this debate raged around, the NJ public health and health care community worked to 'make it happen', collecting Cipro, setting up treatment clinics, doing thousands of 'white powder' laboratory tests, and continuing to man the phones.

We made the particularly fortunate decision to inform the postal service and unions of the information at exactly the same time each day. This gave all interested parties time to hear new information, to vent about the stress and uncertainty in private, and then to present the public a consistent story. There were no arguments in the media — at least between the postal works, management, and public health — and this solidarity undoubtedly led to NJ workers showing the best adherence to their treatment compared to other, more contentious sites. Miraculously — or perhaps due to early preventive treatment and diligent diagnosis in the community, NJ had no fatalities due to anthrax. We had a lot of cases and a lot of people exposed, but we did early preventive therapy and had health care workers on the front lines who bought into our response.

Basically, by applying general public health principles, making sure communication systems were set up, listening to what the public and providers were telling us, working closely with the workers involved and reacting quickly to get samples tested, our response saved lives.

It has been 10 years since September 11, 2001 and the anthrax attacks, yet the lessons for public health from the series of months will not go away.

To me, the biggest change the public health world has seen over the last decade has been our incorporation into the law and public safety community. Surveillance, preparedness, prevention and population based thinking come to play repeatedly during both the planning and response phases of most of our emergency responses. However, I'd have to be willfully blind not to see that there are fewer people in public health departments in NJ now than there were in 9/11. Today, we might respond with a better trained and equipped workforce, but there would be many fewer at the front lines. To me, the most tired and dangerous cliché is 'doing more with less.' Any individual public health worker will almost certainly do more individually then he or she might have during those months in the fall of 2001, but, as a group, we're at clear risk of 'doing less with less'. Which action of that fall would be shortchanged today due to lack of staff — one less worker on a phone line to take a report, one less physician to consider making that call? What impact would that have on the outcome? At the time, if we had a second postal site that had been grossly contaminated we would have been overwhelmed. We simply didn't have the ability to fully respond across multiple locations. Now, would we be able to handle even one?

Given the times we live in, I'm sure we'll find out just what we can accomplish with our current resources.

THE MODEL STATE PUBLIC HEALTH ACT (MSPHA)

The Model State Public Health Act (MSPHA) was created to bolster the legal framework for public health professionals in a time of crisis, such as the 2001 anthrax tragedies.

Funded by the Robert Wood Johnson Foundation, MSPHA was released on September 16, 2003 after three years of development and a national commentary period. The act, which focuses on the organization and provision of essential public health services and functions, is a resource for government officials when amending health statutes and regulations.

According to the law, state and local public health agencies are authorized to provide or implement essential public health services and functions, such as:

- Utilizing a broad range of flexible powers to protect and promote the public's health, including compulsory or mandatory powers as defined in the Act;
- Providing public health information programs or messages to the public that promote healthy behaviors or lifestyles, or educate individuals about health issues;
- Promoting efforts among public and private sector partners to develop and fund programs or initiatives that identify and ameliorate health problems;
- Conducting, funding, providing or endorsing performance management standards for the public health system;
- Developing and providing certification, credentialing or effective training for members of the public health workforce;
- Developing, adopting and implementing public health plans through administrative regulations, formal policies or collaborative recommendations that guide or support individual and community public health efforts;
- Establishing formal or informal relationships with public or private sector partners within the public health system;
- Enforcing existing laws and administrative regulations (including emergency regulations), and propose new laws, amendments to existing laws or administrative regulations that may serve as tools to protect the public's health;
- Identifying, assessing, preventing and ameliorating conditions of public health importance through surveillance; epidemiological tracking, program evaluation and monitoring; testing and screening programs; treatment; abatement of public health nuisances; administrative inspections or other techniques;
- Promoting the availability and accessibility of quality health care services through health care facilities or providers;
- Promoting availability of and access to preventive and primary health care when not otherwise available through the private sector, including acute and episodic care, prenatal and postpartum care, child health, family planning, school health, chronic disease prevention, child and adult immunization, testing and screening services, dental health, nutrition and health education and promotion services; and
- Systematically and regularly reviewing the public health system to recommend modifications in its structure or other features to improve public health outcomes.

From January 1, 2003 — August 15, 2007, the act was featured in 133 bills or resolutions in 33 states.

Sources: The Centers for Law and the Public's Health (http://www.publichealthlaw.net/ModelLaws/ MSPHA.php) & from the Law itself (http://www.hss.state.ak.us/dph/improving/turningpoint/PDFs/ MSPHAweb.pdf)

The Public Health Response to 9/11 and Anthrax: A Great Example of American Spirit, Talent and Teamwork

By James Blumenstock, Chief Program Officer, Public Health Practice, Association of State and Territorial Health Officials and former Deputy Commissioner of Health, New Jersey

As I look back on the public health response to the 9/11 and anthrax tragedies, my perception hasn't changed. If anything, I am even more impressed with how the public health community, many different jurisdictions and the nation as a whole dealt with two historic acts of terrorism.



Photo courtesy of CDC

At the time, I was the senior assistant commissioner of health for New Jersey and the health department's weapons of mass destruction coordinator. Ultimately, I became the incident commander for both terrorist events. It was absolutely amazing, but not really surprising, how the jurisdictions (Washington, D.C., Florida, Maryland, Virginia, etc.), against all odds, effectively responded to meet the immediate and long term needs of the public. I saw people do things for the public's good and push themselves beyond the limits of what they ever thought they could. They never took a break, never buckled and never faltered.

When the towers went down, people evacuated into New Jersey, and those who had minor injuries were coming to our hospitals. In addition, many New Jerseyans worked in New York City. The response and recovery was a huge activity; we sent a lot of our urban search and rescue and ground and air medical transports to the scene and nearby mustering points. We also used some of the properties across the river in New Jersey as staging areas for equipment and recovery planning, including Liberty State Park. As it continued over time, a large portion of our response shifted to mental health counseling and grief support. Many people who lost their lives were residents of the great Garden State.

When anthrax was confirmed, the public health community had just spent four weeks managing the daunting response to the 9/11 attacks. Many states were still running significant response/recovery activities. Then, someone in Florida contracted anthrax, yet you find out that ground zero for that attack was actually in New Jersey. All of a sudden, you are dealing with a crime scene and law enforcement investigation across several jurisdictions. There was potentially a fatal biological agent being distributed by a terrorist using the postal system that could do harm to innocent people all across the country. You had public fear on an unprecedented scale, all the while health agencies were dealing with a biological agent they weren't accustomed to — sure some dealt with naturally occurring anthrax and had trained for such an event, but this was the first "real deal." Then the lab samples start flooding in and they need to be tested in labs that were not originally designed and built for this kind of event.

Prior to the 2001 anthrax attack, New Jersey did about 10-15 specimen tests a year, principally for Federal Bureau of Investigation (FBI) powder investigations. In the fall of 2001 alone, our public health lab tested over 3,000 specimens. The demand for surge capacity was huge because we had samples coming in from local post offices and FBI as part of the investigation and other "white powder" scares. We also knew we would get positives, so we had people under incredible stress testing specimens they knew to be hot. Yet, all 3,000 were done and there was not one incident of cross contamination at our laboratory nor did any worker get infected. This is just one of a hundred stories that can be shared that show the true grit of the public health workforce. When you get down to it, they were working in outdated labs that didn't have the state of the art containment features that we have today. They maximized the use of what they had, innovated when necessary, and relied on their formal training to get the job done as safely, effectively and reliably as possible.

This was a great example of American spirit, pride in public service, talent and teamwork.

As I see it, there are three milestones when it comes to public health and emergency preparedness and response:

- **1999:** The country began to invest in public health preparedness, giving many states a couple of years to start developing capacity to handle those types of events. There is no doubt in my mind that this foundational work made all the difference in the world in better preparing us for the events that were soon to follow!
- **2001:** Every aspect of the country's public health system felt the impact of 9/11 and anthrax and learned what it took to respond to a massive terrorism and bioterrorism emergency.
- **The decade since:** Through the passage of key federal laws and establishment of critical federal cooperative agreement programs with the states, there has been exponential growth in the capacity and capability of local, county, state, territorial and national public health professionals to be more at the ready to respond to and recover from all hazards and threats, not just acts of terrorism.

As a result of the attacks, the public health, law enforcement and full family of emergency services communities were thrust together. It was a clear turning point, sending the signal that we were all in this together and that incredibly different sectors had to work together. Over the last 10 years there has been success after success that shows this. When you look at other events the emergency/disaster/terrorism community has responded to — such as the H1N1 Pandemic and many natural disasters such as hurricanes and other flooding events — clearly public health, law enforcement and emergency management are much more in step and familiar with each other's disciplines and specializations.

It truly is impressive how far we have come in the past 10 years. When I think back to the fall of 2001, the biggest limiting factor was human resources. As an example, there really weren't protocols fully developed and implemented at that time for having workers cross-trained as a means to provide sufficient surge capacity. Most of the work that was being done fell to primary responders (planning, hazmat, and bio hazardous lab folks) because there wasn't yet a mature means to stand up a robust incident command system, which would have created tiers of state workers and possibly even use private sector assets and volunteers able to stand in and take shifts across disciplines.

So, we had to overwork the folks responding to 9/11 and anthrax because we couldn't cross-train others in time. Today, we know you have to build depth on the bench to enable a public health system to have the capacity to scale up as necessary to deal with long-term and multiple events at the same time. No question about it, we pulled it off but it also was a huge wake up call for America that we cannot expect to fully protect the public "next time" without a better developed, trained and equipped public health system. Ten years later, we are much smarter and better prepared as far as having a competent, resilient and flexible workforce.

Following the 2001 tragedies, Congress and President Bush authorized a significant increase in funding for public health systems to build up capacity, capabilities, tools and knowledge. This was a huge turning point. Preparedness is a process, not an endpoint. The main take-away from 2001: the United States responded well, not only to the specific attacks, but recognizing it as a reality check that we needed a better and more resilient public health system and that decades of neglect should be reversed. To our credit, our public health system has been improved dramatically over the last decade. State of the art biosafety laboratories and Emergency Operations Centers have been built and equipped, real time information collection and sharing systems are in place, plans and procedures have been refined, stockpiles of lifesaving medical countermeasures have been purchased and strategically stored, and many drills and exercises have taken place to prepare for real world events. There is no doubt that we would be able to handle a response better and for a longer period of time in 2011.

We need to keep our eyes and minds open to any and all threats — an all-hazards approach — because anything is possible in this world. We also must overcome complacency. The longer we go without an incident, the public and policymakers think that it's something that we don't have to continue to worry about. That's flawed thinking and the public/policymakers must view and treat this as a matter of national priority.

To that end, even during times of economic difficulty, we must continue to invest in public health as a prevention strategy and maintain what we have built and continue to identify and fill remaining gaps. To be truly prepared, every aspect of the public health system must be developed and refined, we can't let the system that we built crumble or fall apart from a lack of continued investment. Public health emergency preparedness is a matter of national security.

I dedicate my reflection of the events of September 2001 to the many men and women of the New Jersey State Department of Health and Senior Services who gave everything they had to help protect the health of the public whom they proudly and tirelessly serve.

Public Health Plays Prominent Role in Homeland Security

By Mary C. Selecky, Secretary of Health, Washington State Department of Health

In public health, we once devoted the great majority of our disaster preparedness and response efforts to naturally occurring events — floods, fires, earthquakes and the like, especially in Washington state.

On February 28, 2001 when the Nisqually earthquake hit, my agency got a firsthand look at being on both ends of that response. The epicenter was 11 miles northeast of our office location at the time in downtown Olympia. Our buildings were damaged. We had to look out for our own, along with other people around the state. It was a long time before I even had a chance to go home and change clothes. Naturally, we responded as a public health agency. We knew the basics to make sure residents were safe, yet it was clear we had a lot to learn.

Less than seven months later, on September 11, the landscape of public health changed completely. Before that time, the only thing public health and Homeland Security had in common were being part of government. When emergency management plans were drawn up to respond to a biological event, public health was largely left out.

Soon after September 11, however, a series of anthrax attacks began around the country. Gary Locke, our governor at the time, asked me to explain what was happening — what anthrax was and what the ramifications could be.

I took an epidemiologist, an environmental health specialist, and a member of my communication team to the meeting. Governor Locke was surprised I had that many people involved. But it quickly became clear we needed diverse skills and talents to fully grasp what was happening, what the biological agent was, and how this might affect people in Washington.

We hadn't prepared for anything quite like this, so there were no specific emergency plans to coordinate between public health and law enforcement. We knew, though, that we didn't have the resources at our lab to test every white powder sample that someone brought in. With help from the Washington State Patrol and the Federal Bureau of Investigation we built a package screening protocol on the spot. Unlike other labs, we decided law enforcement would determine whether there was a credible threat. I know a lot of my colleagues were inundated and overrun with samples.

Our "white powder protocol" is still in place today. It may be the first example of ongoing collaboration between law enforcement and public health.

Before I was secretary of health, I ran a local health department for 20 years. I know people will first turn to their local health department before looking to the state and national levels. In Washington, we have something known as "meet me calls" — regular conference calls with local health agencies to share and gather information and to answer questions during disasters. We're fortunate this existed before the attacks; these calls were vital to sharing information and to help prevent public panic.

With the protocols we established, and with the constant flow of information through the "meet me calls," we ended up testing only a few more than 100 samples. Still, because of how the attacks developed, public health wound up with a permanent seat at the Homeland Security table — and with a prominent role. In short, it changed the landscape of national defense.

We've come a long way in the decade since anthrax and September 11. On that day, I had to go to a local hospital in Olympia just to watch a Centers for Disease Control and Prevention presentation because it was the only place with the technology to do it. Now we have video links with many local health agencies and tribal health centers.

In addition to technological advances, we've seen big changes in the creation of comprehensive emergency management plans. We now have warning systems throughout the state, and turnkey operations that allow us to anticipate what the public will demand in crises. In the events that followed 2001, we've learned to plan, and to make our plans work, instead of waiting to react. The work is far from done, yet Washington state and our national public health system has taken a big step forward we can all be proud of. The people of our nation are safer and healthier because of it.

Public Health, Always Be Prepared

By Georges C. Benjamin, M.D., FACP, FACEP (E), FNAPA, Hon FRSPH, Executive Director, American Public Health Association

On September 11, 2001, our country's notion of national defense forever changed. With the subsequent anthrax attacks, it became apparent that public health is just as important to protecting our citizens as any missile defense shield.

In 2001, I was secretary of the Maryland Department of Health and Mental Hygiene and also serving as president of the Association of State and Territorial Health Officials (ASTHO), so I had my fingers on the pulse of many public health programs and priorities around the country. I always knew we protected people and improved their health, but we had never before seen ourselves as an integral part of the homeland security infrastructure.

We were fortunate in Maryland. A few years before the attacks, my state had begun to build a bioterrorism plan. While serving on the Institute of Medicine's Bioterrorism and Chemical Preparedness Committee, my eyes opened to the potential threats out there. I worked to ensure that Maryland was one of the early grantees of the Centers for Disease Control and Prevention (CDC) Bioterrorism grants. By mid-2001, we had already made substantial investments in time, training, plans, and creating relationships with law enforcement. We had included the Federal Bureau of Investigation (FBI) and other law enforcement agencies in our plan, mostly, to forge relationships that would be needed if an attack took place. I didn't want us first exchanging business cards in the middle of a disaster. We also identified a "go-to place" for an alternative command center should we not be able to use our building. This is where we convened on 9/11 because no one knew if there were other planes and there were rumors that any additional planes might be targeting Baltimore and Annapolis.

After 9/11, we knew we had to be prepared for another attack. In October, I learned through the beltway rumor mill about a confirmed case of anthrax in Washington, D.C. So, I picked up the phone and called District of Columbia health officer, Dr. Ivan Walks, and offered our help. I perceived it was his problem, but quickly learned otherwise. The victim was a Maryland resident who was hospitalized in Virginia who worked in Washington, D.C. Clearly this case eclipsed borders and the entire metropolitan area needed a coordinated, consistent and coherent response.



Photo courtesy of CDC

The victim was Thomas L. Morris Jr., a postal worker whose job was to carry mail from the Brentwood facility in Washington, D.C. to Baltimore Washington International Airport (BWI). At the time, Brentwood hadn't been clearly established as the site where he was exposed — which we refer to as the powder drop — so we had to quickly determine where he got infected. If he was exposed at the airport, people all over the country and possibly the world could have been exposed.

Working through the night, we began piecing it together. We determined that the victim primarily carried mail to an air cargo facility on the outskirts of BWI and consequently could not have contracted anthrax in the airport. This was a great relief, but it also raised other concerns. If Brentwood was the most likely place of exposure, that would mean not only were other workers and residents at significant risk, but so were other members of the Washington metropolitan region.

In addition, many of Baltimore city's (and other Maryland counties) mail came directly (one "mail stop" away) from the D.C. Brentwood Facility. Several banks and other businesses were impacted by this, some having mail rooms with high speed sorting machines similar to those used in the Brentwood postal facility. We received calls from bankers and others whose employee's wouldn't go near the mail even to process checks. They needed to know if the mail was safe. Unfortunately, we didn't have a good answer for them, so we ended up conducting a state wide testing program for business mail rooms to define our risks and reassure the public. Like other public health agencies we tested all kinds of things, from personal mailboxes to powders that turned out to be from donuts.

It was incredibly difficult to allay public fears because there were few reliable rapid tests for anthrax in the environment. In some cases we were inventing new testing methods based on the best science we had. We simply didn't have a lot of experience with environmental testing under these conditions and no experience with mass exposure to anthrax. We got through it, but with a lot of ingenuity and teamwork.

Ten years ago, public health workers answered our nation's call to action. Before that, preparedness had not always been considered central to our jobs. Some feel that the added responsibilities undermine our other important work. But in the 21st century, it's clear that preparedness is an integral and important part of public health. It is not an either or thing. At the end of the day, preparing for any threat makes us better prepared for all threats, whether it's bioterrorism or a flu pandemic.

We learned a lot from these attacks. There is no question that the old Boy Scout motto "be prepared" is still very relevant today, and we are much better prepared for bioterrorism, pandemics and basically any public health emergency. However, I do worry that our short-sighted zeal for financial solvency is putting our health preparedness and safety at risk. Simply trading our long-term health future for short-term fiscal stability isn't a reasonable trade off.



Photo courtesy of CDC

SECTION 6

SUMMARY: A Decade of Public Health Preparedness

Ten years ago, the September 11th and anthrax tragedies clearly demonstrated that the public health system was not prepared for the range of modern health threats we face. Since then, significant investments have resulted in the country being much better prepared to respond to public health emergencies ranging from threats of bioterrorism to major infectious disease outbreaks like a pandemic flu or natural disasters like hurricanes, tornadoes, and floods.

For the past eight years, in the annual Ready or Not? Protecting the Public's Health from Diseases, Disasters, and Bioterrorism, TFAH has documented progress and ongoing vulnerabilities in the nation's ability to respond to health crises. The following provides an overview of key areas of progress, gaps, and recommendations for America's public health preparedness.

Progress In Preparedness Since 2001

Since 2001, major investments in improving preparedness have led to significant improvements in preparedness planning and coordination; public health laboratories; vaccine manufacturing; the Strategic National Stockpile; pharmaceutical and medical equipment distribution; surveillance; communications; legal and liability protections; increasing and upgrading staff; and surge capacity.

MAJOR AREAS OF IMPROVEMENTS	
Planning and Coordination	■ In June 2002, Congress passed the Public Health Security and Bioterrorism Response Act of 2002, which included cooperative agreement funding support for states around the country. In 2006, Congress reauthorized the legislation as the Pandemic and All-Hazards Preparedness Act (PAHPA) of 2006.
	■ Homeland Security Presidential Directive (HSPD) 21 was issued in 2007 setting a National Strategy for Public Health and Medical Preparedness.
	■ All 50 states and Washington, D.C. completed initial bioterrorism response plans by September 2003.
	■ The federal government created a comprehensive National Strategy for Pandemic Influenza, involving all federal agencies and partners within state and local governments, businesses, and communities around the country — and more than $7 billion was provided to improve pandemic preparedness in the United States.
	■ All 50 states and Washington, D.C. developed pandemic flu plans that were reviewed by HHS before the 2009 outbreak of H1N1. In 2003, only 13 states had pandemic flu plans.
	■ 44 states and Washington, D.C. activated their Emergency Operations Center (EOC) a minimum of two times in a year.***
	■ 44 states and Washington, D.C. reported that pre-identified staff were able to acknowledge notification of emergency exercises or incidents within a target time of 60 minutes at least twice.***
	■ 48 states and Washington, D.C. developed at least two After-Action Reports/Improvement Plans within 60 days of an exercise or actual incident.***
	■ In 2007, all 50 states and Washington, D.C. reported conducting an emergency preparedness drill or exercise that included both the health department and the National Guard.

Source: TFAH's *Ready or Not* reports, data from 2003-2010. ** Source: ASTHO Profile Survey, data from 2010.
*** Source: CDC's *Strengthening the Nation's Emergency Response State by State Report,* data from 2007-08.

MAJOR AREAS OF IMPROVEMENTS	
Public Health Laboratories	■ 47 states report having enough staffing capacity to work five, 12-hour days for six to eight weeks in response to an infectious disease outbreak, such as novel influenza A H1N1.
	■ 49 states and Washington, D.C. increased or maintained their Laboratory Response Network for Chemical Threats (LRN-C) chemical capacity from August 10, 2009 to August 9, 2010. In 2005, only 10 state public health labs had adequate chemical terrorism response capabilities.
	■ By 2007, 44 states and Washington, D.C. reported sufficient bio-testing capabilities, an increase from six in 2003.
	■ In 2007, only one state and Washington, D.C. reported their labs did not have the capability to provide 24/7 coverage to analyze samples.
	■ By 2006, 47 states reported having sufficient numbers of trained scientists to test for possible anthrax and plague, an increase from 10 in 2004.
Vaccine Manufacturing	■ Congress appropriated billions of dollars through Project BioShield and the Biomedical Advanced Research and Development Authority (BARDA) to invest in vaccine research and development, but there are still limited financial and business incentives for companies to pursue research and development.
	■ BARDA awarded a contract to develop the first cell-based flu vaccine, expected in 2014.
Strategic National Stockpile (SNS)	■ The SNS maintains a variety of critical pharmaceuticals and medical supplies including antibiotics, chemical nerve agent antidotes, antiviral drugs, pain management drugs, vaccines for a number of agents, and radiological countermeasures. The SNS is positioned in undisclosed locations throughout the United States and is configured to provide flexible response strategies.
	■ In advance of the H1N1 outbreak, the SNS contained pandemic flu countermeasures, including 50 million antiviral treatment courses, 105.8 million N95 respirator masks, and 51.7 million surgical masks.
Pharmaceutical and Medical Equipment Distribution	■ All 50 states and Washington, D.C. have adequate plans to receive and distribute supplies from the SNS based on a CDC evaluation of planning and management. In 2003, only two states had adequate plans according to CDC.
	■ 47 states and Washington, D.C. increased vaccination rates for seniors against the seasonal flu from 2008 to 2009. In 2006, only 38 states increased rates from the year before.
Surveillance	■ 44 states and Washington, D.C. reported using a disease surveillance system that is compatible with CDC's National Electronic Disease Surveillance System (NEDSS), as of 2009. In 2004, only 18 states had disease surveillance systems that were NEDSS-compliant.
	■ 43 states and Washington, D.C. can send and/or receive electronic health information with health care providers.**
	■ 40 states and Washington, D.C. have an electronic surveillance system that can report and exchange information.**
	■ 29 states were able to rapidly identify disease-causing E.coli O157:H7 and submit the lab results in 90 percent of cases within four days.***
	■ CDC, in partnership with state and local health agencies, was able to provide real-time summarized daily data for flu surveillance ahead of the second wave of the H1N1 flu outbreak.

Source: TFAH's *Ready or Not* reports, data from 2003-2010. ** Source: ASTHO Profile Survey, data from 2010.
*** Source: CDC's *Strengthening the Nation's Emergency Response State by State Report,* data from 2007-08.

MAJOR AREAS OF IMPROVEMENTS	
Communications and Community Resiliency	■ 25 states and Washington, D.C. mandate all licensed child care facilities to have a multi-hazard written evacuation and relocation plan.
	■ The Pandemic and All-Hazards Preparedness Act and Homeland Security Presidential Directive-21 make community resiliency a top priority of preparedness.
	■ The Long-Term Disaster Recovery Group, composed of the Secretaries and Administrators of more than 20 federal departments, agencies, and offices, was created in 2009 to strengthen disaster recovery and help communities recover more quickly and effectively after emergencies.
Legal and Liability Protections	■ Every state had adequate statutory authority to implement a quarantine in response to a hypothetical bioterrorism attack as of 2005.
	■ In 2009, at least 33 states have liability protection for entities or organizations that provide volunteer assistance during emergencies.
Increasing and Upgrading Staff and Volunteer Health Responders	■ All 50 states and Washington, D.C. met three key criteria for the Medical Reserve Corps (MRC) (having a coordinator, a majority of units in the state meeting incident management guidelines, and the majority of units are part of a registry), which is a national network of community-based groups which engage volunteers to strengthen public health emergency response and community resilience. In 2007, 13 states did not meet a minimum threshold for MRC volunteers for every 100,000 citizens. In 2008, 16 states did not have MRC coordinators.
Surge Capacity	■ In 2002, the National Bioterrorism Hospital Preparedness Program — renamed the Hospital Preparedness Program in 2006 — was created and has provided around $400 million annually to support hospital preparedness and surge capacity development.
	■ In 2009, the Institute of Medicine published Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report, which included a five-step process for emergency planners to follow when developing crisis standards of care.
	■ An online system for tracking the availability of hospital beds (HAvBED) started in wide use in 2009, helping health care systems and regions care for a surge of patients in the event of a mass casualty incident.

Source: TFAH's *Ready or Not* reports, data from 2003-2010. ** Source: ASTHO Profile Survey, data from 2010.
*** Source: CDC's *Strengthening the Nation's Emergency Response State by State Report,* data from 2007-08.

ONGOING GAPS IN PREPAREDNESS

The United States often takes a band-aid approach to public health preparedness. As new emergencies and concerns emerge and attention shifts, it often means resources are diverted from one pressing priority to another, leaving other ongoing areas unaddressed.

After September 11th and the anthrax attacks, the federal government made an unprecedented investment to quickly shore up areas of preparedness, which have led to major improvements — however, it was not at a sufficient level to backfill long-standing gaps in infrastructure or update technologies to meet state-of-the-art standards.

Currently, there is an additional new threat to preparedness — the current economic climate and budget cuts at the federal, state, and local level mean that the progress made over the past decade could be lost.

Until public health emergency preparedness receives sufficient and sustained funding, Americans will continue to be needlessly at risk for a range of public health threats.

MAJOR ONGOING GAPS	
A Funding Gap	Historically, funding for emergencies is often substandard until there is an actual emergency, and then there is a call for emergency supplemental support. This dynamic means the country is often unprepared to immediately respond during crises. The current economic difficulties have meant major cuts in federal, state, and local support for public health and preparedness, leaving Americans unnecessarily more vulnerable during emergencies.
	■ **State cuts:** 33 states cut funding for public health from fiscal year (FY) 2008-2009 to 2009-2010, 18 of these states cut funding for a second year in a row. According to the Center on Budget and Policy Priorities (CBPP), states have experienced overall budgetary shortfalls of $425 billion since FY 2009.[2]
	■ **Local cuts:** As of December 2010, approximately 29,000 jobs have been cut from local public health departments since January 2009 — totaling 19 percent of the local public health workforce.[3]
	■ **Federal cuts:** Since FY 2005, federal support for public health preparedness has also been cut by 37 percent.[4]
A Workforce Gap	There is already a major shortage of trained public health workers and funded positions. There are not enough workers, particularly experts, to effectively respond during public health emergencies. The United States has 50,000 fewer public health workers than it did 20 years ago, and one-third of public health workers will be eligible to retire within five years.[5,6] As baby boomers begin to retire, there is not a new generation of workers being trained to fill the void. Also, under current policies and in some cases, public health workers in one area are not allowed to be shifted to help in other areas, even during emergencies. The recent budget cuts are intensifying the problem, with a reduction of 15 percent of the local public health workforce in the past two years, and, at the same time, health departments around the country are experiencing furloughs or shortened work weeks.
A Surge Capacity Gap	In the event of a major disease outbreak or attack, the health care system is stretched beyond normal capabilities. Surge capacity, the ability of the medical system to care for a massive influx of patients, remains one of the most serious challenges for emergency preparedness. A large-scale disaster also requires having enough equipment and appropriate space to treat patients. There are numerous ongoing surge capacity issues around response in primary care settings beyond just hospitals including crisis of care standards, alternative care sites, coordinating volunteers to help and providing them with adequate liability protection, and regional coordination.
A Surveillance Gap	The United States still lacks an integrated, national approach to biosurveillance — which would dramatically improve response capabilities ranging from a bioterrorism attack to catastrophic disasters to contamination of the food supply. There is not a standardized system using up-to-date technology, like systems major retail chains use to track inventory and customer patterns. Currently, there is major variation in how quickly states collect and report data, which hampers bioterrorism and disease outbreak identification and control efforts.
A Gap in Community Resiliency Support	The ability to work with communities around ways to cope and recover from a disaster or public health emergency is another major challenge for preparedness. It is particularly difficult to address the needs of at-risk, special needs, and vulnerable populations, such as children, the elderly, people with underlying health conditions, and lower-income communities. The existing gaps in day-to-day public health departments make it challenging to build and maintain the relationships needed to identify and work with vulnerable Americans who need the most help during emergencies.
Gaps in Vaccine and Pharmaceutical Research, Development, and Manufacturing	The research and development of medical countermeasures — including diagnostics, antiviral medications, and vaccines — is outdated in the United States, in large part because it is not a particularly profitable venture for pharmaceutical investors. Project BioShield and the BARDA were developed to help spur innovation and investment in medical countermeasures, but, so far, the result of new, effective products has been limited and we have not created new platforms for multi-use product development and manufacturing. The investments made in vaccine research and development did help lead to the production of a vaccine for the H1N1 flu strain in record time, but manufacturers were only able to produce limited quantities by the beginning of the flu season because of limited capacity and reliance on an old and outdated egg-based production strategy.

WHAT DOES PREPAREDNESS LOOK LIKE?

The Goals of 24/7 Public Health Emergency Response Include:

- Rapid **detection** of and **response** to emergency disease threats, including those caused by bioterrorism.
- Intensive **investigative** capabilities to quickly diagnose an infectious disease outbreak or to identify the biological or chemical agent used in an attack.
- **Surge capacity** for mass events, including adequate facilities, equipment, supplies, and trained health professionals.
- **Mass containment strategies,** including pharmaceuticals needed for **antibiotic or antidote administration** and **isolation and quarantining** when necessary.
- Streamlined and effective **communication** channels so health workers can swiftly and accurately communicate with each other, other front line workers, and the public about 1) the nature of an emergency or attack, 2) the risk of exposure and how to seek treatment when needed, and 3) any actions they or their families should take to protect themselves.
- Communications must also be able to reach and take into consideration at-risk populations.
- Streamlined and effective evacuation of at-risk populations with special medical needs.
- An informed and involved public that can provide material and moral support to professional responders, and can render aid when necessary to friends, family, neighbors, and associates.

What it will take to achieve basic levels of preparedness:

- **Leadership, planning, and coordination:** An established chain-of-command and well defined roles and responsibilities for seamless operation across different medical and logistical functions and among federal, state, and local authorities during crisis situations, including police, public safety officials, and other first responders.
- **Well-funded core public health infrastructure:** Basic public health systems and equipment, including laboratory testing and communications, that keep pace with advances in science and technology.
- **An expert and fully-staffed workforce:** Highly trained and adequate numbers of public health professionals, including epidemiologists, lab scientists, public health nurses and doctors, and other experts, in addition to back-up workers for surge capacity needs.
- **Modernized technology:** State-of-the-art laboratory equipment, information collection, and health tracking systems.
- **Rapid development and ability to manufacture vaccines and medications:** A streamlined, safe, effective system to ensure rapid research and production of medical countermeasures to protect people for emerging threats.
- **Pre-planned, safety-first rapid emergency response capabilities and precautions:** Tested plans and safety precautions to mitigate potential harm to communities, public health professionals, and first responders.
- **Immediate, streamlined communications capabilities:** Coordinated, integrated communications among all parts of the public health system, all frontline responders, and with the public. Must include back-up systems in the event of power loss or overloaded wireless channels.

ALL-HAZARDS APPROACH TO EMERGENCY PUBLIC HEALTH THREATS

The U.S. public health system is responsible for protecting the American people from a range of potential health threats.

EXAMPLES OF MAJOR EMERGENCY PUBLIC HEALTH THREATS

Agroterrorism: The "…deliberate introduction of an animal or plant disease with the goal of generating fear, causing economic losses, and/or undermining stability."[7] Agroterrorism can be considered a subcategory of "bioterrorism" and foodborne diseases.

Bioterrorism: The intentional or deliberate use of germs, biotoxins, or other biological agents that cause disease or death in people, animals, or plants. Examples include anthrax, smallpox, botulism, *Salmonella,* and *E. coli*.

Blast Injuries: Explosions, whether deliberate or accidental, can cause multi-system, life threatening injuries among individuals and within crowds. In addition, blunt and penetrating injuries to multiple organ systems are likely when an explosion occurs and unique injuries to the lungs and central nervous system occur during explosions.

Chemical terrorism: The deliberate use of chemical agents, such as poisonous gases, arsenic, or pesticides that have toxic effects on people, animals, or plants in order to cause illness or death. Examples include ricin, sarin, and mustard gas.

Chemical incidents and accidents: The non-deliberate exposure of humans to harmful chemical agents, with similar outcomes to chemical terrorism.

Food-borne diseases: Food-borne illness is caused by harmful bacteria, viruses, parasites or chemicals that are found in food and beverages and enter the body through the gastrointestinal tract. The Centers for Disease Control and Prevention (CDC) estimates there are approximately 76 million pathogen-induced cases of food-borne diseases each year in the United States, causing approximately 325,000 hospitalizations and 5,000 deaths. Examples include botulism, *Salmonella, E.coli* 0157:H7, shigella, and norovirus.

Natural disasters: Harm can be inflicted during and after natural disasters, which can lead to contaminated water, shortages of food and water, loss of shelter, and the disruption of regular health care. Examples include hurricanes, earthquakes, tornados, mudslides, fires, and tsunamis.

Pandemic flu: A novel, potentially lethal strain of the influenza against which humans have no natural immunity. The H1N1 flu was the first pandemic flu of the 21st century. Historically, pandemic flu occurs two to three times every hundred years or so. In the 20th century the world experienced the 1918, 1957/58, and 1968 pandemic flu, although the severity of the disease varied greatly among them.

Radiological threats: Intentional or accidental exposure to radiological material. For example, a terrorist attack could involve the scattering of radioactive materials through the use of explosives ("dirty bomb"), the destruction of a nuclear facility, the introduction of radioactive material into a food or water supply, or the explosion of a nuclear device near a population center.

Vector-borne diseases: Diseases spread by vectors, such as insects. Examples include Rocky Mountain spotted fever and malaria.

Water-borne diseases: Diseases spread by contaminated drinking water or recreational water, such as typhoid fever and cholera. According to CDC, more than 1,000 persons become ill from contaminated drinking water and more than 2,500 persons become ill from recreational water disease outbreaks annually in the United States.[8]

Zoonotic/Animal-borne diseases: Animal diseases that can spread to humans and, in some cases, become contagious from human to human. Examples include Avian flu, West Nile virus, and SARS. In 2000, the World Health Organization (WHO) identified more than 200 diseases occurring in humans that were known to be transmitted through animals.[9] Experts believe that the increased emergence of zoonotic diseases worldwide can be attributed to population displacement, urbanization and crowding, deforestation, and globalization of the food supply.

ENDNOTES

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