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May 15, 2003

MEMORANDUM

To: Members of the Subcommittee on National Security,
Emerging Threats, and International Relations

From: Joseph F. McGowan

Subject: Briefing Memorandum for the hearing, *Stamping Out Anthrax in
USPS Facilities: Technologies and Protocols for Bioagent Detection*,
scheduled for Monday, May 19, 2003, at 1:00 p.m. in Room 2247,
Rayburn House Office Building.

PURPOSE OF THE HEARING

The purpose of the hearing is to examine available technologies for detecting anthrax and other bioagents, and appropriate protocols for selecting and using those technologies.

HEARING ISSUES

- 1. How sensitive are the methods to detect anthrax contamination and how appropriate are the protocols for selecting and using those detection methods?**
- 2. What lessons have been learned from the anthrax contamination, detection and remediation efforts at the Wallingford, Connecticut Postal Facility?**

BACKGROUND

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*. Anthrax spores are found in the soil in many parts of the world and can remain dormant in the environment for many years. Although anthrax occurs most commonly in plant-eating animals, anthrax can also infect humans.

Human anthrax infections are very rare in the United States. Normally they have been the result of occupational exposure to infected animals or contaminated animal products, such as wool, hides, or hair.¹ Infection can occur in three forms:

- (1) cutaneous — usually through a cut or an abrasion in the skin;
- (2) gastrointestinal — by ingesting undercooked, contaminated meat; and
- (3) inhalation — by breathing aerosolized or airborne anthrax spores into the lungs.

The symptoms depend on how anthrax is contracted. On the basis of experiences in the fall of 2001, medical experts expect symptoms typically to appear within 4 to 6 days of exposure, although individuals have contracted the disease as long as 43 days after exposure. The disease can be treated with a variety of antibiotics, such as Cipro, and is not contagious.

Anthrax spores are dormant cells that can germinate and, if viable, replicate under suitable environmental conditions, such as in the human body. Those who come in contact with anthrax spores are described as having been exposed. Depending on the extent of contamination and its form, a person can be exposed without actually developing the disease. However, if the anthrax spores grow and the bacteria multiply and spread throughout the body, a fatal toxin can develop. **(Web Resource 1)**

Common Sampling Methods

There are several common methods of sampling for anthrax spores:

- Dry swabs – Dry swabs have small surface areas and are similar to Q-tips®. Dry swabs should be a sterile, non-cotton material, such as rayon or polyester.

¹Since 1955, approximately 80% of the U.S. cases have been industry related and 20% agriculture related. About 95% of the reported U.S. cases have been cutaneous, and the remaining 5% inhalation.

Typically, they are used to sample small, nonporous surface areas (less than 100 sq. cm) that do not have a large accumulation of dust.

- Wet swabs – Wet swabs are dry swabs that have been moistened with a sterile wetting agent such as sterile water, a sterile saline solution, or a sterile phosphate-buffered solution. As with dry swabs, wet swabs have a small surface area. They should be used on small, nonporous surface areas of less than 100 sq. cm. that do not have a large accumulation of dust.
- Wet wipes – Similar to sterile gauze pads, wet wipes are approximately three inches square. Typically, they are used for sampling larger (more than 100-sq. cm), nonporous surface areas.
- High Efficiency Particulate Air (HEPA) vacuums – A HEPA vacuum is a suction device with a nozzle and a cone-shaped filtering trap or sock attached. It can be used to collect dust samples from a porous surface, such as carpeting, ceiling tiles, ventilation system filters or cloth seats. It may also be used to collect samples from a non-porous surface, or from the air. **(Web Resource 1)**

After samples have been collected, they are transported to a laboratory that is qualified to analyze the materials. There is a range of laboratory tests for detecting anthrax in the environment or in a person's body. However, analysis by the culture method is considered to be the gold standard for identifying anthrax. Culturing anthrax is accomplished by nutrient medium and watching it grow. Analyzing the resulting growth for the presence of anthrax needs to be done by a qualified lab, such as CDC, that can definitively test for and identify *Bacillus anthracis*. **(Web Resource 2)** Laboratories report anthrax test results either qualitatively (positive or negative) or quantitatively (such as a specific number of colony-forming units per gram, per square inch of surface material sampled, or in milligrams per microliter). **(Web Resource 1)**

The number of living cells in a sample is termed “colony-forming units” (CFU). Typically, in the case of vacuums, it is reported as per gram of material collected, or per square inch for samples collected using wipes.

Postal Service Infrastructure

In addition to the U.S. Postal Service (USPS) headquarters, the Postal Service consists of 8 area offices that are subdivided into 85 postal districts throughout the U.S. The Connecticut postal district in Hartford oversees operations at the Wallingford facility. There also are approximately 350 mail

processing and distribution centers, including Wallingford, and about 38,000 post offices, stations, and branches. **(Web Resource 1)**

The Wallingford Postal Facility is operated by a facility manager and is under the jurisdiction of the District Manager in Hartford. This facility is about 350,000 square feet and has over 1,100 employees. It can process nearly 3 million pieces of mail per day and operates around the clock. **(Web Resource 3)** Two unions represent workers at the facility, the Greater Connecticut Area Local American Postal Workers Union, in New Haven, Connecticut, and the Mail Handlers Union in Boston, Massachusetts. **(Web Resource 1)**

Anthrax Contamination at USPS Facilities:

In the fall of 2001, letters contaminated with anthrax resulted in 23 cases of the disease and 5 deaths, including 94-year old Otilie Lundgren of Oxford, Connecticut. In addition, numerous U.S. Postal Service facilities were contaminated, including the Southern Connecticut Processing and Distribution Center in Wallingford, Connecticut.

On or about October 9, 2001, at least two letters containing anthrax spores entered the U.S. mail stream. The letters were addressed to Senator Thomas Daschle and Senator Patrick Leahy. Before being sent on to Brentwood, the Washington, D.C. postal facility that processed mail to the two Senators, the contaminated letters had been processed on high-speed mail-sorting machines at Hamilton, New Jersey, which is also known as the Trenton postal facility. Hamilton also processed mail that was then transported to Wallingford for further processing.² **(Web Resource 1)**

The USPS initially responded to this crisis by collecting and testing samples from more than 280 facilities that may have been contaminated with anthrax. The Wallingford facility was included in an expanded number of sites. Ultimately, Wallingford was tested for anthrax six times during the period of November 2001 through April 2002.

The first two tests at Wallingford were conducted by a USPS contractor between November 11 and 21, 2001. On November 11, using dry swabs, the

²Two other contaminated letters were sent to a television news anchor and the editor of The New York Post in New York City on or around September 18, 2001. Although the letters were processed through the Hamilton/Trenton facility, it is not known whether these letters contaminated the Wallingford facility.

USPS contractor took 53 samples from random sites within the facility. The November 11 samples were negative.

On November 21, after the Connecticut anthrax infection case was reported, 64 new samples were taken at Wallingford from letter and parcel sorting surfaces using dry swabs. This second set of samples was also negative. **(Web Resource 3)**

In late November 2001, the death of Otilie Lundgren spurred an extensive investigation by a multiagency team to determine, among other things, how she had been exposed to anthrax. The team was formed to investigate and formulate the public health response, and agency participants included law enforcement (the Connecticut State Police and the FBI); environmental safety (the Connecticut Department of Environmental Protection); public health (the Connecticut Department of Public Health, local health departments, and CDC); and the Postal Service. The on-site investigation team was jointly led by the Chief Epidemiologist for the Connecticut Department of Public Health, an on-site CDC team leader, and a CDC team leader in Atlanta.

An extensive investigation was conducted at the Lundgren home and other places she had visited. However, all the test samples taken in the places she had been over the proceeding two months were negative. **(Web Resource 2)** Believing she may have died from exposure to mail that had been contaminated as it passed through the Wallingford facility, federal and state investigators conducted more extensive testing of the facility.

On November 21, 2001, the same day Otilie Lundgren died, workers at the facility received antibiotics as a precautionary measure, even though the earlier testing by the Postal Service contractor at the Wallingford facility had not identified any anthrax contamination. At about that same time, the USPS also initiated a medical surveillance program to monitor the health of Wallingford employees.
(Web Resource 1)

On November 25, the CDC used 60 wet, rather than dry, swabs to retest the Wallingford facility. For a third time, the test results for anthrax were negative.
(Web Resource 1)

On November 28, 2001, CDC took 212 new samples using different technology, wet wipes (2x2-inch) and High Efficiency Particulate Air (HEPA) vacuums. This fourth effort to collect anthrax samples from Wallingford was much more targeted and extensive. On this occasion, CDC obtained positive

results for the presence of anthrax in some of the samples collected from four of the 13 mail sorting machines. **(Web Resource 3)**

Culture and analyses of the November 28 samples at a CDC-contracted laboratory produced quantified results, revealing about 3 million anthrax colonies, or living anthrax cells, in one of the samples. **(Web Resource 3)** Despite this relatively high concentration found in one Wallingford sample, none of the employees at the facility became sick from the anthrax contamination.³

A second HEPA vacuum sample identified 370 colony-forming units per gram of material collected from a second mail sorting machine. Two other positive samples were collected using wet wipes, which, according to the Chief Epidemiologist, did not allow for measuring the amount of dust collected. **(Web Resource 1)**

On December 2, 2001, 200 additional samples were collected from Wallingford using wet wipes. Focusing mainly on the four contaminated mail sorting machines, positive samples were collected on 30 of 52 samples from one machine, three of 52 samples from a second machine, and one of 48 samples from each of two other mail sorting machines.

The Interim Guidelines for Sampling, Analysis, Documentation, and Disposal of Anthrax for U.S. Postal Service Facilities, **(Attachment 1, pp.13-14)**, dated December 4, 2001 (release date, November 28, 2001), require validation of the test results received from CDC and/or State Public Health Laboratories, before informing workers, although the guidelines are silent as to what constitutes validation. Because the Postal Service said results could not be validated, Wallingford postal workers were not informed about the number of anthrax colonies identified from the samples taken on November 28.

On January 29 and February 6, 2002, the American Postal Workers Union requested all test results for the facility. Despite this APWU request, USPS did not release the results. A subsequent OSHA investigation resulted in USPS releasing the quantitative results in September 2002, seven months after the results had been

³This may be attributable to several factors: As a precautionary measure, workers had been provided antibiotics on November 21, the day the Connecticut woman died from inhalation anthrax. The contaminated machines were isolated and decontamination was scheduled to begin the next day. There was no evidence that the anthrax was airborne, because no spores had been found in the facility's heating, ventilating, and air conditioning systems. And, USPS had decided a month earlier to halt using compressed air to clean its facilities, reducing the chances of spores becoming airborne.

requested by the union (APWU), and nine months after USPS first knew those results.

Pursuant to a USPS requirement for testing elevated areas in facilities that had previously tested positive for anthrax prior to any routine cleaning, on April 21, 2002, a USPS contractor sampled areas above the previously contaminated machines using a HEPA vacuum. This was performed in consultation with CDC, OSHA, EPA, and the Connecticut Department of Public Health. Once more, positive test results for anthrax were found in some of the 101 samples from an area located above the previously contaminated sorting machines. The test results indicated one colony from 7.50 grams of material sampled, 10 colonies and 11 colonies from 7.69 grams of material sampled, and 13 colonies and 18 colonies from 5.67 grams of material sampled. **(Web Resource 1)**

On April 24, the laboratory relayed those results to district postal managers. The contaminated areas were subsequently encapsulated and decontaminated. A Postal Service contractor collected follow-up samples to test the effectiveness of the decontamination between May 1 and June 3, 2002. The laboratory reported negative results in all of the samples directly to district postal managers on June 6, and the facility was returned to full operation on June 7. **(Web Resource 1)**

Summary of Anthrax Contamination Sampling at Wallingford November 2001 — April 2003			
Sampling Date	Type (and Number of Samples)	Result	Agency Collecting the Samples
November 11, 2001	Dry Swabs (53)	Negative	USPS Contractor
November 21, 2001	Dry Swabs (64)	Negative	USPS Contractor
November 25, 2001	Wet Swabs (60)	Negative	CDC
November 28, 2001	Wet Wipes and HEPA vacuums (212)	Positive*	CDC
December 2, 2001	Wet Wipes (200)	Positive*	CDC
April 21, 2002	HEPA vacuums (101)	Positive*	USPS Contractor

*A positive finding of anthrax spores on one or more of the samples. **Source: General Accounting Office (Web Resource 1)**

DISCUSSION OF HEARING ISSUES

1. How sensitive are the methods to detect anthrax in the workplace, and how appropriate are the protocols for selecting and using those detection methods?

Questions remain about the sensitivity of various tests and how they are selected. Each of the usual methods for sampling for anthrax spores has advantages and limitations, although all can be successfully used, depending on the nature and extent of the contamination.

In Wallingford, dry swabs apparently proved relatively insensitive in detecting the anthrax. Some experts believe that method may be generally less effective, especially for sampling dry materials in larger areas. Wet swabs, on the other hand, are viewed as a better method for collecting material such as anthrax spores from very small, nonporous surface areas. Similarly, especially for larger, nonporous surface areas, wet wipes can be another effective sampling method, as was found to be the case at Wallingford. Finally, High Efficiency Particulate Air (HEPA) vacuums were particularly useful at Wallingford for collecting dust samples from both porous and non-porous surface areas. **(Web Resource 1)**

The extent of the testing for anthrax, in terms of the appropriateness of the sampling methods and the amount and location of the samples collected, is critical for determining the existence of anthrax contamination at a work site. Any testing performed needs to be aggressive, proceeding with the assumption that anthrax is present. Since the lethal exposure dose to anthrax is not known with any precision, any positive finding could have serious health implications.

The factors and variables affecting whether an individual actually contracts anthrax are varied. Therefore, quantifying the test results may not always be sufficient. For example, using a count of 8,000 to 10,000 spores as the measure for a lethal dose may not be useful in every instance, especially in the case of a 94-year old asthmatic woman who may have inhaled just a single spore of a very virulent, active form of the bioagent.

Hence, a test result of zero (a negative result) may not really be zero. It simply may mean that some spores remain undetected, either due to the method used for sampling, or because of absence of viable spores in the precise locations being sampled.

Furthermore, for some, a count of more than zero, even just one spore, can be as deadly as 10,000 – or even a million – spores, depending on the health of the

individual exposed, the type of contamination, the characteristics of the particular anthrax spores, and whether antibiotics are administered. Any notion about a “non-fatal” dose of anthrax may be misguided.

2. What lessons have been learned from the anthrax contamination, detection and remediation efforts at the Wallingford, Connecticut Postal Facility?

Prior to the fall of 2001, most outbreaks of inhalation anthrax in the United States were linked to occupational exposure.⁴ **(Web Resource 1)** Because so few instances of inhalation anthrax have occurred, scientific understanding about the number of spores needed to cause the disease is still somewhat imprecise and evolving.

There is no firm scientific or medical agreement as to the level of contamination representing a workplace hazard. Therefore, actual anthrax counts could be moot – unless it can be scientifically determined what count constitutes a “lethal” dose. Unfortunately, this information is still not known with any degree of certainty. The data presently available to scientists mainly consists of a non-predictive normalized curve that is based on animal tests.

There is a need to understand what various spore concentrations mean to individuals, and a need to be able to communicate that information in a timely, accurate and meaningful manner. Workers and the public need more information about health hazards so individuals can make informed decisions about relative health risks.

In January 2002, *USA Today* reported on a 2001 study at the Canadian Defence Research Establishment that involved placing varying amounts of a non-lethal powder that behaved like anthrax in an envelope and opening it in an 10x18-foot room. The study found that a person remaining in that room could inhale 480 times the lethal dose when the envelope contained just a tenth of a gram. If the envelope contained one gram of the simulant, a person remaining in the room for 10 minutes could inhale 3,080 times the then-considered lethal dose.

(Attachment 2, p. 2-3)

⁴The Centers for Disease Control and Prevention (CDC) does report on an accidental release of 2 grams of anthrax in 1979 from a military bioweapons facility in Sverdlovsk in the Former Soviet Union. The release of anthrax, which had been prepared in a powder form and was carried downwind, reportedly infected 94 people and caused the death of 66, demonstrating the lethal potential of aerosolized anthrax as a weapon. Most significantly, the last cases of anthrax from this release occurred 43 days after the spores had been released

According to CDC, a 1986 Department of Defense (Defense Intelligence Agency) publication estimates that 8,000 to 10,000 spores would need to be inhaled to contract the disease.⁵ **(Web Resource 1)** The contract physician responsible for providing medical advice in the fall of 2001 to postal employees at the Wallingford facility used this same figure, based on the literature search she performed at the time.

Given that no anthrax spores were ever discovered in the home of Otilie Lundgren (the Oxford, Connecticut woman), or at the places that she frequented,⁶ other experts now believe the number of spores needed to cause inhalation anthrax could, in fact, be very small, depending on a person's health status and the aerosolization capacity of the anthrax spores. **(Web Resource 1)**

According to GAO staff, in the beginning, the USPS seemed not to be expecting to find anthrax. Therefore, the testing performed by the USPS contractor may not have been as comprehensive as it otherwise would have been had finding anthrax actually been anticipated. In fact, at least initially, the Wallingford Postal Facility was not even on a list of locations identified by USPS to be sampled.

However, as the USPS effort progressed, those involved in the Wallingford detection effort learned to improve their methods by more precisely focusing their sampling process and by more extensively and comprehensively testing for anthrax.

Nevertheless, communication about quantified, significant concentrations of anthrax spores to Wallingford postal workers could have been far more complete and timely. Instead, the USPS introduced a delay in notifying postal workers at the Wallingford facility by not releasing positive results they said they could not validate. USPS did not insist on validation of negative test results before they could be released. Finally, withholding this kind of information from workers was not consistent with an OSHA requirement to disclose test results that are requested within 15 working days, unless the delay is explained. (29 C.F.R. Sect. 1910.1020 (e)(1)(I)) Although OSHA did not issue a regulatory citation in this instance,

⁵*Soviet Biological Warfare Threat*, DST-161OF-057-86 (Washington, D.C.: 1986)
(Web Resource 1)

⁶ Similarly, no anthrax spores were ever found in either the home or workplace of a Bronx, New York, female hospital worker, Kathy T. Nguyen, who died from inhalation anthrax in October 2001.

OSHA expressed concern about communication deficiencies “which can have an effect on worker’s safety and health.” (**Web Resource 1**)

In many ways, Wallingford has been an eye-opening experience for the USPS, although that experience has greatly complicated detection and remediation work for USPS. For example, cross contamination has highlighted some of the weaknesses in the USPS approach, which had not considered cross contamination to be a likely scenario. Because of cross contamination, anthrax in the sorting equipment of even one facility can lead to contamination at many others. Hence, once anthrax has been detected, the testing and remediation needs to be very aggressive, with other potentially contaminated locations included in the effort.

Finally, in order to avoid any future Wallingfords, there is a genuine need for comprehensive, clearly-stated, standardized, government-wide procedures and protocols for detecting and remediating anthrax in any public space.

Witnesses

Dr. Keith A. Rhodes, Chief Technologist, General Accounting Office, will present testimony on some preliminary results about the testing approach to detect anthrax at the Wallingford Postal Facility, as well as the communication of test results.

Dr. Robert G. Hamilton, Director of Johns Hopkins Dermatology Allergy and Clinical Immunology, will present testimony on sampling and testing methodologies and techniques, the adequacy of the USPS anthrax sampling plan, and the possible elements of a government-wide approach to testing and validation protocols and methods.

Colonel Erik A. Henshell, Commander, U.S. Army Medical Research Institute of Infectious Diseases, will present testimony on the medical and health implications of anthrax test results and procedures for informing the public.

Mr. Thomas G. Day, Vice President of Engineering, United States Postal Service, will present testimony on the derivation and applicability of the USPS anthrax sampling plan, including the testing and validation process, and the timeliness and completeness of information provided to employees and the public about contamination at Wallingford.

Mr. William Burrus, President, American Postal Workers Union, will present testimony on the sampling methodology employed at Wallingford, the experience of the union in obtaining timely, factual information about the Wallingford test process and results, and how the sampling and communication of information effect efforts to protect the safety and health of workers.

Captain Kenneth Martinez, Engineer, Centers for Disease Control and Prevention, will present testimony on the role of CDC with regard to sample collection, analysis, and interpretation of quantitative test results for USPS, as well as the advice CDC gave to USPS with regard to sampling, testing, and interpretation of test results.

Dr. James L. Hadler, State Epidemiologist, State of Connecticut Department of Public Health, will present testimony on the role of the Connecticut Department of Public Health with regard to sample collection, analysis, and interpretation of quantitative test results for USPS. He will also discuss the advice given to USPS with regard to sampling, testing, and interpretation of test results.

Mr. R. Davis Layne, Deputy Assistant Secretary, Occupational Safety and Health Administration, will present testimony on the role of OSHA in dealing with anthrax or a similar workplace contamination, any applicable standards for notifying employees about workplace hazards, and the timeliness and completeness of employee notification of contamination at Wallingford.

ATTACHMENTS

1. U.S. Postal Service, “Interim Guidelines for Sampling, Analysis, Documentation, and Disposal of Anthrax for U.S. Postal Service Facilities,” December 4, 2001.
2. Parker, Laura, “A Frenzied Race for Answers, Antibiotics,” *USA Today*, January 23, 2002, pg. 6A.

WEB RESOURCES

1. General Accounting Office Report, “Better Guidance Is Needed to Improve Communication Should Anthrax Contamination Occur in the Future.” GAO-03-316, April 7, 2003 <http://www.gao.gov/>
2. CDC “Comprehensive Procedures for Collecting Environmental Samples for Culturing *Bacillus anthracis*” (April 25, 2002) <http://www.bt.cdc.gov/anthrax/environmental-sampling-apr2002.asp>