

**Opening Statement, Charge to the Committee, and Background
to
The National Academy of Sciences Committee:
“Review of the Scientific Approaches used During the FBI's
Investigation of the 2001 *Bacillus Anthracis* Mailings”**

30 July 2009

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Good morning, ladies and gentlemen. I am honored to be here this morning to represent the FBI Laboratory and to start this important project. It has taken us some time to work out all the details, and I want to begin by thanking the staff of the National Academy of Sciences for working with us to reach this point. I further want to thank each of the committee members for volunteering their valuable time and considerable expertise to assist in this study.

This type of study is unprecedented: the FBI usually presents such technical information as part of the normal judicial process. Our principal challenge in this particular project has been the fact that this is still an open case. However, we are committed to providing all relevant documentation to the Committee, and to making FBI Laboratory staff available to explain and expand on any questions that arise.

Let me also state from the beginning that this study will only focus on the science of the case, and will not address the investigative process. The attribution process and identification of a specific perpetrator relies on the confluence of the investigation and forensic science information. The science in this case was used to provide leads for investigative follow-up. This investigative follow-up would often provide further evidence for scientific analysis. The larger picture of overall criminal attribution and identification process will be more fully disclosed when the case closes and further information and documentation can be made available.

From the outset, the FBI's scientific work in this case has included validation and verification of its approach and conclusions. The independent verification and validation to be carried out as part of this NAS study is yet another step in this overall validation process. This process began within weeks of the initial events of 2001 with:

- the consultation of many subject matter experts in technical panels,
- continued throughout the course of the investigation in our work with partner laboratories in government, academia and the private sector,
- proceeds now with an ongoing effort to publish our work and that of our partner labs in peer-reviewed technical journals, and
- is further augmented with this NAS study.

To date, 9 peer-reviewed papers, authored by FBI scientists and/or our collaborating partners, have been published that are the result of developments and analyses relevant to this case. An updated list of these publications will be provided to the Committee and will be made publicly available. Several more papers are in various stages of preparation and submission.

Good scientists are confident in their findings, yet are open to scrutiny. This is the hallmark of the peer-review process for publication and is the spirited activity often seen at scientific symposia. In the same manner, we at the FBI Laboratory are confident in our conclusions, but are actively involved in the above-described validation efforts.

The technical work in this case has been described in some circles as “groundbreaking”, “novel”, “Star Wars stuff”, etc. I do not believe this is accurate. Rather, we utilized established biological and chemical analysis techniques and applied them in a novel way to a difficult problem. In other words, we took these established tools and *applied* them in groundbreaking ways to reach our conclusions and thus assist in the overall investigation of the crime.

This then is the charge we make to this distinguished committee: please review our work to ensure that we did indeed properly apply these techniques in a meaningful way. With that, let me read the formal charge to the NAS and this committee as stated in the contract. Following this, I will provide an overview of the science, to include the timeline and the process by which that science was applied.

[Insert Section C from the Contract: *Statement of Tasks*]

Timeline and Process

As I now proceed with a description of the scientific approach that we utilized, I will describe certain investigative activities. Again, such actions are not the focus of this NAS study, but are described here to put the events in context and within the proper timeline.

In September and October 2001, at least five envelopes were mailed to media organizations located in New York City and Boca Raton, Florida and to United States Senators Patrick Leahy and Thomas Daschle in the District of Columbia. Four of these mailings were recovered, each containing a note and some amount of *Bacillus anthracis* powder. [Slides 2-4]

Hundreds of people were exposed, 22 people became ill with symptoms of Anthrax and 5 people died as a result of these attacks. In addition, there were billions of dollars in economic damage to the US economy.

The four letters and envelopes recovered from the anthrax mailings were subjected to a multitude of forensic analyses by the FBI and the US Postal Inspection Service Forensic Laboratory. However, because this NAS study is focused on the characterization of the powders, I will restrict my remarks to that issue alone.

At the outset of the investigation, three panels comprised of 33 of the nation's leading authorities in microbiology, chemistry, and microscopy-- including some involved in bioweapons development from the former offensive bioweapons program-- were convened to assist the FBI in developing a comprehensive analytical framework to evaluate the anthrax powders recovered from the envelopes and the contamination found in the AMI Building. It was very important to have a solid framework, because there was such a very limited amount of evidentiary material (i.e., the powder). Twenty-nine government, university, and commercial laboratories then assisted the FBI in implementing the panels' recommendations.

Let me begin by reviewing some of the physical determinations of the spore powders from the letters. The following slides are photographs from the letter evidence.

The NY Post letter powder is granular in appearance, somewhat brown in color, and has crystals and cell debris among the *B. anthracis* spores. [Slide 5]

This next slide is has a photo of the Leahy letter powder. Note that this different in color and texture from the Post letter, having higher purity and less cell debris. [Slide 6]

This is the two samples side-by-side. [Slide 7] This difference in visual appearance was an early indication that the mailings were created from at least 2 distinct batches or regrowths of the spores.

Other tests and techniques were used to reach further physical and chemical conclusions. The spore powders exhibited an electrostatic charge, showed no signs of genetic engineering, and were non-hemolytic, gamma-phage susceptible, antibiotic and vaccine sensitive, and devoid of aerosolizing enhancers (e.g., fumed silica, bentonite, or other inert material). These characteristics were and are inconsistent with weapons grade *B. anthracis* produced by offensive, state-sponsored biological weapons programs. Further chemical analysis tests confirmed that two separate production batches of anthrax were used for the New York and Washington, D.C. mailings because each contained the noted differences in spore concentrations, color, contaminants, texture, growth media remnants, and observed debris.

There has been a great deal written regarding the presence of silicon in the samples and the location of that silicon. The FBI Laboratory used Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) to quantify silicon, as well as other elements, in the Leahy letter spore powder. The results indicated the Leahy spores contained 1.45% by weight. The New York Post letter spore powder was qualitatively analyzed using ICP-OES and was found to have Silicon present in the sample. However, the limited quantity of recovered material precluded a reliable numerical measurement of any elements present within this powder. Insufficient quantities of both the Daschle and Brokaw letters spore powders precluded the analysis of these samples using this elemental analysis technique.

Sandia National Laboratory (SNL) conducted analyses capable of mapping elemental signatures within a sample using electron microscopy techniques on a number of samples. This slide shows an electron micrograph color-coded to specific groups of elements. [Slide 8]

These analyses localized the elemental silicon and oxygen signatures associated with these materials to the spore coat. While the word “coat”, to a nonbiologist usually denotes an exterior, the *spore* coat is actually located inside the exosporium. The exosporium is the outermost layer of an anthrax spore and is normally where any “fluidizers” or weaponizing agents would be found. In this slide, the green color denotes the elements Si, O and Fe. You can see that this green outline is *inside* the exosporium, shown here in red. There was no silicon signature in any of these powders found on the exosporium or outside of the spores. This indicated that there were no “fluidizers” or weaponizing agents added to the spore preparations.

Several other chemical analysis tests were utilized. [Slide 9] Among these were:

- Stable Isotope Ratio Mass Spectrometry to provide information potentially probative of geographic attribution, and
- Accelerator Mass Spectrometry to identify the relative age of the material.

The Stable Isotope Ratio analysis was inconclusive, but this is not surprising given the large potential contributors of light stable isotopes between water sources, growth media components, etc. The accelerator mass spectrometry results indicated that the material was produced within a reasonable timeframe of the mailings.

Turning now to the genetic analysis, scientists confirmed that the anthrax powder in the letters to Senator Daschle and the New York Post matched the same strain of anthrax found in the clinical isolates of bacteria from the blood of the Florida victim, thereby linking the three events in Florida, New York, and Washington, D.C.

Professor Paul Keim of Northern Arizona University [Slide 10] is a noted expert in strain identification among *Bacillus anthracis* strains. I note one such publication here. He identified the strain in the letter powders and that which infected the victim in Florida as being from the “Ames” strain. The history of Ames was that it was first isolated in 1981 in Texas from a dead heifer. It was eventually used as a challenge strain in anthrax vaccine research and development, and it was never used in the U.S. or Soviet offensive biological weapons programs.

This is a photo of the NY Post material as it was diluted and plated, showing the characteristic growth patterns of BA. [Slide 11]

In Nov 2001, a lab technician at The United States Army Medical Research Institute for Infectious Diseases (USAMRIID) grew the spores from the letters over an extended period of time. This revealed a small percentage of colonies that were noticeably different – they exhibited phenotypic variations with different textures, colors, and growth patterns, as seen in this photograph on this slide. [Slide 12]

This revealed the possibility that there were variants, or mutations, in the evidentiary material, which might be distinguished through modern genetic methods. FBI scientists and other investigators thus began to evaluate whether they could identify and classify these mutations genetically, thereby potentially identifying the source of the material used in the attacks.

Turning to the investigation phase for a moment: investigators endeavored to build a collection of Ames samples for potential genetic comparison to the evidentiary material, and thus created what would become known as the FBI Repository (“FBIR”). A total of 1,070 samples were ultimately collected, which represents a sample from every laboratory identified by the FBI as having had the Ames strain. A number of mutations were ultimately selected that were determined to be the most suitable for comparison to the FBIR samples. Beginning in May 2002, the FBI contracted with an outside lab, The Institute for Genomic Research, to perform genetic sequence analyses of the Ames strain of *Bacillus anthracis*. The genetic analyses included the original Ames isolate, known as the “wildtype,” to be used as a baseline for comparison to the mutant organisms identified within the evidentiary material. Genetic analysis of morphological variants identified mutations which were later exploited to develop specific assays to identify the presence of identical mutations in evidence collected during the investigation and making up the Repository. This effort led to the identification of four mutations that passed validation and were deemed suitable for further analysis.

Once the genome of the wildtype and the specified mutations were mapped, the next step was for other outside laboratories, Commonwealth Biotechnologies Incorporated, the

Midwest Research Institute, and the Illinois Institute of Technology and Research Institute, to develop assays to test for the presence of these mutations in the Repository. Upon development, the assays were validated by the FBI laboratory, and were approved for use in the Repository project – the assays came to be known as Morph A1, Morph A3, Morph D, and Morph E. Over the ensuing years, each of the 1,070 Repository submissions was compared to the evidentiary material using the four genetic assays. By early 2007, the results indicated that eight Repository submissions were positive for the mutations originally found in the anthrax letter evidence. Using submission records, investigators determined that these eight samples were derived from a single source.

The following slide summarizes the overall timeline of the scientific analyses that were applied in the course of the investigation. [Slide 13]

I have referred several times this morning to technical review panels that were formed early in the process. I was actually on one of those panels in December 2001 as a representative of Los Alamos National Laboratory in the Analytical Chemistry Sciences Group. I was impressed then with the willingness of the FBI to reach out to the broader scientific community and say, “This is how we have planned to proceed. Tell us what you think.” The memory of that willingness to ask for such validation remained with me, and I remembered it well when I was asked a little over a year ago to lead the FBI Laboratory. I was honored to be asked to lead such a group. And I am proud to continue in their tradition by standing before you now and saying, “This is what we did. Please tell us what you think.”

I wish to thank some of the many institutions that assisted us in our work

- Government institutions [Slide 14]
- Private sector and academic institutions [Slide 15]

Again, my thanks to the National Academy of Sciences staff and to each of you on the Committee who have agreed to serve in this important role. Thank you very much for your attention.