

## Pressure Grows for F.B.I.'s Anthrax Evidence

by Scott Shane and Nicholas Wade via reed - New York Times *Wednesday, Aug 6 2008, 1:44am*  
international / injustice/law / other press

**or, 'I left my flight manual (in Arabic) at Boston airport!'**

WASHINGTON — After four years of painstaking scientific research, the F.B.I. by 2005 had traced the anthrax in the poisoned letters of 2001 to a single flask of the bacteria at the Army biodefense laboratory at Fort Detrick, Md., according to government scientists and bureau officials.



But at least 10 scientists had regular access to the laboratory and its anthrax stock — and possibly quite a few more, counting visitors from other institutions, and workers at laboratories in Ohio and New Mexico that had received anthrax samples from the flask at the Army laboratory.

To get that far, the Federal Bureau of Investigation had helped invent what was virtually a new science, microbial forensics, the use of biochemical clues to track a germ weapon to its source.

The bureau sponsored research at a score of government and university laboratories intended to estimate the age of the anthrax, tracing the water used to grow it, assessing how it was made into an inhalable powder and, perhaps most important, taking its genetic fingerprint.

But at that point, the science had largely reached its limits. To figure out who in the narrowed pool of scientist-suspects was the perpetrator, the F.B.I. would have to rely on traditional gumshoe investigative methods: interviewing colleagues and family members, searching houses and cars, doing surveillance, and assessing personalities.

About 18 months ago, investigators appeared to sharpen their focus on Bruce E. Ivins, a veteran anthrax researcher, whom they placed under intensive surveillance as they examined every aspect of his life and work.

Since Dr. Ivins's suicide last week, F.B.I. officials have said prosecutors were preparing to indict him for sending the anthrax letters, which killed five people, although charges appear to have been a few weeks away.

Dr. Ivins had been a respected microbiologist for three decades at the United States Medical

Research Institute of Infectious Diseases at Fort Detrick. He was a popular neighbor in Frederick, Md., a Red Cross volunteer and an amateur juggler who played keyboards at his church.

But the investigators found some personal quirks, according to law enforcement officials and people who knew the scientist well. They found that Dr. Ivins, who had a history of alcohol abuse, had for years maintained a post office box under an assumed name that he used to receive pornographic pictures of blindfolded women.

Years ago, he had visited Kappa Kappa Gamma sorority houses at universities in Maryland, Virginia and West Virginia, an obsession growing out of a romance with a sorority sister in his own college days at the University of Cincinnati — although someone who knew him well said the last such visit was in 1981.

What is more relevant, agents focused new attention on a 2002 Army investigation of a spill of anthrax the same year outside the secure laboratory that Dr. Ivins worked in, and his puzzling behavior in trying to clean the area with bleach while failing to report the contamination. They studied his anthrax vaccine patents and considered whether the promise of royalties after a bioterrorism scare might have been a motive. They noted that he had a lyophilizer, which could be used to dry wet anthrax into powder, a form not ordinarily used at Fort Detrick.

They had even intensively questioned his adopted children, Andrew and Amanda, now both 24, with the authorities telling his son that he might be able to collect the \$2.5 million reward for solving the case and buy a sports car, and showing his daughter gruesome photographs of victims of the anthrax letters and telling her, “Your father did this,” according to the account Dr. Ivins gave a close friend.

As the investigation wore on, some colleagues thought the F.B.I.’s methods were increasingly coercive, as the agency tried to turn Army scientists against one another and reinterviewed family members.

One former colleague, Dr. W. Russell Byrne, said the agents pressed Dr. Ivins’s daughter repeatedly to acknowledge that her father was involved in the attacks.

“It was not an interview,” Dr. Byrne said. “It was a frank attempt at intimidation.”

Dr. Byrne said he believed Dr. Ivins was singled out partly because of his personal weaknesses. “They figured he was the weakest link,” Dr. Byrne said. “If they had real evidence on him, why did they not just arrest him?”

Another former co-worker, Dr. Kenneth W. Hedlund, who collaborated on anthrax research with Dr. Ivins in the 1980s, had a similar theory.

“The investigators looked around, they decided they had to find somebody. They went after all of them but he looked the most susceptible to pressure,” Dr. Hedlund said. “It is like prisoners of war: if they are harassed enough, they will be driven to do anything. But I don’t believe he would have done what they say he did.”

With such views voiced by Dr. Ivins’s acquaintances — and vocal skepticism from key members of Congress — the pressure is growing on the F.B.I. to unveil its evidence.

On Monday, officials began to contact survivors of the anthrax attacks and family members of the five who died to say they would get a briefing, in person or by telephone, before the case against Dr.

Ivins was made public.

Shirley Davis, the primary caretaker for Otilie W. Lundgren of Oxford, Conn., a 94-year-old woman who was killed in the anthrax letter attack, said that she received a call on Monday.

"They asked if we could put together a list of questions we would like to have answered, just to get an idea of just exactly what happened," Ms. Davis, 78, said. She said she had not yet been given a day or time for the briefing.

"It is a relief to know that they have found something," Ms. Davis said. "It has been seven years now. But it may end up still that they don't really know why this happened or what happened."

F.B.I. officials say they do know a great deal about what happened and will make it public, possibly as early as Wednesday. They say the core of their case will be the science, which produced the giant step from a globe of possible suspects to a single lab and a single flask.

Faced with the scientific mystery of the powder, government and outside scientists first looked at chemical isotopes in the attack strain for clues as to when and where the bacteria had been grown. Analyzing traces of the beef broth used to grow the anthrax, scientists measured carbon-14 left from nuclear weapons tests in the 1950s, whose quantity diminishes every year.

By calculating the ratio of carbon-14 to the normal kind in residue of plants eaten by the cow from which the broth was made, investigators learned by June 2002 that the anthrax had been grown within the last two years.

A second clue was developed from the new ability to sequence, or decode, the chemical letters of DNA. Scientists at the Institute for Genomic Research, a pioneer in genome sequencing, sequenced the full genome of the anthrax recovered from the blood of Robert Stevens, the first victim of the attacks.

The genome of various stocks of the Ames strain of anthrax used in the attacks were almost identical in all the 5 million chemical letters of their DNA. But researchers found enough differences in the attack strain to provide a reasonable chance of identifying its source.

The chief difference was that a stretch of DNA was flipped head to tail in some bacteria in the attack strain, but not in any other samples.

Further, the attack strain contained bacteria with both the flipped and the unflipped DNA, showing that it was a mixture of two strains, which analysts later found reflected a mix of origins — 85 percent from the Dugway Proving Ground of the Army in Utah and 15 percent added at Fort Detrick, according to one person close to the investigation.

To make sure the case for the distinctive features of the attack anthrax could hold up in court, agents collected thousands of samples of Ames strain anthrax from labs around the world, said scientists familiar with the F.B.I.'s thinking. "This is the step that took so long," one scientist said.

Decoding the genome of a bacterium like anthrax may have cost around \$500,000 in 2002, and even the F.B.I.'s budget would have been strained to decode thousands of genomes. A new generation of sequencing machines can now sequence bacterial genomes for around \$500. But those machines did not become available until about 2005, which may have been another reason for the delay.

Despite speculation that the anthrax had a special coating to make it more deadly, an F.B.I. scientist, Douglas Beecher, published an article in 2006 saying no such sophisticated additives had been found. That finding broadened the number of scientists and technicians who could have made the anthrax, another obstacle to a quick resolution.

Richard Ebright, a Rutgers University biochemist and an opponent of the rapid expansion of biodefense research since 2001, said the F.B.I. should long ago have released some of its scientific conclusions.

“The finding that the attack material could be traced definitively to a U.S. bioweapons research lab could, and should, have been released as soon as it was obtained,” Dr. Ebright said, noting that the finding could raise questions about the wisdom of proliferating stocks of anthrax and other pathogens.

“This is not just a finding with Agatha Christie-Perry Mason implications,” he said.

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