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DEADLY SECRETS

FIVE DEATHS, FIVE GRAMS, FIVE CLUES: WHO MAILED THE ANTHRAX LETTERS?

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AN ELUSIVE ATTACKER

Somewhere out there, roaming free among the public, is a would-be mass killer. Someone who has killed five people already, injured many more and set off a nationwide panic -- and who may well be poised to strike again.

Remember the anthrax attacks? Back in October 2001, they regularly led the news as fear of anthrax gripped the nation. Five people died. Approximately two dozen developed full-blown infections. Many more were exposed, but were treated in time to avoid becoming ill. Tens of thousands at risk of exposure were prescribed antibiotics as a precaution. Millions had qualms about opening mail. And the attacks were widely believed to be the work of Al Qaeda, following up on Sept. 11.

As the anniversary of the attacks approaches, the investigation remains an embarrassing failure. The problems with the investigation lie with the circumstances that made the attack possible, not with the cleverness of the attacker.

But as the preponderance of evidence gradually grew to show that the attacks have domestic roots – the attacker is profiled by the FBI as a "lone wolf" type with a personal agenda -- rather than international terrorism linked to al Qaida or Iraq, the news receded from the front. As we approach the anniversary of the attacks, the evasive silence by baffled law-enforcement officials on the case caused the story's retreat to the neverland of media coverage.

One of the many puzzles in the case is why the FBI pursued a case theory of international terrorism for three months – until the trail went stone cold – and then, when the domestic roots of the attack became glaringly public, suddenly switched to a theory the attacks were the work of a "lone wolf" working in isolation. The puzzle is what led the FBI to conclude that only one person was involved – and at the same time have no clue as to who that single isolated individual could possibly be.

The killer or killers, however, remain at large. Indeed, as the trail grows colder daily, the likelihood anyone will ever be brought to trial becomes more faint … unless the attacks resume.

The attacker's elusiveness so far is a direct product of the incredibly dangerous nature of the anthrax itself. Among the few things we know about the killer is that he well trained in microbiology and handling biowarfare agents. Along with the letters to various public figures in which the anthrax was delivered, he left behind virtually none of the usual clues -- hairs, fibers, smudgeprints -- that help forensic scientists narrow the investigation in most such cases. The care required to avoid exposure to such a powerful toxin – one that has killed two victims in New York and Connecticut by routes that remain obscure – make it virtually certain the attacker never had physical contact with the letters after they were filled with anthrax.

However, there is the anthrax itself. Importantly enough, just the fact of its use provides important evidence about the killer. And from the sample used by this killer, there are five clues that emerge clearly -- clues that eventually may reveal his identity:

- We know the culprit used a particular strain obtained from USAMRIID at Fort Detrick.
- We know the letters contained about seven to ten grams of material, of which roughly two to three grams were weaponized spores.
- We know the spore powder was remarkably pure in the later attacks, less so in the earlier ones.
- We know the range of particle sizes and the method used to make the dry powder.
- Finally, the spore powder contained chemical additives developed specifically for weaponization.

Very little information about the anthrax has been made public by federal authorities, despite repeated pledges of disclosure by the White House, the Office of Homeland Security and the FBI. Much of the information appearing in the press is attributed to unnamed sources or "officials speaking on condition of anonymity" and very little hard information can be traced to on-record sources. Unfounded speculation, conflicting reports and uncorrected misinformation are common. Erroneous reports of links between the anthrax case and the Sept. 11 attacks continue to be publicized, though none of these supposed connections have panned out.

Was the anthrax produced domestically, as part of an undisclosed biological weapons program? If so, how did it come to be used to commit a series of murders that threw the country into an uproar? Was the attacker acting as an agent of a foreign government? Or was the crime an extortion plot that got out of hand? Was the motive political? Or was it intended to inspire a spate of funding for research into bioweapons? An attempt to erode American inhibitions on the first use of nuclear weapons? Or even an attempt by criminals to establish credentials in the international black market in weapons? Finally, might the attacker simply be insane and his motives purely idiosyncratic?

None of these questions can be answered until those responsible are brought to justice. The publicly available evidence, such as it is, casts little light on whatever motive impelled the crimes.

	NY	FL	DC
Date Mailed	Sept 18	Sept 18?	Oct 9
Letters found	2	0	2
Earliest infection	Sept 22	Sept 27	Oct 13
Cutaneous infections	8	0	3
Inhalatory infections	0	2	9
Spore purity	10%	unknown	~100%
Type of powder	Clumpy, rugged	Mixed	Aerosol powder

It is widely acknowledged that there is a link between the murderer and biological weapons research. But we don't know who mailed the anthrax. We don't know who made the anthrax. We don't know who stole the anthrax from USAMRIID or how. We don't know if those are the same people or different. And if they are different, we don't know what the connection between them might be. We don't even know if there might be more than one person involved. There is a lot we don't know.

But thanks to the anthrax, there are a few things we do.

The problem, however, is where these clues inevitably lead. Tracing the anthrax, it has become clear that in order for the case to be solved, the FBI must take the lid off the nation's bioweapons-development program. And with a bevy of national-security issues at stake -- not to mention a host of political realities -- that makes the solution of the anthrax case by federal agents a critical test of the reorganization of the FBI.

THE AMES STRAIN

The first clue is the use of the Ames strain of anthrax. Ames is one of the more virulent strains and is used in research to "challenge" vaccines. Anthrax is one of the least genetically diverse bacteria known. As of the beginning of this year, there were less than two hundred genetically identified strains, a fraction of the diversity found in other bacteria.

Anthrax is remarkably immune from mutation, thanks largely to an odd life-cycle that vacillates between long periods of dormancy and brief periods of volatile activity. It's estimated that over 100,000 cell divisions can occur before a mutation of the chromosomal DNA takes place. Since anthrax spends most of its time as dormant spores, this can take a long time -- so long that two samples collected decades apart can and often do have the same DNA fingerprint. Highly sensitive

DNA tests using both genomic sequencing and polymerase chain reaction (PCR) testing shows that the attacker's anthrax is identical to a strain used in biological weapons research. The DNA test results were complete sometime in February, but the results were kept from the public until mid-May.

Though it is known as the Ames (as in Iowa) strain, the anthrax used in the 2001 attacks in fact originated in Texas. Disease strains usually are named after the city nearest to the laboratory where the strain was first isolated, and this strain was isolated at the veterinary laboratories of Texas A&M University in College Station, Texas in the early 1980's. Properly speaking, it should have been named the "College Station" strain. However, a program at the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) at Fort Detrick, Md., was collecting samples of anthrax from around the country. The Texas strain was found to be uniquely virulent, more deadly than the Vollum 1-B strain used to develop stockpiles in the now-defunct strategic weapons program. This finding was reported in a paper published in 1986 by Dr. Gregory B. Knutson of USAMRIID, which misidentified the strain's origins due to a mixup involving the mailing labels used to ship the sample.

Though incorrect, the name "Bacillus anthracis Ames" stuck and Knutson's sample became the parent of all the cultures of this strain. The samples distributed by USAMRIID are the sole source of identified Ames strain cultures found in laboratories. Some time between 1981 and the 1986 publication of Knutson's paper can be considered the earliest opportunity for the Ames strain to have begun it's travels from USAMRIID to the attacker.

Only a handful of laboratories do anthrax research, but until 1997, the exchange of samples between researchers was both common and informal. After the Oklahoma City bombing, Congress passed a law requiring all transfers of biological agents to be registered with the Centers for Disease Control in Atlanta, Georgia. The transfer documents are open records under the Freedom of Information Act. FOIA requests unearthed by the Washington Post show that USAMRIID distributed samples of the Ames strain to about a dozen researchers. To date, about fifteen locations in the United States and another half-dozen in other countries are identified as receiving the Ames strain from USAMRIID. Some of them appear to have shared samples with others still unknown. In addition to this distribution, there could be specimens of anthrax in many places, none of which are labeled "Ames," but which are the same strain. Nobody really knows. So the use of the Ames strain is weak evidence for prosecution, but it shows a direct link between the attacker and research connected to USAMRIID. The real question is how direct is the connection.

THE QUANTITY OF ANTHRAX

The second clue is the quantity of the anthrax used in the attacks, which was also noteworthy largely because of the nature of the sample.

The total amount of material used in the letter attacks was about seven to ten grams. Earlier reports lean to the higher numbers and the later reports cite smaller amounts. Of this, most was comprised of dead vegetative cells and other non-infectious debris, but roughly two to three grams were pure spores -- a fact that stops researchers in their tracks. Growing anthrax bacteria is one thing, but turning the living vegetative cells into dormant spores is something else.

Producing quantities of vegetative cells is difficult, but not incredibly so. The problem lies in getting the vegetative cells to turn into spores without killing them. Making purified spores in quantity is a difficult and complex task -- not just hard to do, but hard to discover how. An amateur could conceivably grow live anthrax bacteria. But it is unlikely someone could independently rediscover how to purify and dry spore powder without drawing on knowledge and techniques gained from experience in weapons research.

Weapons production works in enormous quantities of anthrax. Under these conditions, producing pure spores is relatively easy. The attacker's anthrax was roughly 75% non-infectious material. This was probably due to the attacker working with a relatively small quantity in weapons terms. In medical research, the quantity produced by the attacker is considered enormous.

Growing purified spores in larger than microscopic quantities is strongly associated with bioweapons research and development. Spores are only of interest for examining inhalatory infection, a subject of mostly military concern. Even then, only tiny quantities are necessary. A lethal dose of inhaled spores is about 1/100,000th of a gram. Anthrax research for non-military purposes rarely if ever uses spores. Producing quantities of spores is the object of weapons-related research.

Thus the quantity of spores is a second, and even more substantive, link between the attacker and weapons research. The overwhelming odds are that if the attacker produced the anthrax, he found out how from contact with military research. It also suggests that similar weaponized anthrax powder may have existed at some as-yet undisclosed laboratories. Whose laboratory and where it is located will be critical information in a criminal trial.

THE ANTHRAX VARIED IN PURITY

The third clue from the spores is ambiguous -- namely, the anthrax used by the attacker varied in purity. It seems likely there were two batches of letters; three letters mailed in mid-September to New York and Florida, followed by two letters mailed in early October to Washington, D.C. The anthrax for the New York mailings was not very high in purity; those batches contained about 10 percent anthrax spores. The powder in the Daschle and Leahy letters is remarkably pure, consisting almost entirely of viable spores.

The composition of the Florida anthrax is critical to the case. It appears to have been intermediate in purity between the New York and Washington, DC samples. It was more concentrated than the New York anthrax and contained a sufficient amount of aerosolized spores to cause three inhalatory exposures (one fatal and one nearly so), numerous trace instances of contamination in post offices, and a distinct pattern of airborne and non-airborne contamination in the American Media, Inc. offices. The epidemiological evidence shows that it was mailed at the same time as the New York letters. The great significance of these facts has been consistently overlooked.

Maj. Gen. John Parker, commander of the division that includes USAMRIID, says the New York samples were considerably less pure than the Daschle sample. "Times ten difference," according to Gen. Parker. According to the testimony of Dr. Kenneth Alibek, the former head of the Soviet Union's bioweapons research program, before the House International Relations Committee, the impurities included dead vegetative anthrax cells.

The Daschle and Leahy samples are reportedly nearly pure spores. The Leahy sample is somewhat more pure than the Daschle sample. However, the anthrax used in U.S. and Soviet weapons was not this pure. The impurities in the military anthrax were mostly due to the milling process used to reduce the size of the particles to the tiny size necessary to enter people's lungs. This milling debris would dilute the anthrax with killed or damaged spores. Its absence in the Senate samples is highly suggestive of a spray-drying process, a recent innovation in anthrax-weapons research.

The high purity of the anthrax is an indication the attacker knew critical details of weaponization technology and was familiar with the process. It is unlikely anyone would be able to produce this pure a product on the first try. That suggests the quantity used in the attacks was only one of several batches, some of which may have been failures. What happened to the earlier trial batches? Why

does it appear the attacker had such a small amount, compared to the quantity necessary to perfect the process?

Most importantly, how do the five samples of anthrax in each of the letters compare to each other? Are they different portions of a single batch or do they differ in their essential chemical and physical characteristics?

THE SIZE OF THE PARTICLES

The fourth clue is the size of the anthrax particles. The earlier mailings used coarser powder than the later ones. There is conflicting information about the size of the particles. All of the envelopes were tightly taped to seal the seams and openings. It appears the anthrax that escaped in the mail leaked through the paper, not through openings or seams. To pass through the microscopic pores in the envelopes' paper, the particles would have to be smaller than 50 microns. To get into the lungs, anthrax particles have to be smaller than 10 microns. A single spore is about 1 micron. The tightly taped envelopes worked as filters, passing only the deadliest size of particles.

The only inhalatory infections were related to the letter sent to Florida and the two letters sent to Washington, D.C. Tiny amounts of fine powder leaked out of the Florida letter in the mail, enough to be detected in several post offices, but not enough to make people sick. The pattern of contamination in the American Media, Inc. offices suggests a mixture of coarse and fine particles. Three people at the AMI offices were exposed to airborne particles. One died, one became very ill and one received antibiotics before an infection developed. The two who became ill are believed to have handled or opened the letter.

Neither of the two letters sent to New York can be tied to any inhalatory infections, but they did cause several cutaneous infections. Those letters contained coarse granules -- according to one eyewitness, the New York anthrax was like sand, not fine powders.

The known dates of initial infectious symptoms occur first in New York and are followed by the deaths in Florida. The New York infections (not including Kathy Nguyen's anomalous death in late October, which appears to be linked to the Washington DC anthrax letters) were cutaneous – not inhalatory – and there is no evidence of airborne transmission with the anthrax in the New York letters. The onset of infections in Florida followed several days after the initial symptoms appeared in New York. The difference between the Florida and New York anthrax samples will have to be explained during any prosecution of the attacker.

Given what is known about how anthrax can be weaponized, the most likely (but not the only) explanation is that the anthrax used in the attacks was dried and weaponized as a single batch and the separation into different particle sizes and purities occurred after the spores were dried. This conclusion, if supported by additional evidence, has the corollary that the envelopes were filled in the following order: New York, Florida, Washington, D.C..

Some reports -- which appear to be leaks from a briefing given to senators by the heads of the FBI and CIA on the morning of October 25 -- say the particle size of the Washington D.C. anthrax was between 1 and 5 microns or between 1.5 and 3.5 microns. The same anonymous reports claim that the anthrax was "milled" -- ground into a fine powder. The narrow range of particle sizes and use of milling are typical of the older processes used by the U.S. and Soviets during their offensive weapons programs. It is now clear the anthrax used in the attacks is distinctly different from the anthrax made and stockpiled for military use.

None of the reports of milled powder with a narrow particle size range have identified sources speaking from direct knowledge. Nor do these reports discuss the varying purity and particle size between the early and late letters. Yet these unsubstantiated hearsay reports have been continuously repeated in describing the powder. It now appears these leaks from the Senate briefing were wrong

in several details: the quoted range of particle size is too small and the anthrax used in the attacks was not milled. The misinformation about the particle size and milling continues to be repeated in news reports.

Three Office of Homeland Security press conferences given by Tom Ridge and others between October 25 and October 29, beginning immediately after the closed Senate briefings, contained little specific information. This is the only official source of information on the characteristics of the anthrax powder, and the specific size range of the particles was not disclosed. Overall, the information given out at the Homeland Security press conference was vague, muddled and created more speculation than answers. It did not settle the questions about the size of the anthrax particles or the process for producing the powder. It did, however, confirm the presence of weaponization additives. And unlike all but one other instance, the White House press conferences featured identified sources speaking on the record.

Dr. Kenneth Alibek -- a Russian scientist who worked at the very top of the Soviet anthrax program and defected to the United States in the early 1990s -- is a third source of information about the anthrax powder. On December 5, Dr. Alibek and two other experts testified before the House International Relations Committee about the anthrax attacks. Of the three, only Alibek claimed to have direct knowledge of the investigation. He said he had been shown "pictures" of anthrax from two of the letters.

Alibek identified what he called the "first sample" as being largely contaminated with vegetative cells; these would be dead anthrax bacteria that didn't turn into spores. This "first sample" was probably the New York Post anthrax, though Alibek did not make that clear. The second set of pictures were of the Daschle anthrax. An anthrax spore is about one micron in diameter. Alibek said the Daschle sample had particles ranging from one to fifty microns in size. This size range is typical of powders produced by spray-drying, but not of milled anthrax.

Alibek unequivocally said that the particles showed no signs of milling. Alibek's testimony about the particle size has not appeared in any news reports, though some stories have described other parts of the hearing. To date, though, Alibek has declined interview requests to discuss what he calls "detective questions" about the anthrax.

Following the completion of the tests on the Leahy sample, unidentified sources were cited repeating the details about the range of particle sizes, the lack of milling debris and the presence of chemical additives. The newer information about the Leahy anthrax further reduced the likelihood of the older military process (which is what was described in the Senate leaks) being used by the attacker. Most significant among the Leahy results was the report of individual coated spores being observed in the sample, something that had never been observed with the older military process.

The two different descriptions of the anthrax powder correspond to the two ways of weaponizing anthrax into a dry powder. At least one of the descriptions is wrong. The anthrax used in the attacks is either one description or the other or neither, but not both. The leaks from the Senate briefing describe the drying and milling process used by the U.S. and the Soviets. Alibek appears to be describing a spray-drying process similar to one the Iraqis were experimenting with a decade ago. The United States is known to be intensely interested in this newer technology for weaponizing anthrax.

Both the milling and spray-drying processes have been reproduced by the United States in several recent "defensive" research programs. The CIA has done extensive research on biological munitions and production processes. Two of these efforts have been identified as Project Jefferson (actually a broad program involving many separate projects) and Clear Vision, the reproduction of a Soviet anthrax bomb. The Defense Threat Reduction Agency has built a pilot plant in Nevada capable of producing anthrax as part of Project BACHUS (Biological Activities CHaracterized by

Unconventional Signatures.) Reportedly, this project acquired milling equipment, though DTRA has denied it was used for weaponization. The publicly acknowledged work at BACHUS used Bacillus globuli, a less-dangerous "simulant" of anthrax. And the U.S. Army has been producing small quantities of weaponized anthrax for several years at the Dugway Proving Grounds. Prior to the disclosure of these activities, the U.S. government has routinely denied such research has been taking place.

CHEMICAL ADDITIVES

Ames strain, quantity, purity and particle size: These four points are strongly suggestive of weapons research being the source of the anthrax used in the attacks, but none of them are conclusive in and of themselves. Together, they paint a very strong circumstantial picture. It is unlikely that a loner, even with a strong background in microbiology, could produce five grams of purified anthrax spores with fine particle sizes. It's possible, but it would be very difficult and time-consuming to independently reproduce the results of years of research from highly specialized military programs. If the attacker had access to secret technical information about weaponizing anthrax, the difficulties become less of a barrier. If he had experience with the process, they practically disappear. The use of the Ames strain, the quantity, the purity and the particle size suggest the attacker had access to secret bio-weapons research. But there is nothing about these facts that points unequivocally to a source for the anthrax.

The fifth clue implicating weapons research is the most damning -- namely, the presence of chemical additives. Without going into the details, this is the one part of the weaponization process that lacks other uses or applications and is unique to producing biological weapons. These additives are necessary to produce small particles from the spore slurry. They were detected in the anthrax used in the attacks by energy dispersive spectroscopy (EDS), a very sensitive test for chemical composition. These additives were discussed in the leaks from the Senate briefing, as well as at two Homeland Security press conferences. They also are mentioned in the still-secret FBI report on the Leahy sample.

In mid-April, some facts from the analysis of the Leahy anthrax sample were leaked to CNN, U.S. News and World Report and Newsweek magazines. All three reports are based on anonymous sources. They disagree as to whether the weaponization additives are previously known or unknown to U.S. researchers, but they all agree that the additives are present.

Chemical additives are a crucial part of the weaponization process. The specific chemicals are a tightly held secret, one that should not be disclosed to the public. But the particular combination of ingredients would be strong evidence if the attacker used a formula similar to one developed in recent U.S. bioweapons research. The EDS testing is sensitive enough to identify the elements present in the anthrax powder. In some circumstances, it can also identify the chemical compounds themselves. So again, the critical information is not a mystery to the investigators, though it is not being made public.

SECRECY AND INSECURITY

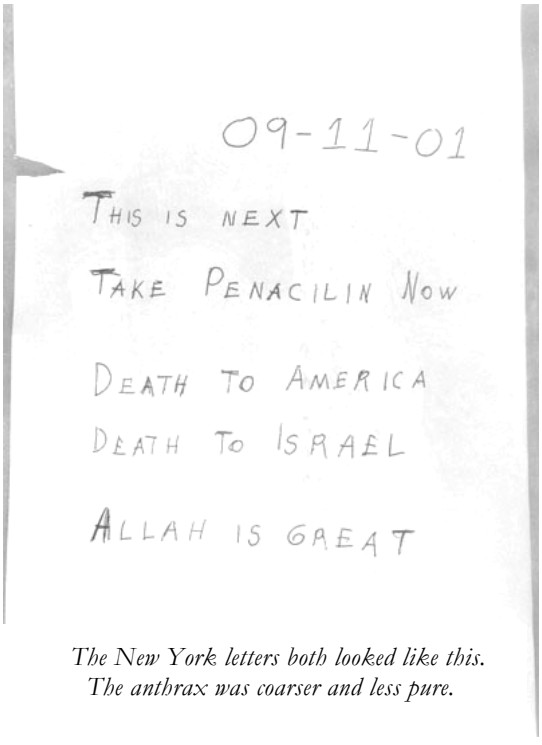
These five clues sum up what is publicly known about the anthrax used in the attacks. Together, they strongly suggest the attacker had access to either the technical information or the product from biological weapons research. The Ames strain from USAMRIID, amount of spores, purity, particle size and chemical coatings point to a well-funded and sizable research program with government support. The investigators know the composition of the additives, a highly restricted and specialized area of research. They also know whether the powder was milled or spray-dried, which means they know the type equipment which must have been used to make the anthrax.

All of the questions posed in this article have answers. Many of the answers have been known to the investigators since late October, less than a month after the attacks became known. They have not been publicly disclosed nor has there been any explanation for this secrecy. The FBI investigation has been an embarrassing failure and it has taken many wrong turns. Some of the general information about the anthrax powder should be made public. There are details which can be revealed that could aid the investigation without revealing technical secrets.

It may very well jog the memory of witnesses who can provide valuable leads.

The secrecy surrounding the anthrax is central to the mystery of how this investigation has gone so wrong. Some facts are clear about the case. The weaponization process used by the attacker is newer and more sophisticated than allowed under the Biological and Toxin Weapons Convention, which specifically forbids developing new weapons. The attacks have shown how small quantities of a biological weapon are sufficient to be used as a strategic offensive weapon. The problem with the investigation may not be the attacker's attempts at concealment, but what the existence of the anthrax itself implies.

And that is that somewhere – in an environment insecure enough to allow diversion to criminal use – secret, illegal and unauthorized research has developed new and dangerous ways to proliferate biological weapons. If that secrecy can also shield a murderer and a traitor, then murder is not the only crime the FBI should be investigating.


09-11-01

THIS IS NEXT

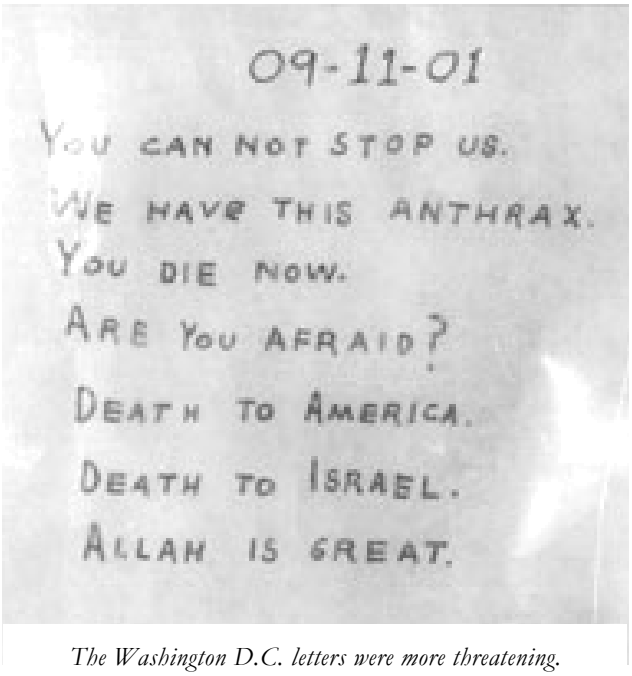
TAKE PENACILIN NOW

DEATH TO AMERICA

DEATH TO ISRAEL

ALLAH IS GREAT

The New York letters both looked like this. The anthrax was coarser and less pure.


09-11-01

YOU CAN NOT STOP US.

WE HAVE THIS ANTHRAX.

YOU DIE NOW.

ARE YOU AFRAID?

DEATH TO AMERICA.

DEATH TO ISRAEL.

ALLAH IS GREAT.

The Washington D.C. letters were more threatening. The anthrax was finer and nearly pure spores.

HOW ANTHRAX IS MADE

First, the attacker must obtain the Ames strain and successfully grow a pure colony, probably in petri dishes.

The next step is to grow a large quantity of pure anthrax bacteria. Either solid or liquid growth media would leave residue detectable by EDS under an electron microscope. The FBI almost certainly has this information, but it has not been disclosed.

Next, the living bacteria must be forced to go dormant and form spores. The NY samples were mostly dead vegetative cells, showing the attacker was unable to cause complete sporulation.

The spores are then separated from the dead vegetative cells by centrifuge, a complex and dangerous process. The attacker only got partial separation, with significant contamination by dead vegetative cells.

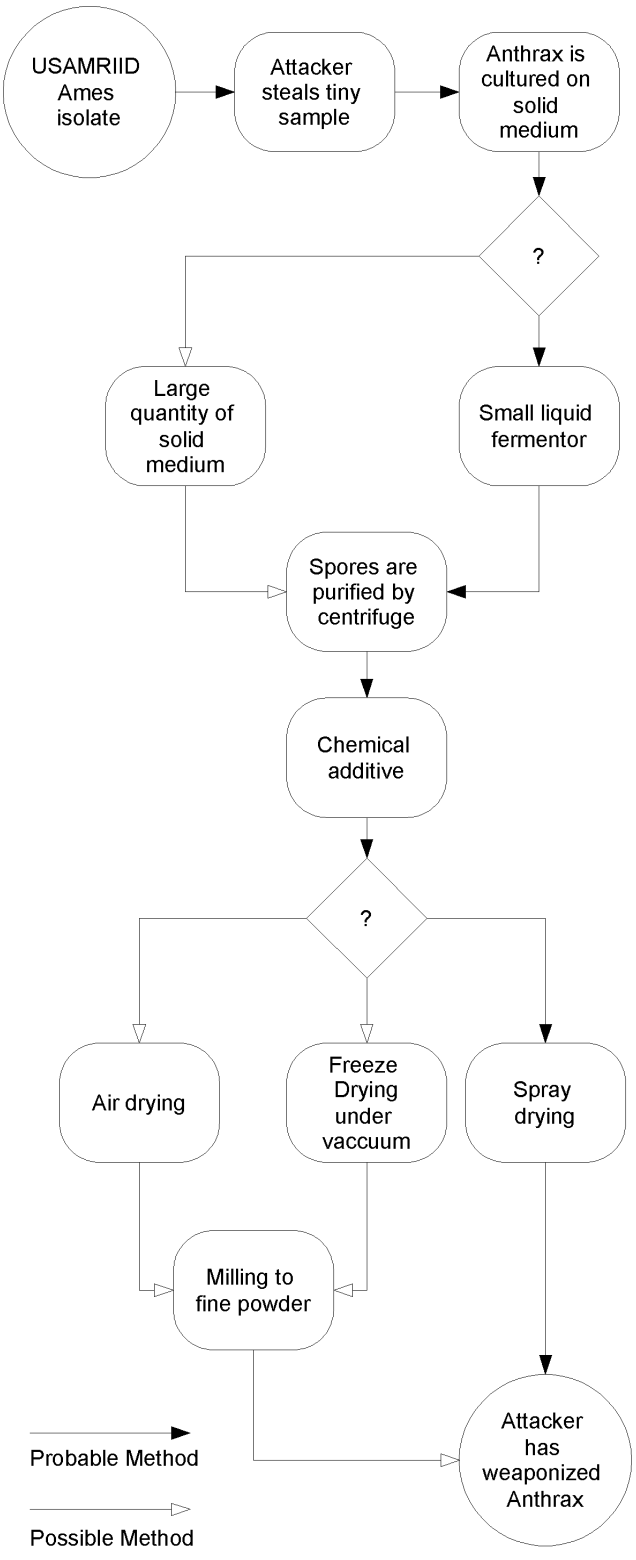
Chemical additives are unique to the weaponization process. They have no use other than biological weapons. The FBI knows the composition of the additive and probably knows which domestic weapons labs possessed the formula used by the attacker. This is the most highly restricted information and strongest clue to narrowing the suspect pool.

The wet spore slurry from the centrifuge must be dried into a powder. There are three possible routes. The Daschle anthrax reportedly lacks milling debris, which may rule out two of the processes.

The Leahy sample reportedly contains some individually coated spores, which increases the likelihood that a spray drying process was used. Spray-drying apparatus is at least six feet tall to allow adequate time for the powder to fall through a column of heated air. Spray drying is not normally performed in most biological laboratories. However, spray drying equipment is neither terribly expensive, nor hard to make from commonly available parts.

The drying process used by the attacker is almost certainly known to the FBI, since each process leaves distinct patterns on the final product.

Producing weaponized anthrax is a difficult and technically demanding process. The initial stages, from the theft of the sample to the preparation of the wet spore slurry with chemical additives, could be done without attracting attention of casual observers. The centrifuging and later stages are extremely hazardous. The drying and weaponization stage would be difficult to disguise or explain.



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