New Army Biowarfare Lab Raises Concerns

Some prominent scientists are troubled by the government's plan to build a new P4 laboratory for testing of biological warfare agents

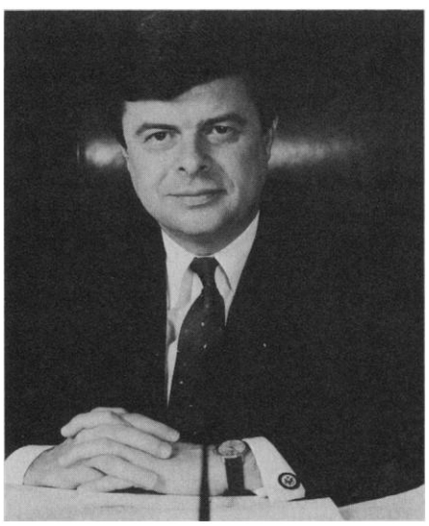
Last August, as the 98th Congress was struggling to conclude its work and leave town, John Quetsch, an acting assistant secretary of the Army, asked the House and Senate appropriations committees for routine approval to reallocate $66 million. In a letter, he said that the Pentagon wanted to take funds from existing programs and spend them on new troop housing in Europe, a heated parking garage in upstate New York, a new physical fitness center in rural Pennsylvania, and an aerosol test facility in Utah, among other minor projects.

In accordance with standard congressional procedures, Quetsch's request was reviewed only by the chairmen and ranking minority members of the subcommittees on military construction. There were no formal votes, no hearings, and no debates. An aide to Senator James Sasser (D–Tenn.), one of the four members involved, recalls that "it was all fairly straightforward. Nothing on the list seemed troublesome or unusual." Like his three colleagues, Sasser quickly signaled his assent, and the reallocation was legally authorized.

Only later did Sasser realize that Congress had thereby signed off on an unprecedented expansion of the Army's biological weapons research program, which is fast becoming one of the most controversial items in the Pentagon budget. Specifically, the four members had authorized the construction of a sophisticated laboratory whose primary function would be the testing of extremely hazardous biological agents in aerosol sprays—agents that may include the viruses of Lassa fever, Ebola fever, Venezuelan equine encephalitis, Marburg disease, yellow fever, and the hemorrhagic fevers. Only four U.S. laboratories, commonly known as P4 containment facilities and designed according to the most stringent government safety standards, are capable of studying these highly infectious, lethal agents at present.*

Sasser is not one of the Senate's more showy members, nor one of its more iconoclastic. But when he discovered the remarkable capabilities of the Army's new "aerosol test facility" last month, he took the extraordinary action of withdrawing his approval for the reallocation of Army funds. In so doing, he placed the program in legal limbo and set off a vigorous political and scientific debate. "We're traveling in uncharted waters here," his staff aide says. "This is the first time within memory that a request has been suspended like this."

Sasser is principally concerned that the lab will enable the Pentagon "to test offensive biological and toxin weapons," which are banned by a 1972 international treaty. In a lengthy written statement designed to allay his concern, Pentagon officials vigorously deny that such testing will be conducted. "Absolutely no work is being done to develop, manufacture, store or weaponize biological warfare agents," the statement says.



Senator James Sasser

The Pentagon sought "to avoid the regular authorization and appropriation process."

Nevertheless, Sasser's anxiety is shared by some prominent micro- and molecular biologists who reviewed the Pentagon's statement at *Science*'s request. Most believe either that the lab is unnecessary or that it could be misused without vigorous independent oversight. For example, David Baltimore, a molecular biologist and Nobel laureate who heads the Whitehead Institute for Biomedical Research in Cambridge, believes that "this is too elaborate a program. It is too much and too open to ambiguous interpretation even if [the Army's] intentions are good." Similarly, Robert Sinsheimer, a molecular biologist who is chancellor of the University of California at Santa Cruz, says that "I find it rather troubling. If I were a congressman and was asked to vote on it, I would want to see a stronger argument that it is needed, because it can lead to an escalation of the arms race in this area." Moselio Schaechter, a molecular biologist at Tufts University who is president-elect of the American Society for Microbiology, is among several experts who believe that the laboratory should be subjected to continuing scrutiny by a special congressional panel. Neither Congress nor the Army has any plans for such oversight at present.

Some of the anxiety both on Capitol Hill and in the scientific community stems from the obscure procedure by which the Army sought to obtain congressional approval. Most experts agree that even a hint of subterfuge in this politically sensitive area can generate corrosive mistrust. Senator Sasser, for one, is convinced that the Pentagon deliberately "sought a reprogramming action under emergency fund statutes in order to avoid the regular authorization and appropriation process of the Congress." Colonel Robert Orton, who directs the Army's chemical and biological warfare defense division, says this is untrue, but adds that the actual decision to submit the request in that form was made by the Army Corps of Engineers and that he was not informed in advance. Dee Boldan, a spokesperson for the Corps of Engineers, says in turn that the decision was made in response to a request from the Army Materiel Command, and that she is unable to supply the names of those who sent or approved the request.

According to Sasser, the funding mechanism used by the Army was established primarily for minor, noncontroversial programs requiring an emergency infusion of cash. But Orton says that plans for the aerosol test laboratory were laid several years ago and have not been changed. Somewhat incongruously, Orton argues that the need for funding is urgent, because defensive military equipment to be tested in the laboratory—items such as masks and biological aerosol detectors—has been readied on time. "It is urgent that we get on with the development of this equipment, and it is

* They are operated by the National Institutes of Health, the National Institute for Allergic and Infectious Diseases, the Centers for Disease Control, and the Army Medical Research and Development Command. The new facility would be the Army's first such lab devoted entirely to nonmedical research.

urgent that we have the test facilities to do that, and we can't afford to have [it] delayed for 3 years or 5 years, given our perception of the [Soviet] threat that faces us," Orton says.

He and other biological warfare experts at the Pentagon are unable to point to worrisome new developments in the Soviet Union since the preparation of last year's formal U.S. defense budget, however. Neither are they able to point to specific evidence, instead of mere inferences, that the Soviet Union has begun its own aerosol testing of biological warfare agents. "What I have seen in general terms is that there is work going on in the military development environment involving modern biotechnological techniques," Orton says. "Now what the results of that work [are], I don't know. But one certainly has to worry about that."

The proposed aerosol laboratory is only a small part of an enormous, ongoing effort to modernize and expand chemical and biological testing facilities at Dugway Proving Ground, a 283,000-acre military base southwest of Salt Lake City. Since it opened in 1942, numerous chemical and biological weapons have been used in experiments there, the most infamous being a test of the nerve agent VX in 1968 that accidentally caused the death of 6000 sheep on neighboring ranches. Orton says that the base fell into general disrepair during the 1970's, and that the purpose of the modernization effort is to bring it "out of the Dark Ages." Several hundred new employees are to be hired, and the overall cost will be more than $300 million.

One major piece of the modernization program is the construction of a new chamber for chemical weapons tests, capable of simulating arctic and tropical climatic conditions. In the statement submitted to Congress, the Army explains that two existing test chambers, constructed in the 1960's, are grossly underpowered, lack adequate air filtration and sampling equipment, cannot be readily decontaminated, and are too small for tests involving modern tanks, armored personnel carriers, and mobile communications vans. The Army also notes that the existing chambers are unsuited "for testing today's thickened agents"—lethal chemicals encased in a gel-like substance for added endurance.

The new $1.4-million aerosol test facility, like other labs designed for research involving extremely hazardous viruses, rickettsiae, and bacteria, will contain fumigation and sterilizing steam chambers for the decontamination of equipment and clothing after each experiment. Employees will wear special protective suits with individual oxygen supplies, and shower when leaving. A negative air pressure will be maintained with the assistance of interlocking air-tight doors. Biological materials will be stored in a locked deep-freeze.

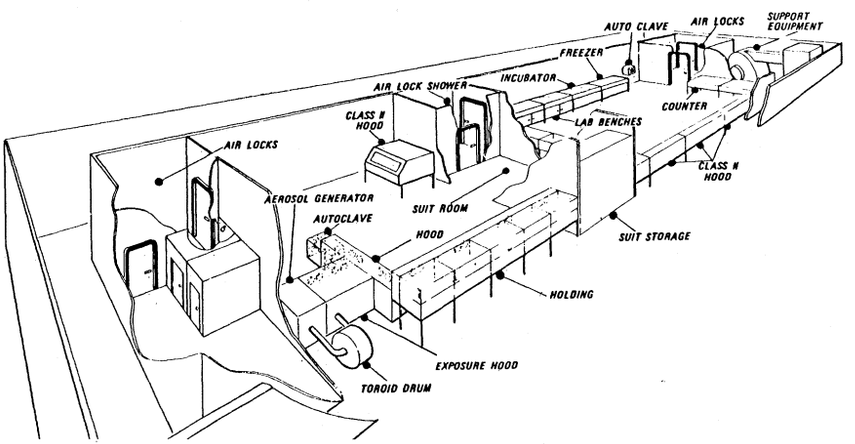
According to the Army, the test chamber will contain a variety of standard laboratory equipment, such as microscopes, centrifuges, incubators, animal cages, scales, and mixers, a spectrophotometer, a lyophilizer, and a rocking platform. At 400 square feet, it will probably accomodate four researchers comfortably at once. At its heart will be a small stainless steel box for experiments with what the Army characterizes as "substantial volumes of toxic biological aerosol agents." No such aerosols are tested at present by the Defense Department.

Matthew Meselson, a professor of biochemistry and molecular biology at Harvard University, questions whether such a sophisticated laboratory is needed to conduct purely defensive biological research. He suggests three reasons why it may not be. One is that virtually all of the toxic biological agents to be studied in the lab can be simulated for the purposes of experimentation by organisms that are far less hazardous. Second, he says, the use of such simulants makes sense from a military perspective. The reason is that a single simulant can replicate key properties shared by numerous bacteria or viruses. As a result, simulants can pose a more generic, robust challenge to the equipment being tested.

Third, Meselson says, data on the persistence of toxic biological agents are the only additional bits of information to be gleaned from tests involving the agents themselves, and this information is useful only if one is contemplating offensive use. "If you're only designing protective equipment, you should simply assume that threatening agents will persist. And if you're going to do that, you might as well use a highly persistent simulant," he says.

Meselson is careful to draw a distinction between defensive chemical and biological test laboratories. "Facilities of this sort are certainly justified for chemical agents," he says. "The properties of each chemical are so different that you really do need to test each one. But the characteristics of aerosols important for defensive work are particle size and surface tension, and we've known for a long time how to match these with simulants. I just don't understand why they need to go to a P4 [a maximum safety laboratory]."

Roy Curtiss, a professor of molecular biology and chairman of the biology department at Washington University, agrees. "We know a good deal about the likely biological warfare agents, and one can easily choose nonpathogenic or avirulent agents with the same size and molecular properties," he says. "If the only goal is to test the adequacy of defensive equipment, protective clothing, and decontamination procedures, I don't see the need for a P4 lab. It's overkill and it's not good science."



An Army sketch of the proposed aerosol test laboratory [U.S. Army]

Several other scientists disagreed, however. Ivan Bennett, a professor of medicine at the New York University Medical Center who serves on the Defense Science Board, argues that "one can use simulants up to a point, but then you want to test the permeability of equipment to the actual agent itself in as realistic a setting as you can. One can sit on the outside and say, 'I'm more of an expert on how equipment should be tested before buying it in large quantities and giving it to the troops, that maybe there are better ways of doing things.' [However,] from what I've heard in the last 4 years, the facilities requested here provide a needed capability." Similarly, Schaechter says that "it's probably a

judgment call, but without tests involving the actual agent, I don't think you would be able to say with assurance that your generic results apply to a specific bug." This view is also expressed by Norton Zinder, a professor of genetics at Rockefeller University who sits on the National Research Council's Board on Army Science and Technology.

Many of the experts consulted by *Science* said their principal worry is that the aerosol test facility could someday be used to test or refine genetically modified biological agents with exceptional virulence and enhanced resistance to antibiotics—to develop, in short, prohibited offensive weapons. The most common fear is that genes from pathogenic or toxin-producing organisms could be implanted in bacterial hosts capable of rapid spread among limited populations or ethnic groups. No one expects such agents to spring from a formal offensive research effort; instead, the fear is that they might be developed through so-called defensive threat assessment. This would occur as follows: The United States learns, or perhaps simply believes, that the Soviet Union is developing a specific biological weapon, agent XYZ; to learn more about this threat, it conducts nearly identical research. The results will influence the design of defensive equipment and determine whether a vaccine should be developed, clearly legitimate objects of scientific inquiry. Along the way, however, the bench scientists will have unavoidably recorded data that could be used by the United States to develop agent XYZ itself. As Lieutenant Colonel Wyatt Colclasure, a staff officer in the Army's chemical and biological defense division, acknowledges, "you do get information, and like a lot of information, you can put it to different uses."

This is not a new problem in the biological weapons area. In the estimation of several scientists, however, it has become a more pressing issue because the Pentagon's construction of a sophisticated new laboratory will substantially raise the stakes involved. As Schaechter notes, "a lot better work can be performed in this lab, both for defensive as well as offensive purposes. By and large, there is no way to tell the difference. They are exactly the same." Richard Goldstein, a professor of microbiology and molecular genetics at Harvard University, goes even further. "In my mind, the opening of this facility substantially escalates the biological arms race," he says. Similar concerns are expressed by Sinsheimer and by Sheldon Krimsky, an associate professor of urban and environmental policy at Tufts who formerly served on the federal government's recombinant DNA advisory panel.

To some, a line should be drawn between legitimate defensive research and prohibited weapons development at the point where the Army uses the laboratory to genetically modify existing biological agents. If it appears that the Soviets do such work, the Army may decide to follow suit because it will want to assess how serious a threat such organisms pose. Most experts agree that the Army could reasonably characterize such work as defensive, but largely because foreign intelligence information is bound to be somewhat ambiguous, it may soon look like a biological weapons development program. On balance, these experts claim, the United States should avoid such work.

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Baltimore, for example, says that "there is no question that this equipment will give the Army the capability to perform genetic manipulations at Dugway. If they actually begin such work, that would give me cause for concern. That's one of the few clear things. They should also say that they are absolutely not going to make any new toxins," or poisonous compounds created by novel biological organisms. Similarly, Royston Clowes, a professor of molecular biology and chairman of the biology department at the University of Texas in Dallas, favors a legislative prohibition on the development of new toxins. In addition, he says, any proposals to use recombinant DNA techniques at the laboratory should be subject to approval by the National Institutes of Health advisory panel for such work.

Colonel Orton, Lieutenant Colonel Colclasure, and Thomas Dashiell, a molecular biologist in the Pentagon's research and engineering office, all say that they are uncertain exactly which biological agents are to be studied at the new lab. But Colclasure says that "we don't have any plans to do recombinant DNA work; that's not what this facility is for." An Army spokesman also says that "there is no specific intent to use substances created [elsewhere] by or through recombinant DNA processes." But he specifically refuses to rule this out, particularly if the Army learns that the Soviets are doing it. Orton comments that it might be extremely difficult to create practical new biological weapons through genetic engineering. "But one surely has to look at the possibilities and ensure that there isn't an easy way to do it," he says.

A sure way to allay suspicion is to declare that all work at the laboratory will be unclassified, according to several scientists. Meselson in particular argues that "the only way our policy will be credible to others is if we lean over backwards to keep everything open." Krimsky suggests that at a minimum, a list of every organism to be tested there should be published openly. But Dashiell says that some of the laboratory's work will probably be kept secret. "It will have to be decided on a case-by-case basis," he says. "Normally, our threat assessment and equipment vulnerability work is classified."

One means of resolving the disagreement may be to create an expert panel capable of scrutinizing the laboratory's work. Schaechter says that he would be greatly reassured if Congress created such a panel and empowered it to scrutinize even the laboratory's classified work. Krimsky, Sinsheimer, Baltimore, Curtiss, and Harlyn Halvorson, director of the Rosenstiel Basic Medical Science Research Center at Brandeis University, also support this idea. "Among other things, I'd want to keep track of whether any microbial geneticists are working there, what sort of work they do with monoclonal antibodies, and who their suppliers are," Curtiss says.

As of this writing, the Army's request for the laboratory funds remains in a peculiar legislative limbo. If it wants to, the Reagan Administration could probably persuade the appropriations subcommittee chairman, Senator Mack Mattingly (R–Ga.), to ignore Sasser's objection and poll the other three members, thereby obtaining the votes needed for approval. The decision would not be subject to debate or reconsideration, and the Army would be free to set its own agenda for defensive research.

To its credit, the Army has thus far been reluctant to force the issue. But neither is it willing to withdraw the request and resubmit it as a formal budget request, subject to a full and open debate. "The request is still over there and I would hope that they act on it," says Lieutenant Colonel Colclasure. Given the grave concerns expressed by scientists in the United States, as well as the obvious need to allay any suspicions elsewhere, a change of heart would probably better serve the Army's legitimate scientific interests.—**R. JEFFREY SMITH**