Preemptive Biopreparedness: Can We Learn Anything From History?

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ABSTRACT

The threat of bioterrorism is in the public eye again, and major public health agencies are urging preparedness efforts and special federal funding. In a sense, we have seen this all before.

The Centers for Disease Control and Prevention grew substantially during the Cold War era in large part because Alexander Langmuir, Chief Epidemiologist of the CDC, used an earlier generation's anxieties to revitalize the CDC, create an Epidemic Intelligence Service, and promote epidemiologic "surveillance" as part of the nation's defense. Retrospective investigation suggests that, while Langmuir contributed to efforts promoted by the Department of Defense and the Federal Civil Defense Administration, the United States did not have real cause to fear Communist biological warfare aggression.

Given clear historical parallels, it is appropriate to ask, What was gained and what was lost by Langmuir's central role in that first instance of American biopreparedness? Among the conclusions drawn is that biopreparedness efforts fed the Cold War climate, narrowed the scope of public health activities, and failed to achieve sustained benefits for public health programs across the country. (*Am J Public Health.* 2001;91:721–726)

Bioterrorism seems to be the topic of the hour. Our medical and public health journals are full of articles, like one in this issue of the Journal, that raise questions about our state of readiness to deal with bioterrorist attacks, sound alarms about our lack of preparedness, or point to shortcomings in our institutional infrastructure. We are cautioned that most local health departments lack plans to address bioterrorist events and that few public health agency staff members have received comprehensive bioterrorism training.[1] We are warned that we are "perilously vulnerable" and that a bioterrorism event, possibly one of catastrophic proportions, is likely to occur within the next several years.[2,3] Major public health organizations and institutions, such as the Centers for Disease Control and Prevention (CDC) and the Association of State and Territorial Health Officers, are centrally involved in urging the importance of the bioterrorist threat.[4–6] So are public health leaders formerly known for their success in global immunization campaigns. Most notably, D.A. Henderson, former dean of the Johns Hopkins School of Public Health and director of the World Health Organization campaign to eradicate smallpox, now serves as director of the Hopkins Center for Civilian Biodefense Studies. His group publishes the *Biodefense Quarterly,* which provides up-to-date news about "the myriad issues related to biodefense" and helps "establish ties among the diverse members of the biodefense community."[7]

Whereas the Departments of Defense, Justice, and Energy now receive most of the funds for biological terrorism control, public health agencies and departments have urged that they be given a larger share of available funds. In fiscal year 2000, the Department of Health and Human Services devoted $277 million to "anti-terrorism funding," of which the largest single amount ($90 million) went to the CDC for surveillance, developing epidemiologic expertise, and improving laboratory facilities for detecting bioterrorism agents.[8] In June 2000, senators Bill Frist and Edward Kennedy introduced a bill in the US Senate that they have named the "Public Health Threats and Emergencies Act." This legislation would encourage funding for a coordinated national network of training programs to prepare personnel to protect civilians against bioterrorism, and would support research on microbial resistance on the grounds that such research is needed as a counterterrorist measure.[9] In another recent news item, the Food and Drug Administration approved ciprofloxacin as the nation's first medication specifically designated for use after a bioterrorist event.[10]

The First Wave of Biopreparedness

In a very real sense, we have seen all of this before. As Elizabeth Etheridge and others have documented, the CDC (then called the Communicable Disease Center) played a central role in America's response to the threat of "biological warfare" during the Cold War era.[11] The effort was led by Alexander D. Langmuir, a major public health leader from the 1940s through the 1970s, who served for many years as chief epidemiologist at the CDC. Langmuir brilliantly exploited an earlier generation's fear of biological warfare to revitalize the CDC in the postwar period, design a system of disease reporting, and create the Epidemic Intelligence Service (EIS), a practical training program for young epidemiologists. The EIS in turn served as educational preparation for many national and international public health leaders who would spread the Langmuir philosophy of surveillance and disease control.[12]

Langmuir studied medicine at Cornell and public health at Johns Hopkins, earning his master of public health degree in 1940. Even before the United States entered World War II, he served as a consultant to the Armed Forces Epidemiological Board, and in 1942 he accepted a post as epidemiologist for the Commission on Respiratory Diseases at Fort Bragg, NC. There, he worked on the transmission and spread of acute respiratory diseases, including airborne infections—a topic soon to be of central interest to the biological warfare establishment. After the war, Langmuir returned to the Johns Hopkins School of Hygiene and Public Health as associate professor of epidemiology. There, he became close to Kenneth

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Maxcy, who was then professor of bacteriology and epidemiology and a member of the Department of Defense's Committee on Biological Warfare. This committee, which met for the first time in 1941, was responsible for developing the United States' program and policy on biological warfare. Langmuir served first as Maxcy's alternate and later, when Maxcy was incapacitated by Parkinson's disease, as his full-time replacement on the biological warfare committee. Langmuir later recalled that although he was initially "over his head" on this highly classified committee that "used up a great deal of time," he had learned much from the experience.[13] Beginning in 1949, he also served on the Army Chemical Corps' Administrative Council, the entity responsible for overseeing biological warfare research. Etheridge notes that Langmuir knew more about biological warfare than anyone else in the Public Health Service. He had a high-level security clearance, higher even than that of the surgeon general.[11(pp41–42)]

Langmuir was recruited to the CDC in June 1949. Within a few months of his arrival there, in October 1949, he raised the question of biological warfare defense in a meeting with state health officers. He argued that sabotage of food and water supplies was the most likely mode of attack and that epidemiologists must form the first line of national defense. Two months later, the National Security Resources Board declared that the nation must develop ways of responding to bacteriological warfare. The CDC ordered planning reports from each of its divisions and called in consultants from 20 states to gauge the adequacy of responses to a potential biological assault. Historically, this was a tense moment, as the nation was rocked with waves of anticommunist anxiety. In September, the Soviet Union had exploded an atomic bomb and in October, the victorious Chinese Communist army had declared a People's Republic. Senator Joseph McCarthy was beginning his campaign to root out suspected or supposed communists from the State Department and the federal government; the Hiss trials were in progress; the news media were reflecting and in some cases cultivating a general atmosphere of fear and suspicion. In his inaugural address of January 1949, President Truman had spoken only of foreign policy and denounced communism as a false doctrine of deceit and violence.[14] By June 1950, the nation was at war in Korea. President Truman ordered all nondefense budgets to be scaled down so that maximum resources could be devoted to the wartime emergency.

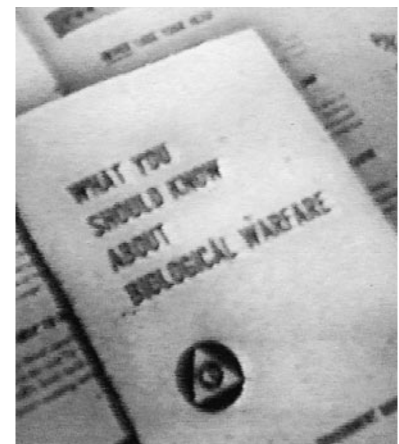
At the CDC, "epidemiologic intelligence" was listed as a defense expenditure. Apparently, it was Joseph W. Mountin, the man who secured congressional approval to found the CDC, who first coined the phrase "epidemic intelligence service," with its overtones of covert activity.[15] The phrase was a clever encapsulation of Langmuir's general concept of a nationwide team of epidemiologists ready at any moment to respond to the threat of biological attack. Langmuir also popularized, if he did not invent, the term "surveillance" to describe the general practice of gathering epidemiologic intelligence.[16] "Surveillance" had overtones of military or intelligence activities, and the term suggested more excitement than the traditional public health process of disease reporting, with its associations of dull bureaucratic paperwork. Langmuir became known for the concept of surveillance as well as for the energy with which it was implemented.

In December 1950, the Executive Office of the President published the government's official position on biological warfare, *Health Services and Special Weapons Defense*, a report to which Langmuir contributed. This manual stated baldly that a determined and resourceful enemy could effectively employ agents of biological warfare and that such agents could well be used either in covert actions or in open warfare. Many different agents could be used and might be transmitted by air, food, or water. The Federal Civil Defense Administration was charged with organizing a national system of defense against atomic, biological, and chemical warfare and planning "to treat simultaneously the great numbers of living casualties resulting from each attack."[17]

The Federal Civil Defense Administration and the US Army published popular pamphlets, such as *What You Should Know About Biological Warfare*, to explain the threat of biological warfare to the general public.[18] The pamphlets stated that the main danger of biological warfare came from aerosol sprays that could be carried aboard airplanes or submarines, "blown into the air intake of a factory ventilating system," or loaded into specially designed bombs. Secret agents might try to poison food and water supplies; plant and animal diseases could be unleashed to destroy food supplies. The many possible biological agents included plague, typhus, cholera, smallpox, anthrax, glanders, plant blights, and botulinum toxins. The pamphlets offered some very specific advice: when an alarm sounded, people should get into a shelter and stay there until an all-clear signal sounded. Afterward, polluted clothing should be washed and boiled or dry-cleaned. People should be careful what they eat; preferably, they should consume canned or bottled goods with unbroken seals. To play it safe, people could boil all foodstuffs for 10 minutes and use a service gas mask to protect against airborne pathogens.

These official pamphlets communicated a curious mix of anxiety, information, and reassurance. They discounted some dramatic rumors about biological toxins that could wipe out whole cities in an instant, but they also fed popular apprehensions through authoritative assertions that an invisible biological warfare attack could come at any time, without warning. A similar impression was provided by a popular television program, *What You Should Know About Biological Warfare*, aired by the Department of Defense and leaders of the Federal Civil Defense Administration in early 1951 as part of the weekly Johns Hopkins University science program.[19] Starring a youthful and intensely serious Alexander Langmuir, the program presented a compelling case for both the threat of biological warfare and the importance of the public health system as the country's best defense.

At one point in the program, Langmuir turned on a Waring blender filled with dry ice for a vivid demonstration of how clouds of aerosol mist could contaminate a whole studio and infect everyone inside. He then used a familiar can of insecticide to demonstrate the working of an aerosol spray. Employing much the same principles, he said, an enemy could mount aerosols on airplanes and cover a city with a vast cloud of infectious material. Langmuir also injected colored liquid into a model of the water supply of a city to show how easily a biological warfare agent could spread. How could anyone protect or defend against such an attack? The only real answer, said Langmuir, was to build a complete biological warfare defense program. This would be based on the existing public health system, but it would use more effective sampling methods to detect biological warfare agents and employ faster reporting of disease incidence, upgraded



1951 pamphlet "What You Should Know About Biological Warfare," shown on the TV program with the same name. (Courtesy of the National Library of Medicine.)

Alexander D. Langmuir explaining how an insecticide spray works, from the TV program "What You Should Know About Biological Warfare," 1951. (Courtesy of the National Library of Medicine.)

laboratory facilities, more extensive immunization programs, and better investigations of all outbreaks of disease. In short, he said, the country needed an epidemic intelligence service. The program Langmuir outlined was not only a blueprint for the creation of the EIS but also in many ways a plan for the future development of the CDC.

The Epidemic Intelligence Service

Langmuir had already raised the idea of, and received approval for, an epidemic intelligence service in July 1950 at a meeting in Washington called to discuss biological warfare. Funding for the EIS was included in the budget for civil defense activities presented in Congress. Langmuir started with a training team of 6 members; by September 1950, once doctors knew they would soon be subject to the military draft, applications to the new EIS began pouring in. The first class of 23 recruits arrived in July 1951. After a rapid and very challenging training, they were ready to be sent out across the country to assist official health agencies in investigating infectious disease outbreaks. The entire EIS training course was managed with Langmuir's characteristic flair for the dramatic; at all times, trainees had to have a bag packed and be ready and willing to respond to an official alert within hours of a request for assistance. The challenge appealed to the bright young doctors Langmuir recruited for the program.

Three faculty members from Johns Hopkins—John Hume, Phillip Sartwell, and Abraham Lillienfeld—offered the first year's curriculum. The course was based on the Johns Hopkins case study method as originally developed by Wade Hampton Frost, Hopkins' first professor of epidemiology. It added something that the Hopkins course often lacked: an immediacy and relevance created by reports from officers in the field who discussed the problems with which they were dealing. Some of the reports came in by radio; all were timely and up-to-the-minute "breaking news."

By all accounts, however, Langmuir put his personal stamp on the entire program. He dominated the training of EIS officers and insisted that the experience be made "as exciting as we knew how." During his years as chief epidemiologist at the CDC (1949–1970), Langmuir was responsible for training some 672 officers of the EIS, many of whom considered the experience a highlight of their careers.[20]

The EIS provides a direct connection between Langmuir's era and our own through the relationship of Langmuir to D. A. Henderson. Henderson was one of those bright young recruits to the EIS; he arrived in 1955, trained under Langmuir, and later became one of Langmuir's deputies at the CDC. Langmuir gave each of his most talented trainees a specially challenging assignment; he nominated Henderson to be chief of the surveillance section of the CDC. When Langmuir was becoming interested in the global problem of smallpox, he made Henderson chief of the CDC Smallpox Eradication Program. Starting on this foundation, Henderson would go on to lead the extraordinarily successful World Health Organization smallpox eradication program.

Henderson gave Langmuir's insistence on accurate disease surveillance much credit for the success of the global smallpox eradication program. In the course of his career, Henderson had worked for 12 years with Langmuir and had absorbed Langmuir's insistence that surveillance was the key to infectious disease control. "One does not spend 12 months, let alone 12 years, with Langmuir without obtaining a point of view," said Henderson.[21] His close identification with Langmuir's career, approach, and ideas is evident in the videotaped oral history interview he conducted with Langmuir for the Alpha Omega Alpha series *Leaders in American Medicine*.[13] More recently, Henderson has taken on his mentor's concern with and interest in biological warfare—now reconceptualized as defense against bioterrorism.[22]

The Threat of Biological Warfare

The connections between an earlier era of biological warfare defense and the contemporary concern about bioterrorism invite us to look more closely at that earlier historical experience for some cautionary guidance. One central question about the earlier episode is, How good was the available information about the clear and present threat of biological aggression against the United States? On the basis of our reading, we found it very difficult, if not impossible, to discover much evidence for any real threat of biological aggression against the United States around the time of the Korean War. The strongest arguments presented in official government documents are based not on facts but on speculative constructs and hypothetical scenarios. These documents contend that since a biological warfare attack was *technically feasible*, the threat required every possible preparation.

As we have noted, Langmuir was himself recognized as a leading national expert on the threat of biological warfare. A close reading of his papers of that period reveals that his primary case for American preparedness was based on theoretical explorations and hypothetical projections rather than on any clear documentation of imminent enemy threat. He laid out the epidemiologic possibility of biological warfare by airborne infection or food and water contamination, but he freely admitted that he was modeling potential rather than empirically established threats.[23] His projections were typ-

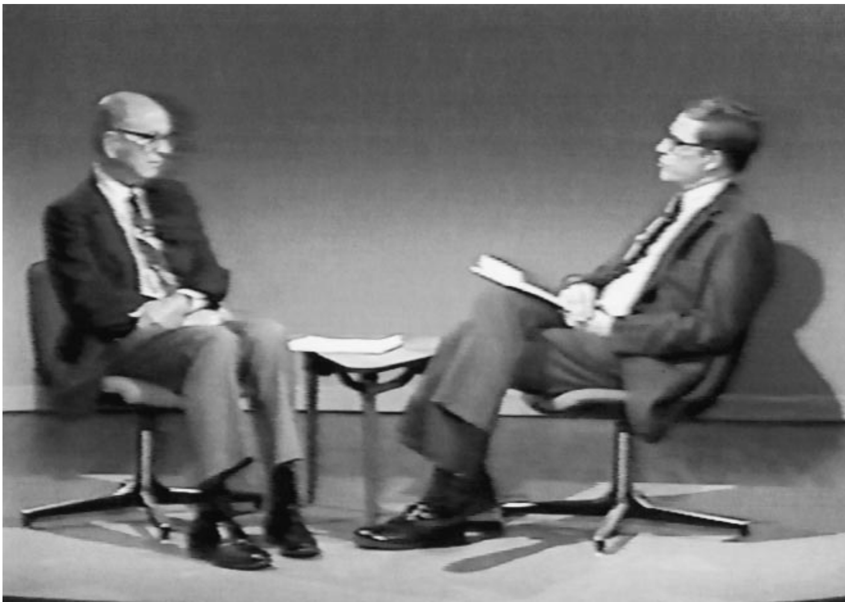
ically phrased in such terms as "Let us now visualize the problems that might be encountered in surreptitious attacks," and "To visualize more clearly the need for epidemiologists in the civil defense organization, let us outline the events which might follow a biological warfare attack."[24] Even in retrospect, Langmuir recollected in his oral history interview that his argument for the EIS depended on biological warfare being "even a slight probability."[13]

The best recent historical research, in fact, suggests that, whatever may have been the case in more recent decades, the one nation in the early Cold War period with the most fully developed commitment to investigating the possibilities of biological warfare was the United States.[25] If a biological warfare attack was technically feasible, it was the Americans, the British, and the Canadians who proved it so. According to recent research based on previously classified documents, the British had done the key research to prove the possibility of using biological weapons; the Americans had demonstrated the feasibility of their mass production.[26]

Biological warfare research had started during World War II in the Army Chemical Warfare Service with about 4000 workers and a budget of $60 million.[27] Oversight of the secret program was then moved into the civilian Federal Security Agency under the newly named War Research Service headed by George W. Merck, president of the pharmaceutical firm Merck and Co, Inc. In the early period, work focused on anthrax and botulism. Research was, however, conducted on a series of biological agents for use against people and plants. One specific plan to drop ammonium thiocyanate on rice-producing areas near major Japanese cities was preempted by the dropping of atomic bombs on Hiroshima and Nagasaki.

Japanese occupying troops in China had carried out their own biological warfare experiments. A biological weapons development program under the direction of Shiro Ishii employed 3000 scientists and technicians to carry out experimental infections in large-scale field trials in which at least 10 000 prisoners are said to have died. The Japanese also attacked Chinese cities with biological agents, although the results of these attacks are uncertain or disputed. After the war, the United States offered immunity from war crimes prosecution to some of the leading Japanese scientists responsible for biological warfare experiments in China, on condition that they disclose information about these experiments in secret debriefings. Much later, the Americans decided that the Japanese data were poor and of little use in developing biological weapons capacity.[26]

After the war, the United States continued to develop its own biological warfare research. Science historian Susan Wright has traced the development of biological warfare capacity by the United States and the buildup of biological weaponry intended by the US military as deterrence.[28] The military tended to regard each type of weapon of mass destruction as needing to be deterred with a similar weapon: nuclear with nuclear, chemical with chemical, biological with biological. As support for basic research and development of biological weapons rose throughout the 1950s and 1960s, the Army built a 500-acre research and development facility at Camp Detrick, Md (renamed Fort Detrick in 1956), created huge testing sites in Mississippi and Utah, and obtained 6100 acres for a manufacturing plant near Terre Haute, Ind.[29] The research and development network centered in Fort Detrick expanded to include some 300 universities, research institutions, and corporations.



Alexander D. Langmuir and D. A. Henderson, from the 1979 videotaped interview for "Leaders in American Medicine," the Alpha Omega Alpha series. (Courtesy of National Library of Medicine.)

Ed Regis and other writers have recounted the history of extensive field tests using "simulants" and pathogens at Dugway Proving Ground, Utah, and other locations; research on human subjects; and aerosol spray tests carried out over major cities.[25–30] Alistair Hay has also used documents released under the Freedom of Information Act to elaborate details of this biological warfare research. One project, "Big Buzz," tested the feasibility of mass-producing mosquitoes and disseminating them from aircraft, with the idea that munitions loaded with mosquitoes carrying yellow fever virus could be targeted at the southern regions of the Soviet Union.[30] Such activities were justified by the need to defend against a Soviet threat or to stay well ahead of a future Soviet threat, arguments that followed the generally familiar and self-sustaining logic of the Cold War arms race.

During the Korean War, there were allegations that the United States had used biological weapons. These allegations were hotly debated at the time and continue to be matters of dispute. A recent book by Stephen Endicott and Edward Hagerman, *The United States and Biological Warfare*, which draws on extensive research in US and Chinese archives, has reopened the debate.[31] It shows beyond reasonable doubt that biological weapons were being intensively developed before and during the Korean War and that there was, for a period of several years, no clear constraint against their first use by the United States. Much of the evidence from this period, which could be relevant for settling these questions definitively, is still classified.

Learning From History

Given a brief historical review of this highly contentious area, we can ask what was gained and what was lost to public health by Langmuir's central role in the first episode of American biopreparedness. Certainly, resources were made available to build up the EIS and the CDC; these are important long-term achievements. Perhaps it is perfectly rea-

sonable to build up public health activities, personnel, and institutions no matter what the source or overt purpose of the funding. This certainly seems to be the reasoning of many public health officials today, who are quite eager to use bioterrorism or health-alert funds to, as some would put it, "grow the public health infrastructure." And it is certainly true that some resources, such as better telecommunications for the public health workforce, clearer standards for communicating information, and more training for public health personnel, should have broad applicability for other, perhaps more pressing, public health issues. But there are also choices to be made. Funding turned toward one set of problems can be—and in our experience often is—diverted from others. Biological warfare funding in postwar Britain and America was devoted especially to the study of diseases such as anthrax that were not of any real threat to their populations outside of their presumptive use as biological weapons. Great attention was given to the experimental infection, with such organisms, of laboratory animals and to methods of delivery by air.

At the same time that funding for biological warfare research was increasing in the United States, funds for local health departments were cut sharply. Jobs in public health departments went unfilled for long periods of time because salaries offered were too low. In the 1950s, enrollments in schools of public health declined so dramatically that the Johns Hopkins School of Hygiene and Public Health considered eliminating entirely the master of public health degree—the main training program for public health personnel. Had it done so, arguably the oldest, largest, and most prominent public health education program would have been closed down, with the faculty and doctoral students left to focus their entire attention on funded research, freed from major teaching obligations. By 1955, the state of public health was so bad that the annual conference of the American Public Health Association offered a major symposium on the theme "Where Are We Going in Public Health?" During the generally gloomy assessments, Henry Vaughan suggested that if public health were dead, it should have a decent burial, and Hugh Leavell proposed "to apply a stethoscope to the chest and perhaps a mirror to the mouth to see if there is any breath left in it . . . before ordering the coffin."[32(p408)] It seems, then, that the funds made available for biological warfare research failed to have a notably beneficial effect on public health programs across the country.

Looking back, we can see that a brief period of enthusiasm and idealism within public health in the immediate postwar years was all but eliminated by the generally repressive ideologic atmosphere of the McCarthy period. At a time of declining health department budgets, one of the most important and clearly cost-effective public health measures, fluoridation of the water supplies, became bogged down in many localities in endless ideologic squabbles and fear-mongering. Why were many communities so afraid that the Communists were about to poison their water supplies that they refused to listen to the supposedly authoritative voices of scientists, physicians, and public health professionals? Perhaps publicity about the plausibility of a biological warfare attack did much to fan such fears.

Many of the more progressive voices in public health were silenced or muted in these years, and those who continued to speak out were subject to political suspicion. Such leading lights as Thomas Parran, the surgeon general, and Martha May Eliot, leader of the Children's Bureau, were publicly censured, as were medical care activists Fred Mott and Milton Roemer, who had sustained the innovative and important rural medical care programs of the Farm Security Administration.[33] There are many indications of the chilling effect of the Cold War era on particular areas of public health, such as health insurance and medical care organizations,[34] the compilation of mortality statistics by occupation and socioeconomic classification,[35] and the development of epidemiologic theory and methods that avoided dangerous speculation about the social determinants of health.[36] These issues have yet to be thoroughly explored.

Neither Langmuir nor the biological warfare establishment can be held responsible for all that was lost to public health in the late 1940s and early 1950s, but they were part of the same seismic shift rightward. First, by emphasizing the need for biopreparedness—however prudent that emphasis may have been from one perspective—Langmuir contributed, even if unintentionally, to the biological arms race. Merely by being involved so visibly, centrally, and convincingly in the debate, he added legitimacy to one dimension of the fear-driven mentality of the Cold War era. Most current viewers of the television programs or readers of the popular pamphlets on biological warfare are likely to agree that they tended to reinforce the anxieties of the Cold War rather than lead the nation toward a cool rationality and circumspect evaluation of its options and possibilities.

Within public health, and despite Langmuir's broad vision and wide range of interests, his involvement in preparedness efforts and his emphasis around the time of the Korean War on intelligence and surveillance both channeled the energy and narrowed the scope of epidemiologic research to an infectious disease focus. Most public health people agreed in the late 1930s and the immediate postwar period that the country's leading causes of mortality, morbidity, and disability were the chronic diseases, yet relatively little was done to address these issues in the 1950s. It was not until the 1960s and 1970s, for example, that the CDC began to develop programs in chronic diseases, occupational and environmental health, toxic hazards, birth defects, family planning, famines and disasters, and drug use. The fact that the institution grew in opportunistic response to anxieties about biological warfare with infectious agents was not the only reason that the CDC limited its initial focus, but the centrality accorded to the threat of biological warfare certainly did not help to widen its vision.

What are the risks we face today? Will the interest in bioterrorism—justified by a few incidents causing alarm (usually cited are the sarin attack on the Tokyo subway, airborne anthrax in the Soviet Union, and salmonella in salad bars in Oregon)—help or hinder the public health? Are the resources becoming available for defense against the threat of bioterrorism out of proportion to the seriousness of the threat? Does that possibly disproportionate allocation drain resources from other pressing public health needs? Will we "grow infrastructure"—not a bad outcome in itself—but limit the scope of public health in the process? Will present funding trends and policies seriously skew the system of health promotion and protection toward a few exotic threats rather than the sources of existing social inequalities in health? Some voices in public health argue that the new fascination with bioterrorism weapons bodes ill for the future of public health and may damage both domestic politics and international relations.[37,38]

We cannot say for sure, of course, what the future will bring, but we feel there may be lessons to be learned from our earlier encounters with the threat of biological warfare and its consequent less than stellar results for the development of public health. These questions deserve our attention. Perhaps we ought to pay heed to Yogi Berra's penetrating and uniquely stated wisdom: "It's like *déjà vu* all over again."[39] ☐

Acknowledgments

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