Taking biodefense too far

The United States is developing a costly bio-umbrella to protect its citizens against biothreats that do not now—and may never—exist.

In April 28, President George W. Bush unveiled an unclassified version of a secret presidential directive, "Biodefense for the 21st Century," indicating his administration's plans for defending Americans from terrorists intent on spreading dreaded diseases. The document, while light on detail, is heavy on goals: The country's air, water, and food will be closely monitored, as will its public health; huge quantities of vaccines and therapies will be stockpiled to be used in the event of a bioterrorist attack; and defenses against futuristic genetically modified pathogens will be developed. Moreover, the deadly organisms that are needed for research and development and the people who work with them will be tightly controlled in Andromeda Strain-type laboratories.

Bush promises Americans a vast bio-umbrella intended to shield them from deadly bio-aggression in the same way that President Ronald Reagan promised that his Strategic Defense Initiative ("Star Wars") would shield them from nuclear missiles. A key component is even known as "BioShield." This is the vision of "biosecurity" that has seized Washington's imagination since 9/11.

From military to civilian defense

Bill Clinton, not George Bush, actually began the U.S. counter-bioterrorism effort. As Clinton counterterrorism adviser Richard Clarke tells it in Against All Enemies, published earlier this year, the Clinton administration realized by the mid-1990s that Al Qaeda was the organizing force behind international terrorist actions against the United States, including the first attack on the World Trade Center in 1993.

Clarke and others in the Clinton administration believed international terrorists were also interested in using biological weapons, but whether there was an actual link was—and still is—debateable. [1] All the attacks of the 1990s, as well as those on 9/11, suggest that international terrorists are far more interested in using bombs or in turning peaceful technologies against the societies they benefit. There is much less reason to believe they want to employ weapons that are difficult to disseminate, uncertain in impact, and that might, if mishandled, infect the user.

Proponents of a link between international terrorism and bioweapons frequently cite the chemical attack by the Japanese sect, Aum Shinrikyo, in the Tokyo subway in 1995 and the sect's failed attempt to use anthrax. Revelations about the former Soviet Union's huge biological weapons program, and Iraq's admission in 1995 of its much smaller program, also brought the question of biological weapons to the attention of Washington security circles and the media. Despite a skeptical countercurrent of thinking about the difficulties of using biological weapons, arguments for seeing bioterrorism as an emerging "catastrophic" threat were taken increasingly seriously within the Clinton administration.

Clinton's technical advisers were prominent biologists and technical experts. With the exception of Barbara Hatch Rosenberg, a molecular biologist at the State University of New York at Purchase, who was leading the efforts of nongovernmental organizations to support international negotiations to enhance compliance with the Biological Weapons Convention, these advisers either had, or would have, important roles in biotech companies that stood to reap vast benefits from civilian biodefense. This is not to claim that biodefense advice was determined by actual or future biodefense contracts, but that it was heavily weighted toward a single view—a search for technical solutions to all types of biological agents through biotechnology.

At a White House meeting on April 10, 1998, these advisers told Clinton that the nation was dangerously underprepared for a biological attack and needed to develop and stockpile vaccines, antibiotics, and other therapies, and to train first responders to
pathogens like Ebola virus and genetically modified germs. [2]

The sense of alarm was reinforced by a series of scary thrillers that painted scenes of an American population pushed to the edge of extinction by lethal hybrid microbes. Clinton himself acknowledged the influence of one such novel, *The Cobra Event*, published in 1997.

Other members of the administration also hyped the threat. In November 1998, Defense Secretary William Cohen appeared on an ABC-TV news show bearing a 5-pound bag of sugar, warning viewers that a similar quantity of anthrax, dispensed over Washington, D.C., would wipe out half the population.

In this atmosphere of impending biological doom, Clinton and his advisers crafted a radically new biodefense policy. A presidential directive issued in 1995 committed the administration to giving bioterrorism, as well as terrorism using nuclear and chemical weapons, "the highest priority." Until then, responsibilities for biodefense rested with the Pentagon, which focused exclusively on protecting troops on battlefields. Protecting some 300 million civilians was quite a different proposition, partly because of the sheer number, but also because the military is barred from domestic law enforcement.

In January 1999, Clinton announced a new biodefense policy, one designed to protect all Americans, to an audience at the National Academy of Sciences. The program would encompass the following elements:

- training first responders to cope with a bioweapons attack;
- nationwide surveillance of disease;
- establishing a national stockpile of vaccines and therapeutic agents for emergency use; and
- launching a program to develop new vaccines and therapeutic agents for civilian use.

To achieve the last goal, the Clinton administration intended to tap the expertise of molecular and cellular biologists, the intellectual force powering the biotechnology industry. Most of these biologists worked toward a basic understanding of cellular and molecular processes, and on civil, not military, applications of their knowledge. Redirecting their skills into biodefense meant reorienting their work toward microbes like anthrax, smallpox, and plague. The prestigious National Institutes of Health, the world's leading biomedical research establishment, was enlisted in the effort. As Health and Human Services Secretary Donna Shalala said in January 1999, this was "the first time in American history in which the public health system has been integrated directly into the national security system."

**Bush and biodefense**

If Clinton launched the civilian biodefense program, the Bush administration has not only expanded it, but has also integrated it into the administration's general goal of global military and technological dominance.

Even before the end of the Clinton administration, policy changes were already in the air. A series of reports from Washington think tanks and blue-ribbon commissions issued in 1999 and 2000 argued that the United States was still ill-prepared to cope with bioterrorism and not investing nearly enough in research and development. In June 2001, a simulated smallpox attack on the United States, "Dark Winter," predicted a trail of death and disease across the nation. Although later analyses questioned the assumptions on which Dark Winter was based, particularly the transmission speed for the disease, media coverage was overwhelmingly apocalyptic. [3]

In addition to calls for expanding biodefense, some think tanks also called for technological innovation that would put the country ahead of biodefense elsewhere by developing a capability to defend not only against known pathogens but also against futuristic ones—genetically altered microbes that could overcome existing vaccines or antibiotics or attack the immune system in novel ways, and so forth. As one Washington security think tank, the Center for Strategic and International Studies noted in its report, *Defending America in the 21st Century*, in December 2000:

"Many experts believe that the federal government should foster an acceleration of research in immunology and genetics with the objective of putting improvements in immune responses ahead of the ability to create new and more deadly biological agents."

In other words, American technological prowess should allow it to prevail against any biological weapons-armed foe by staying
Project for a New American Century (PNAC). In September 2000, PNAC published *Rebuilding America's Defenses*, a blueprint for a world dominated by American military force. Many of those supporting the PNAC proposals would populate the higher echelons of the Bush administration following the November 2000 election.

When Al Qaeda attacked the World Trade Center and Pentagon on September 11, 2001, and anthrax was disseminated through the postal system some two weeks later, the groundwork for the government's response, in terms of both a major expansion and a reorientation of biodefense, had been very effectively prepared.

As the news of the first casualty from pulmonary anthrax broke on October 4, 2001, the Bush administration launched a dramatic expansion of counter-bioterrorism programs, requesting emergency funding of $1.5 billion. A frightened Congress increased the amount to $2.5 billion. Funding for counter-bioterrorism began to soar and has been soaring ever since (see page 62). If Congress approves the White House request of $7.45 billion for fiscal 2005, the increase in funding over fiscal 2001 will be nearly 1,500 percent.

The civilian biodefense seeds sown by Clinton have germinated into a massive, multifaceted effort. Two departments receive most of the biodefense billions: Health and Human Services (HHS) takes 52 percent and the Department of Homeland Security, 38 percent (Defense, Agriculture, the Environmental Protection Agency, the National Science Foundation, and the Energy Department receive the remainder). [4]

Most biodefense research within HHS is performed by the National Institute of Allergy and Infectious Diseases (NIAID), whose biodefense budget has skyrocketed from roughly $17 million in fiscal 1998 to a requested $1.5 billion for fiscal 2005. NIAID's mission, explained in February 2002, is "to carry out the research needed to understand the pathogenesis of [agents of bioterrorism] . . . and the host response to them, and to translate this knowledge into useful interventions and diagnostic tools for an effective response." To pursue research on highly dangerous organisms, last year NIAID launched two Biosafety Level 4 national centers and nine Biosafety Level 3 regional centers, in addition to several Level 4 and many Level 3 facilities under construction elsewhere. [5]

Homeland Security, on the other hand, focuses on assessing threats and turning research results into technologies to defend against them. Key elements of its programs include:

- **Expansion of the Strategic National Stockpile** of vaccines and therapies initiated during the Clinton administration, including enough smallpox vaccine to immunize every American.

- **Project BioShield**, a $5.6 billion program for producing new vaccines and therapies against a whole range of suspected agents. BioShield was announced with much fanfare in the 2002 State of the Union address.

- **BioWatch**, a huge surveillance program that uses a network of sensors in large cities and other "high-threat" areas, aimed at converting the data collected into effective responses to bioattacks.

- **The National Biodefense Analysis and Countermeasures Center (NBACC)**. Although it received only brief mention in the unclassified version of the president's biodefense directive, the NBACC has been described as "the centerpiece of efforts to anticipate and prevent bioterrorism." [6] NBACC comprises four separate centers. Two of them, the Biological Threat Characterization Center and the Bioforensic Analysis Center, are at Fort Detrick in Maryland. The Agricultural Biodefense Center is at the Plum Island Animal Disease Center off the coast of New York, and the Biodefense Knowledge Center is at the Lawrence Livermore National Laboratory. The purpose of the first is to understand "classical as well as new and emerging [biological] threats." [7] The other three focus, respectively, on forensic dimensions of threat agents, defense against foreign animal diseases such as foot-and-mouth disease, and analysis of information from intelligence and other sources. [8]

**Billions for dubious biodefenses?**

This biodefense umbrella is not cheap, and there is already talk of an entirely new industry springing up, fed by ever-flowing funds for Project BioShield and other big-money items. The total amount committed to civilian biodefense, from fiscal 2001 to the budget request for 2005, is $23 billion--most committed after 9/11. It's important to ask what the nation is buying with these billions of biodefense dollars--it may not be exactly what Americans expect.

Of course, much of the funding for counter-bioterrorism supports purposes that are widely accepted and for which there is broad public support: training of first responders, provision of medical facilities, communication and coordination, epidemiological
that is just the beginning. Other components of the plan are much less well understood. Some pose major problems:

- **Mass vaccination.** Although the administration intended to vaccinate half a million first responders against smallpox, as of January 3, 2004, only 39,353 individuals had been vaccinated. Concerns about transmitting live vaccinia virus to family members or to patients with compromised immune systems—and about the legal liability of those administering the vaccine—have acted as powerful deterrents to vaccination, especially in the absence of an immediate threat. As biodefense analysts Elin Gursky and Michael Greenberger ask in a recent article, "Suppose They Gave a Civilian Smallpox Vaccination Program—and (Almost) Nobody Came?" [9]

- **BioShield.** Following Bush’s announcement in 2002, BioShield was bogged down in Congress for more than a year. Enticing pharmaceutical and biotech companies to develop new drugs to treat possible agents proved considerably more difficult than anticipated. “Big Pharma” wasn't interested; profits from drugs to be used only in a biowarfare emergency would be minuscule compared to the potential payoff from drugs used to treat common diseases. Many small biotech companies were interested in BioShield funding, but that raised a different dilemma: Given that it is unethical to conduct human trials with biowarfare agents, how could the government decide which companies’ efforts were most promising?

Furthermore, biotech companies pressed for indemnity with respect to injuries resulting from counter-biowarfare drugs. They also wanted reduced Food and Drug Administration (FDA) testing requirements. On July 14, Congress approved BioShield legislation that allowed the government to expedite or bypass FDA controls in emergencies but without indemnity. Already, some legislators are proposing a second BioShield bill that offers drug makers liability protection. [10]

- **BioWatch.** The presidential directive confidently describes BioWatch as “a network of environmental sensors to detect biological weapons attacks against major cities in the United States.” But no comprehensive system of environmental monitoring exists—or is likely to exist. As JASON, an elite group of scientists that advises the government, reported flatly in 2003, “it is not realistic to undertake a nationwide blanket deployment of biosensors.” While detectors in 31 U.S. cities now sample outdoor air, some modes of delivery would evade these detectors and some organisms would not be detected. The detectors also produce false alarms (in Houston, air monitors picked up naturally occurring tularemia bacteria in October 2003). Environmental sensors will play a role in biological defense, but they will not be the first line of biological defense. That role, the JASONs conclude, will be played by American citizens, “the most important component of a biodetection architecture.” In the event of an attack, stricken Americans, not machines, are likely to be the first “biodetectors.” [11]

Neither safe nor sorry?

Finally, an important dimension of the Bush administration’s approach could make the country not more but radically less secure. Biodefense is being directed not only against pathogens like anthrax and plague that are known to have been developed as bioweapons in the past, but also against novel pathogens genetically engineered to express traits that would render existing defenses useless.

In the past, some biologists have argued that it would be impossible to create more horrendous organisms than those already provided by nature—implying that crazed attempts to create novel pathogens would fail. But not any more. If there were remaining doubts, they were settled in the late 1990s when an attempt by Australian scientists to produce an infectious contraceptive for mice, which periodically breed out of control in parts of Australia, ran amok. In introducing a gene to boost production of antibodies against mouse egg cells, the scientists accidentally created a killer virus capable of destroying an entire population of mice. They claimed the result was a complete surprise. [12]

The Bush administration apparently wanted to explore the properties of such novel pathogens—in the name of "biodefense"—from the outset. The first indication of the change in direction in U.S. policy was the revelation in September 2001 by three New York Times journalists that work on a genetically modified, vaccine-resistant form of anthrax had been secretly initiated by the Pentagon in early 2001. The project was later transferred to the Defense Intelligence Agency, which turned it over to Battelle, a private military contractor based in Columbus, Ohio. A senior White House official told journalists that the defense secretary had the authority to approve the project and that the administration intended to pursue more work of this kind "to help build germ defenses and protect American lives." [13]

The legitimacy of such a project—especially in the absence of any known threat—was soon questioned (by, among others, Mark Wheelis and Malcolm Dando, in "Back to Bioweapons?" in the January/February 2003 Bulletin). With public caution softened by the 9/11 attacks and the anthrax-laden letters, government claims that terrorists might employ genetically altered pathogens in an attack have been used to justify similar projects—despite a lack of evidence that any terrorist organization has the resources (laboratories, scientists, engineers, equipment, and evaluation facilities) to develop and test such organisms safely and without being detected.
transmissibility is portrayed as normal. Last year, a National Academy of Sciences report, *Biotechnology Research in an Age of Terrorism*, described such work as “areas of concern”—but only because, if known, it might give terrorists similar ideas. In February, NBACC Deputy Director Lt. Col. George Korch revealed that NBACC intends to pursue a range of topics including “aerosol dynamics,” “novel packaging,” “novel delivery of threat,” “genetic engineering,” “bioregulators/ immunomodulators,” “genomics and proteomics,” and “red teaming.”

The National Institute of Allergy and Infectious Diseases, one of the world’s leading AIDS research establishments, is also conducting research on genetically modified organisms in the name of biodefense. NIAID’s strategic plan, published in February 2002, states that “chimeric organisms engineered by relatively simple genetic manipulations may pose a significant threat. Goals include development of procedures to detect or cure illness associated with them.”

A disturbing indication of where NIAID is taking biodefense was revealed in November 2003 by Mark Buller, a scientist at St. Louis University whose biodefense research is supported by NIAID. Buller reported not only repeating the Australian mousepox research, but also applying the same procedures to cowpox, which infects humans. Indeed, an attenuated strain of the virus is the basis for the existing smallpox vaccine, which was used worldwide to achieve the global eradication of smallpox. What Buller may well have created is a novel cowpox virus that attacks humans. The rationale for Buller’s work? “To better understand how easy or difficult it would be to apply the same kind of genetic engineering to the human smallpox virus and make it more lethal.” Buller anticipated that scientists at the U.S. Army Institute of Infectious Diseases in Fort Detrick would test the novel cowpox virus to find out. [14]

Genetic engineering of pathogens like Buller’s engineered cowpox poses three major problems: First, there is no sound scientific rationale for it. There are so many possibilities for genetically modifying organisms that designing a specific defense against any single genetic variation makes no sense (see Eileen Choffnes’s “Bioweapons: New Labs, More Terror?” in the September/October 2002 *Bulletin*). When the question arose during a seminar at Princeton University in April this year, Adel Mahmoud, president of Merck Vaccines and a prominent expert on infectious disease, said that producing protection against a genetically modified organism would be “a nightmare.” Drugs take many years to develop. And then there’s an absolute ethical barrier: The testing in humans of drugs against pathogens that are not public health problems is out of the question.

Second, without accurate intelligence, it would be impossible to know what kind of organism a determined adversary would try to make. There is no evidence that Al Qaeda has the resources to develop and test a genetically engineered bioweapon, or for that matter, any existing biological weapon. [15] As Princeton University’s Frank von Hippel asks, in allowing the fevered imaginations of defense planners to dictate research, “must we have a [biological weapons] arms race with ourselves?” [16]

Finally, such projects fundamentally destabilize the 1972 Biological Weapons Convention, the main legal barrier against possession of biological weapons. Treaty adherents are forbidden to “develop, produce, stockpile or otherwise acquire or retain . . . biological agents or toxins . . . of types or in quantities that have no justification for prophylactic, protective, or other peaceful purposes” [emphasis in original]. If as is made possible by genetically modified organisms, then there is no reasonable justification for developing such an organism. Arguably, proceeding to do so crosses the line between defense and offense. How would the United States have responded had the projects planned by the NBACC or NIAID been uncovered in Iraq? The Bush administration would surely have claimed such facilities as the triumphal end of its quest for “weapons of mass destruction”!

Even if it can be argued that developing novel agents is somehow within the bounds of the Biological Weapons Convention, these projects undermine the treaty by stimulating similar work elsewhere—creating a situation that could generate a spiral of suspicion and retaliation that could wreck the treaty entirely. The irony of this dangerous dimension of the Bush biodefense effort is that the search for absolute control could produce a race for novel biological weapons that is wildly out of control.

**The emerging debate**

Projects that cross the line from defensive to offensive—or, at the least, push hard on the boundary—are increasingly controversial. Many of the proposed high-containment facilities around the nation, where such projects will be conducted, have met with resistance from surrounding communities (see, for example, Marylia Kelley and Jay Coghlan’s “Mixing Bugs and Bombs,” in the September/October 2003 *Bulletin*). Objections to specific facilities have been raised in Davis and Oakland, California; Boston, Massachusetts; Hamilton, Montana; and Los Alamos, New Mexico. A coalition of eight nonprofit organizations has called on Congress to reappraise the need for the nation’s biodefense building boom.

The Council for Responsible Genetics, a public-interest organization, is circulating a statement calling for the prohibition of genetically modified pathogens for any military purpose, defensive or offensive, and many scientists, public health professionals, and others have already signed on. Individual scientists like Richard Ebright at Rutgers University and Peter Gilligan at the University of North Carolina Medical School are publicly questioning the rationale for enhancing the pathogenicity of microbes for biodefense purposes.
Ebright has been characterized by the New York Times as a "lone voice." But increasingly, he is not alone. Earlier this year, the former chief American negotiator of the Biological Weapons Convention, James Leonard, together with Richard Spertzel, the senior biologist for the U.N. Special Commission in the 1990s, and bioweapons expert Milton Leitenberg warned that the most troubling components of the Bush biodefense effort could certainly be interpreted as "development" of biological weapons--activities prohibited by the Biological Weapons Convention. [17]

Preemption or cooperation?

Many life scientists seem unaware that their work is being framed by the hyper-realist paradigm that Bush endorsed at West Point in 2002--a vision of the United States as so powerful, so technologically dominant, that military competition is pointless. In pursuing every conceivable form of defense--even against organisms that exist only in the imagination--scientists are buying into that vision. But just as hyper-realism has not worked in Iraq--and has, instead, increased insecurity by providing a new breeding ground for terrorism--so a parallel argument applies to forms of biodefense that strain the limits of the Biological Weapons Convention. In seeking the ultimate form of biological dominance--a biological defense against which all bioweapons fail--the United States runs a grave risk of providing a breeding ground for a new form of biological warfare.

There is an alternative. It is reasonable to protect all Americans by strengthening public health measures, training first responders, developing effective drugs and vaccines to protect against existing pathogens--and also by providing access to health care to all Americans. As it stands now, America's 45 million uninsured, many of whom are reluctant to seek medical help if they fall ill, represent a biological vector waiting to happen.

The United States also needs to commit to preventing an attack from occurring. Effective intelligence gathering and effective institutions for assessing and sharing intelligence are clearly parts of the answer. In addition, the United States should commit to two major international goals:

• Developing the strongest possible international barriers to biological weapons around the world. Just as President Richard Nixon renounced the U.S. biological weapons program in 1969, today we need a president who will renounce all efforts to use the knowledge of the life sciences to create novel weapons, for any military purpose. Proposing a ban would generate challenges of many kinds--political, conceptual, and others. But so far no country has tried. We are at a stage that parallels the negative thinking within the U.S. government before Nixon reviewed the arguments for and against a ban on biological weapons. Now, as then, the instinct for survival is a huge incentive for attempting to extend that ban.

• Committing the country's outstanding resources in the life sciences and public health to address the biothreats that today kill millions worldwide (malaria, AIDS, tuberculosis, diarrhea); and the conditions in which they proliferate (poverty, malnutrition, lack of education, lack of access to clean water).

How many friends would America make around the world if it directed a few of the billions now spent on war to giving every human being the hope of a secure life? A biodefense policy based on global cooperation and a search for collective security, rather than a drive for domination and a research and development effort leading to greater insecurity, is urgently needed.


13. Miller, Engelberg, and Broad, Germs, pp. 308-10.

14. Shane, "Building a Stronger Mousepox."


17. Leitenberg, Leonard, and Spertzel, "Biodefense Crossing the Line."

© Susan Wright 2004. Susan Wright, a historian of science at the University of Michigan, is the coauthor and editor of Biological Warfare and Disarmament: New Problems/New Perspectives (2002). A seminar series in 2003-2004 sponsored by the Princeton University Program on Science and Global Security, "The Biodefense Challenge," supported by the Carnegie Corporation, generated important discussions on which this article draws.


Sidebar: Corporate ties of President Clinton's April 1998 biodefense advisers

Joshua Lederberg, president emeritus of Rockefeller University, is a member of EluSys Therapeutics' scientific advisory board. Since 2000, the company has received biodefense contracts worth more than $8.1 million.
Frank Young, former Food and Drug Administration commissioner and former director of Health and Human Service's Office of Emergency Preparedness, is chairman and chief executive officer of Cosmos Bio Life Sciences Alliance, an investment organization that encourages corporate investments in biotechnology companies. Young is also a member of EluSys Therapeutics' scientific advisory board.

Lucille Shapiro is a professor of cancer medicine at Stanford University's School of Medicine. She is a cofounder and member of the board of directors of Anacor Pharmaceuticals, recipient in 2002 of a Defense Advanced Research Projects Agency (DARPA) and army contract worth $21.6 million for developing a method for synthesizing antibiotics for biodefense.

Thomas Monath, former head of the Centers for Disease Control's laboratory for vector-borne diseases and former chief of virology, U.S. Army Medical Research Institute of Infectious Diseases. He is a former vice president of OraVax and now the chief scientific officer of Acambis, successor company to OraVax. The company has received $780 million in contracts for development and production of a new smallpox vaccine for the entire U.S. population.


Craig Venter, former president of the Institute for Genomic Research and former president of Celera Genomics, is now a member of the Institute's board of trustees. The Institute for Genomic Research received a $500,000 contract from DARPA for development of detection technology and a $21.1 million contract from the National Institute of Allergy and Infectious Diseases for a genomics database for biothreat agents.