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A battle cry for biomedicine

The Biological Weapons Convention (BWC) was written in 1972 in an attempt to curtail global development, production and deployment of biological weapons. The ambitious goals were to eradicate pathogens and toxins with no prophylactic or protective justification and to abolish delivery systems, munitions and equipment used to deliver biological weapons. Although these aims were probably never wholly attainable, 143 nations have since ratified the convention to diminish the threat and as an overt statement of principle. This summer, the United States government blocked the passage of a verification and inspection protocol for the BWC (*Nature* **412**, 463; 2001). In light of recent anthrax exposures in the US (see *News* page 1167) such a stance has proven reckless. Instead of trying to prevent outbreaks through policy, the government has chosen to spend money on post-outbreak vaccination and medication.

Spearheading much of the anti-bioterrorism research in the past is the Defense Advanced Research Projects Agency (DARPA), the Pentagon's central research organization. DARPA spent $166.8 million on biological defense research in the last fiscal year, but their work is primarily aimed at protecting military personnel. Among agencies outside the Defense Department, the National Institutes of Health spent $49.7 million on research for biodefense last fiscal year; the Centers for Disease Control and Prevention (CDC) was allocated $46.6 million and the Department of Energy, which runs national laboratories, received $39.6 million. All of these figures are likely to increase in response to the tragic events of 11 September, with projections for the next year's CDC budget reaching $181 million. Covert military research initiatives are also likely to intensify.

On 14 October, President Bush asked Congress to increase anti-bioterrorism funding for the Department of Health and Human Services to an unprecedented $1.8 billion. While $643 million will be spent directly on medications for the National Pharmaceutical Stockpile and $343 million on vaccine stocks (see *News* page 1167), the rest will be spent on surveillance programs, hospital and emergency preparedness, and security for crops, reservoirs and government labs. It is as yet unclear how much of this money will be spent to further primary biomedical research.

Although the threat of diseases and agents like plague, salmonella, nerve gas and botulism are genuine, the main thrust of public research so far has only been to expand existing smallpox and anthrax vaccines. Researchers have begun to investigate whether they can simply dilute the nation's meager stockpile of smallpox vaccine (15.4 million doses) to provide cover in the advent of a widespread bioterrorism attack. The BioPort Corporation of Michigan is contracted to make the anthrax vaccine for the Department of Defense, but has not been able to produce new doses of the vaccine for several years because the company has failed Food and Drug Administration safety inspections. The company has recently filed the papers necessary for another inspection, while the government is looking elsewhere for a source of vaccines.

With both therapeutic and diagnostic research goals in mind, DARPA is collaborating with several scientists and companies. Private companies are developing broad-spectrum bactericidal drugs and vaccines that protect against multiple pathogens. DNA-binding technology is being used to develop antivirals and antibiotics. Early warning sensors to detect biological agents in the environment are being developed by multiple labs. Some of these sensors are based on technology using functional tissue while others rely on genetic analysis.

Although diagnostic development and research into novel therapies is important, there is a real need for fundamental basic scientific research into the biology of these pathogenic organisms. A new generation of cheaper, safer and more effective vaccines is required; the current anthrax vaccine is not considered safe for those with respiratory conditions and the existing smallpox vaccine, derived from infected calves, is both cumbersome to produce and potentially harmful to certain people. Prevention and treatment will involve the tools of biotechnology, genomics and immunology. The genomes of microbes like *Yersinia pestis* can now be sequenced in a matter of weeks, giving new insights into their biology. By pinpointing the genetic variation that makes mice resistant to anthrax and by developing peptides that protect rats against normally lethal doses of anthrax toxin, researchers at Harvard Medical School are sending us down the right path. As resources for scientific anti-bioterrorism research will doubtlessly increase, hopefully a sense of duty and altruism will draw diverse scientists to this field. If the government can't find a way to prevent bioterrorism through political means, of which inspections might play a small part, the answer will lie in prevention and protection through science.