

Biodefence on the research agenda

The world needs new and creative ways to counter bioterrorism.

Anthony S. Fauci

The vulnerability of the United States and the rest of the world to attacks of bioterrorism remains starkly exposed by the as-yet unsolved anthrax attacks¹ immediately following the horror of the 11 September 2001 terrorist assault on the World Trade Center. We have invested many resources to control or eradicate pathogenic microbes that, as these events show, cannot now be ignored. It is the responsibility of the biomedical community to undertake research on defence against biological agents with energy, creativity and commitment. The world expects nothing less from us.

The US government is investing an unprecedented amount of money — \$5.9 billion planned for fiscal year 2003 — to counter the threat of bioterrorism. Of that sum, the National Institutes of Health (NIH), the lead government agency in biomedical research, will receive nearly \$1.75 billion, almost eight times the fiscal year 2002 budget for biodefence research, and the largest single increase in resources for any initiative in the history of the NIH. With this largesse come enormous responsibilities.

Preventative steps

The overriding objective of the NIH is to support biodefence in order to provide people with countermeasures in the form of diagnostics, therapies and vaccines. We at the NIH enthusiastically accept this important new responsibility² and have devised a strategic plan and research agenda through the National Institute of Allergy and Infectious Diseases (NIAID), with major input from the scientific community who will ultimately implement this agenda.

In discussions with the Department of Health and Human Services, the Office of Homeland Security and the US Congress while devising this programme, we underscored the premise that our efforts to defend against bioterrorist attacks would be anchored in the traditional processes of basic biomedical research. We were also acutely aware of the need to rapidly translate basic research results into definable, quantifiable endpoints such as diagnostics, therapeutics and vaccines. A major goal of the NIH has always been the translation of basic research findings into practical interventions, but until now, the path to product development has not been central to our research strategy. Current global threats have compelled us to somewhat modify the way in which we do business.

First, we have increased our commitment to translational research and product develop-

These are lofty goals that may take many years to accomplish.

ment, based on the strongest possible foundation of fundamental knowledge about pathogens and mechanisms of microbial pathogenesis, as well as host responses. We are committed to strengthening basic research endeavours, but it is no longer adequate to pursue an avenue of research, to learn something interesting and potentially important, and then to move on, leaving the translation of that knowledge predominantly in the hands of others. The NIH did not suddenly decide to research potential agents of bioterrorism or appreciate the need to develop practical countermeasures on 11 September 2001, or on the occasion of the anthrax attacks. The NIAID funded research on smallpox, anthrax, Ebola virus, botulinum toxin and other potential bioterror pathogens well before these events. An immediate practical spin-off of this research was the demonstration of the potency of decades-old stores of smallpox vaccine, which when diluted five-fold still generate the skin lesion 'take' regarded as a hallmark of protection³. Such findings provide a readily available countermeasure against a potential bioterror threat at the same time as development of second-generation products proceeds.

Second, we are considering the design and development of biodefence products in new and creative ways. While continuing to develop therapeutics and vaccines targeting specific pathogens, we will devise new strategies for producing broader-spectrum therapeutics and vaccines. The goal of developing 'universal' antibiotics, antivirals and antitoxins, effective against all or most classes of biological pathogens, is not unattainable. Likewise, we will develop safe and effective vaccines against ranges of microbial agents. We will pursue innovative approaches for modulating innate immunity to induce and enhance protection against many biological pathogens, as well as simple and rapid molecularly based diagnostics to detect, characterize and quantify infectious threats. These are lofty goals that may take many years to accomplish — but we must aspire to them.

Third, we must enormously strengthen our interactions with the private sector, including biotechnology companies and large pharmaceutical corporations. Many biodefence-related products that we are

pursuing do not provide sufficient incentives for industry — the potential profit margin for companies is tenuous, and there is no guarantee that products would be used. Therefore, we will seek non-traditional collaborations with industry, for example guaranteeing that products will be purchased if companies sign up (even if the fate of those products is a stockpile), so that we can quickly make available effective vaccines and treatments against agents such as anthrax, botulinum toxin, Ebola and plague.

This concept was mentioned by President Bush in his announcement of the Bioshield project in his State of the Union address on 28 January (see web links).

New strategies

We need a new paradigm to meet the requirements of this sobering international situation within an uncharacteristically brief time-frame for biomedical research. In pursuing basic research, we must never lose sight of the goal of the development of safe and effective countermeasures to protect the public against the threat of bioterrorism. The heightened and urgent need for increased collaborations among the academic sector, government and private industry will surely provide benefits far beyond protection from deliberate acts of bioterrorism. After all, the general philosophy and strategy of bioterrorism defence is essentially the same as that for defence against naturally emerging and re-emerging infectious diseases threatening global public health. The carefully planned use of the new resources will unquestionably have enormous benefits in our struggle against these natural pathogens, as well as other threats to public health that far transcend the spectre of bioterrorism. ■

Anthony S. Fauci is director of the National Institute of Allergy and Infectious Diseases, National Institutes of Health, Department of Health and Human Services, Bethesda, Maryland 20892, USA.

1. Jernigan D. B. *et al. Emerg. Infect. Dis.* **8**, 1019–1028 (2002).

2. Lane, H. C., La Montagne, J. & Fauci, A. S. *Nature Med.* **7**, 1271–1273 (2001).

3. Frey, S. E. *et al. New Engl. J. Med.* **346**, 1265–1274 (2002).

NIAID strategy on biodefence

► www.niaid.nih.gov/biodefense/research/strat_plan.htm

Status of anthrax investigation

► www.cnn.com/2003/HEALTH/01/30/anthrax.lessons

Bioshield initiative

► www.whitehouse.gov/news/releases/2003/01/20030128-19.html

► www.washingtonpost.com/wp-dyn/articles/A63430-2003Jan29.html