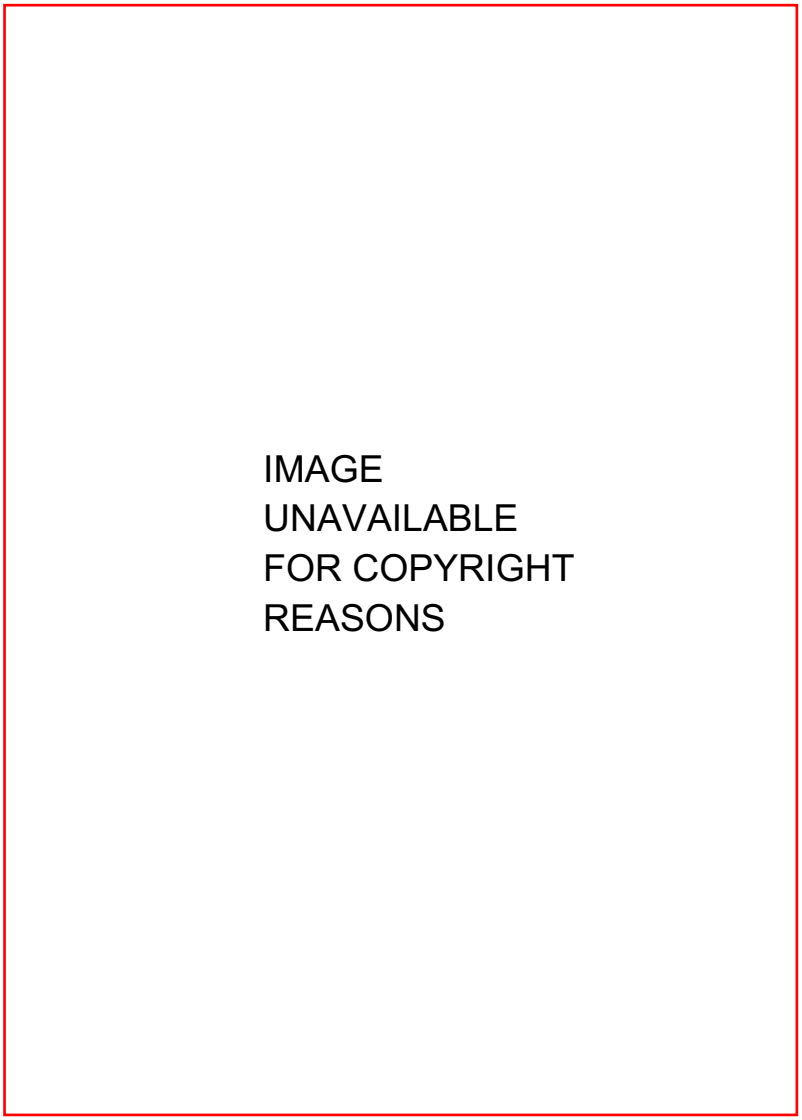
A defensive strategy

Fearing that it will be the target of future bioterrorist attacks, the United States has been ploughing huge amounts of money into biodefence. The result is a reinvigorated market for microbiologists. **Corie Lok** reports.

Virologist Jens Kuhn was studying exotic pathogens long before the terrorist attacks on 11 September 2001 and the subsequent anthrax attacks made them fashionable. In the wake of those atrocities, a host of potential biological weapons, from plague and anthrax to Ebola virus, were declared by the US government to be major threats to public safety. Microbiology was back in vogue. "Before September 11, people said to me: 'Why are you wasting your career in microbiology?' Now it's the opposite," says Kuhn, a postdoc with the New England Primate Research Center in Southborough, Massachusetts. "There's been a change in attitude towards the field."

The US government has since poured hundreds of millions of dollars into academic and industrial research to develop bioterrorism countermeasures, such as drugs and vaccines. The main agency behind many of these projects is the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health (NIH). The NIH has invested a growing amount of money — more than $1.5 billion in 2003 and a requested $1.7 billion for 2006 — in new academic research centres, biocontainment labs, research grants and contracts to biotechnology companies. More recently, the agency has begun handing out funds as part of the Project Bioshield Act of 2004, which provides $5.6 billion over ten years to buy vaccines and drugs, and to finance research. All these investments represent new job opportunities for microbiologists, infectious-disease specialists, immunologists, molecular and cell biologists, and those experienced in the scale-up and manufacture of biologics such as antibodies and vaccines.

But Kuhn is wary of this apparent boom in biodefence. "It's a field of hype," he says. Government funding may be plentiful now, he explains, but how long will it stay? Biotech companies are asking the same question — government contracts may have fuelled hiring at some firms but further job creation will depend on whether the sector can sustain itself.



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Academic bonanza

Many young academic scientists, including Kuhn, have already benefited from the US government's focus on biodefence thanks to training grants. This year, Kuhn received a two-year career-development fellowship from the NIAID for his work on Ebola and Marburg viruses. These kinds of awards "give researchers working on select agents a little bit of a boost and try to embed them in the biodefence community", says Kuhn. In 2004, the NIAID awarded more than $8 million in training and career-development grants for biodefence research.

The agency is also funding 15 new biocontainment labs across the United States, many of which will open in 2008. "In about two years, we're going to need a lot of people to work in these labs," says Susan Garges at the NIAID's Office of Biodefense Research Affairs. These labs will be seeking a range of skills from bacteriologists, virologists and immunologists to veterinarians.

The NIAID is also spending $430 million on ten new regional centres for researching treatments and diagnostics for bioterror agents and emerging infectious diseases. Each centre is dedicating up to 8–10% of its grants to training and career development, says Garges. "One of the goals of these centres is to bring new researchers into the field," she says. These will include microbiologists and molecular biologists whose knowledge and skills can be applied to the bioterror pathogens.

Many small and medium-sized biotech companies, always on the lookout for new funding sources, quickly

capitalized on the biodefence grants and contracts. Vaccine company VaxGen in Brisbane, California, for example, received a $877.5-million contract to develop and produce 75 million doses of anthrax vaccine. In the past year, it has hired 140 new employees, mostly in the areas of manufacturing, research and development, and quality control.

PharmAthene in Annapolis, Maryland, has also benefited from government funding, expanding its research programmes and hiring scientists. The company is about to begin its first human clinical trials of a monoclonal antibody designed to protect against and fend off inhalation anthrax infection. It has hired three PhD-level scientists since 2002 for the regulatory side of the business. They work with the Food and Drug Administration (FDA) to interpret and provide the safety and efficacy data needed to proceed with product development. Solomon Langermann, PharmAthene's chief scientific officer, says that the biodefence research community needs scientists knowledgeable in animal models and how they relate to human responses to drugs.

Rapid response

Most other biotech companies involved in biodefence are focused on making products for commercial markets and have added one or two bioterror-related programmes as further applications of their technology. Most of the people hired by these firms don't work just on biodefence, but on other research programmes as well. The opportunities tend to centre on development rather than discovery, as many of the government biodefence contracts aim to get drugs and vaccines already at the preclinical stages developed, tested and manufactured as quickly as possible.

Acambis, for instance, a vaccine company in Cambridge, UK, received a $475-million contract in late 2001 to test and produce nearly 183 million doses of a smallpox vaccine for the US government. It used this money to double the size of the company to about 260 employees. Production of the drugs was completed in 2003, and the company is now developing a weaker smallpox vaccine for people who cannot safely take the regular version.

Although the focus of many of these companies is on later-stage development of biodefence products, it is not only engineers who are in demand — scientists too are very much required. What young scientists often don't realize is that "later development stages are fantastic opportunities", says Una Ryan, chief executive of AVANT Immunotherapeutics in Needham, Massachusetts. AVANT has highly skilled and trained people doing scientifically interesting jobs in late-stage development and manufacturing, she adds. The company has been developing vaccines for anthrax and plague thanks to $10 million in government funding since 2002.

Indeed, in biotech, scientists working in scale-up and manufacturing are in demand and opportunities are growing for them, says Patrick Scannon, chief scientific and medical officer of XOMA in Berkeley, California. "Biodefence is helping to catalyse that." XOMA got a $15-million contract in March from the NIAID to produce botulinum toxin monoclonal antibodies.

The US government has also given out grants to smaller, younger start-ups to do earlier-stage research. Elusys Therapeutics of Pine Brook, New Jersey, has received $20 million since 2000 to develop an anthrax antibody treatment. The company has 36 employees, about a third of whom were hired as a result of the government biodefence funding. "Government grants have been enormously helpful to us," says Elizabeth Posillico, the company's president and chief executive. "They're great for small companies." Most of her new recruits were scientists and a few did not have much industry experience. They started as junior scientists and have now taken on more management responsibility.

The construction of additional biosafety labs is increasing demand for qualified microbiologists.

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"Biodefence is helping to catalyse the demand for scientists in biotech scale-up and manufacturing."

MaxThera of Beverly, Massachusetts, got its start last spring to develop new antibiotics for both bioterror agents and community- and hospital-based infections. With four employees, it received a $1.45-million grant this year from the NIAID. It is now looking to hire a PhD microbiologist. "Without the grant, we wouldn't have been able to hire anyone," says Ania Knap, MaxThera's president and chief scientific officer.

Although the funding situation for biodefence looks good now, it remains unclear whether it will spur the growth of a self-sustaining industry. Many companies hesitate to move into the field because there is essentially only one customer: the US government. Some have complained that without a clearer indication from the government of how much it is willing to spend on biodefence products, they can't make long-term commitments to research and development. And companies are seeking greater protection from legal liability should their products end up making people ill. If these kinds of issues are not resolved, they may hamper long-term commitments within the sector, ultimately stifling growth. Nevertheless, Ryan maintains that the demand for more young scientists will remain strong. "The new funding and new challenges are good for creativity," she says. ■

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