published, the overall strategy and timeline seem to be set. As decided by the Programme Committee at its meeting on October 11, the commission plans to publish a 'call for expression of interest' on November 15, and will invite scientists to submit their suggestions for topics in the field of functional genomics that should be supported by the EU. Early in 2001, an evaluation panel will select approximately five of the most important topics from this set for further consideration. Then, in June 2001, a special call for full proposals for research within those five topic areas is scheduled. In this case there will be full disclosure of applicant names, in order to avoid the awkwardness of anonymity—one aspect of the current programme that has bemused many scientists. Ultimately, two or three research projects will be selected for funding in the range of 10–15 million Euro each. Successful projects will have to integrate excellence in research, training of younger scientists and networking of laboratories. The latter will be of importance in that it is a preparatory step to bringing together the most important European researchers in this field. However, and in contrast to the existing 5th Framework Programme, the greatest emphasis will be on the scientific quality of the proposed research. Because this procedure is regarded as being experimental, the initial funding period for each project will be for three years, but this may eventually be extended to five years. The overall funding of 30–35 million Euro for this special initiative will come from the 130 million Euro genome initiative—money that was already part of the budget for the Quality of Life Programme.

The main targets of criticism within the 5th Framework Programme have been its exclusive focus on research that is relevant to socio-economic goals, and its complicated regulations for applicants. Thus, the details of the new funding regulations for genomics research are signs of a remarkable change in science policy, as decisions about the projects to be funded will be based on research proposals rather than on political goals. Furthermore, by its very nature, the current 5th Framework Programme has favoured dispersion of funds—which has a certain political appeal. It is a brave move to transfer the emphasis to excellence and to treat the European research arena as a single entity in which the geographic locations of the collaborators on a grant application become of secondary importance. Giving larger awards to a smaller number of projects should ultimately have the consequence of creating and supporting the 'centres of excellence' that EU Commissioner Philippe Busquin described in his vision for a 'European Research identity' [EMBO reports, **1**, 96–99 (2000)]. The integrated projects will recognise the need to have a critical mass of excellent research in order to achieve advances in the area of functional genomics. However, the remaining nearly 100 million Euro will presumably be dispersed through the standard procedure, thus continuing support for a number of smaller laboratories and increasing infrastructure.

The details of the new funding regulations for research in functional genomics are signs of a remarkable change in science policy

Interestingly, the commission also seems willing to move away from the requirement of a detailed, long-term work plan by which the progress of the project can be monitored. But the commission will closely monitor the progress of the projects with the assistance of a scientific advisory board. This new approach recognises that it would be an unusual research project that could accurately predict what is going to happen in the 36th month of its existence. Indeed, the effectiveness of the programme would be compromised if the applicants had detailed work plans with predictable outcomes. In fast-moving areas of open-ended research, results are often not predictable.

The EU commission has shown a commendable willingness to respond to a gap in the 5th Framework Programme. Hopefully, researchers throughout Europe who would benefit from extra funding in the area of genomics will become actively involved, to ensure that those who promoted change towards high-quality science get the necessary support for further improvements in the philosophy and practice of EU funding. If Commissioner Busquin is indeed willing to continue to listen to the scientists—and these recent developments seem to indicate that this is the case—the 6th Framework Programme will probably reflect the needs of European scientists better than the current one does.

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Preparing for the worst

The USA and Japan's preparations for a terrorist attack with chemical or biological weapons

Biological weapons are not just topics for contemporary novelists but found their way into classical literature long ago. Shakespeare has Hamlet's father's ghost describe, 'Upon my secure hour thy uncle stole, with juice of cursed hebona in a vial, and in the porches of my ears did pour the leprous distillment.' (Act 1, Scene 5) Indeed, neither the act nor the accusation is new. Jews in Europe were accused of poisoning wells to cause plague in the Middle Ages. Japanese planes in World War II dropped plague-infested fleas over Chinese cities and villages.

Murder or terrorism with biological or chemical agents is not a far-fetched scenario—it has been used before. Criminal cases in the USA include various uses of biological agents in the last decades. The Rajneesh Foundation used *Salmonella* bacteria in 1984 to poison ten restaurant salad bars in the city of The Dalles, OR, hoping it would influence an election in its favour. A separatist group calling itself 'Republic of Texas' used *Botulinum*, HIV and rabies in 1998 and 1999 to threaten judges. Three members were later charged with conspiracy to use weapons of mass destruction and the eldest, Johnnie Wise, was sentenced to 24 years in prison. In 1977, Diane Thompson, a nurse from Texas, was sentenced to 20 years for intentionally contaminating doughnuts with *Shigella dysenteriae* in order to achieve personal revenge.

In 1998 and 1999, a separatist group from Texas used *Botulinum*, HIV and rabies to threaten judges

The particular risk of biological agents, when used as weapons, is their extreme uncontrollableness. An infectious agent can easily spread from the original victim to relatives or colleagues. Particularly at risk are the medical personnel who treat victims without knowing what kind of infection they are dealing with. More unpredictable are the number of people and the patterns in which they are affected. The worst-case scenario is a terrorist attack against a major city. One assessment from the World Health Organisation in 1970, asserted that a dissemination of 50 kg of *Yersinia pestis* over a city of five million might result in 150 000 cases of pneumonic plague and 36 000 deaths.

As a preventive measure, and to protect medical personnel, federal institutions have started to educate doctors and nurses about the imminent dangers of an outbreak of an unknown disease. At a recent meeting of the American Association of Clinical Chemists in July, doctors and security experts discussed precautionary measures that hospitals and laboratories could take. Representatives from the Federal Bureau of Investigation and the Centers for Disease Control and Prevention (CDC) talked to hundreds of laboratory technicians about the consequences of attacks with biological and chemical agents. As an introduction to his talk about preventive measures, Dennis Reutter from the US Army Biological and Chemical Command showed a slide of a soldier in protective chemical garb, including gas mask. When the USA entered World War I, these preventative measures were already available to the soldiers because gas had been used previously and scientists had had time to devise countermeasures.

Preparations against a biological attack are again being undertaken. In 1998, President Clinton, probably influenced by James Preston's novel *Cobra Event*, which described a bioterrorism attack on New York City, requested US$ 94 million funding to build a civilian stockpile of medicine that could be used to respond to a large chemical or biological attack. The funding is also being used to improve the public health surveillance system in order to rapidly detect disease outbreaks. Furthermore, the National Institutes of Health are spending an additional US$ 10 million to expand research programs on bioterrorism agents, as well as candidate vaccines and therapies against these agents. In 1999, the CDC received its first bioterrorism funds of US$ 121 million, almost half of which was earmarked to stockpile pharmaceuticals. Also, the US Food and Drug Administration formally approved ciprofloxacin as an antibiotic to treat inhaled anthrax.

Particularly at risk from bioweapons are medical personnel who treat victims without knowing what kind of infection they are dealing with

In 1996, the FBI—the leading US agency to deal with crisis management—formed the Hazardous Material Response Unit, including biologists and chemists. The bureau has developed field procedures for screening suspected weapons of mass destruction and has designed laboratory protocols for the identification of biological threats. 'There is good chemical screening in the field,' said biologist Scott Decker of the FBI, 'but for biological first response we don't have the screening technology now.' There are many tests, but few have been validated. 'The interpretation is difficult,' explained Richard Spiegel, Doctor of Veterinary Medicine and Master of Public Health at the CDC. However, the FBI will soon have a mobile laboratory ready to analyse biological agents that can be deployed anywhere in the world.

Japan was the first country in the world to experience a terrorist attack using chemical weapons. On March 20, 1995, Aum Shinrikyo, a religious doomsday cult, released the nerve gas sarin in the Tokyo subway. The diluted form of the gas affected five subway cars during morning rush hour, killing 13 people and injuring a further 6000. More than 600 patients were admitted to St Luke's International Hospital near the affected subway station. The hospital reported that, after three years, many patients still complained of neurological symptoms. The attack on the Tokyo subway still has repercussions for the media, the victims and the perpetrators whose children have been barred from local schools. The mastermind behind this attack, Chizuo Matsumoto, is still on trial. As for Aum as an organisation, it still exists and is even growing in spite of the fact that its leaders and many of its members have been arrested and sentenced. 'Aum Shinrikyo is regaining power and is now two thirds of its former size,' Japanese Chief Cabinet Secretary Hiromu Nonaka told reporters in a press conference in 1999.

Hiromichi Oiwa, professor at the Department of Hygiene and Space Medicine at Nihon University Medical School in Tokyo, pointed out that many episodes of nuclear, biological or chemical terrorism have happened in Japan. 'Aum tried an attack with a biological agent, anthrax,' he said. 'Fortunately they failed in their attack in the mid-city of Tokyo. They failed in the manufacture of small vapour molecules. Aum made only large molecules that fell to the ground. Small molecules are necessary to be inhaled by the human body.'

This February, Oiwa and Alfred Bove, Professor of medicine and Associate Dean of Temple University's School of Medicine, organised the workshop 'International Cooperation in Medical Disaster Relief: Impact of Telecommunications and Information Technology'. Among the topics discussed were medical preparedness for the threat of bioterrorism, chemical hazards and information systems for the detection and management of disaster.

Medical professionals from Japan, the United States and Taiwan talked about natural and man-made disasters to an audience of about 300 scientists, doctors, firemen, government agencies and research institutes, including Japan's National Institute of Infectious Diseases in Tokyo and its branch, the National Defense Medical Center in nearby Saitama prefecture. Further proceedings will be published and the participants agreed to organise another meeting. 'But we've just started to research bioterrorism,' says Oiwa, who recalls that in the 1930s Japan had 'an excellent institute of the Imperial Army to make biological weapons, which is now destroyed.'

As a consequence of the Great Earthquake in Kobe, the field exercise of mass casualty care in Japan was reformed

In Japan, the first days of September are dedicated to annual drills in disaster relief. This year, the exercise coincided with the real evacuation of an island near Tokyo due to a volcano outbreak. The Great Hanshin Earthquake in Kobe of 1995 was a bitter turning point, showing Japan its lack of preparation. As a consequence, the field exercise of mass casualty care—the annual September drill—was reformed under the Ministries of Health and Welfare and Home Affairs. Also, the National Hospital Tokyo Disaster Medical Center was established to care for disaster victims and to train medical personnel. In addition, the Regional Network of Civil Emergency Medicine was founded in collaboration with the All Japan Hospital Association, the Association of Medical Doctors in Asia and the Japanese Medical Association. As in the USA, exercises assume that civilian hospitals will be important bases of medical operations in the case of emergency.

In spite of all these internal efforts, Japan is not prepared to cooperate internationally with other nations in disaster prevention. 'As I understand, we have no international disaster plans,' conceded Hiroyuki Doi, Deputy Director of the Health and Welfare Ministry, which is responsible for medical services, including emergency and disaster medicine. Doi, who had been in Indonesia for two years as a Japan International Cooperation Agency (JICA) expert on community health, does not think that the existing plans are sufficient. 'The content of their [JICA] activities is just to dispatch medical teams all over the world. That's all. Concerning NBC [nuclear, biological and chemical] terrorism, we are beginners,' said Doi. 'We would like to foster and develop international cooperation with European scientists.'

The day after the seasonal September drill on disaster prevention, the daily Japanese newspaper Yomiuri Shinbun carried the headline: 'Government panel to overhaul disaster response plan.' The Central Disaster Prevention Council, which consists of those Ministries responsible for disaster prevention and treatment, is developing a national plan for government action during a crisis. 'Plans are going through a total revision,' confirmed Doi. In the USA, a headline from the United Press International news service read 'Pentagon urged to create extensive program—US wholly unprepared for bioterror, panel says.' The search for the penultimate disaster relief plan is not finished yet.

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