# Pretty poisonous

## The darker end of the spectrum

by Malcolm Dando
(Department of Peace Studies, University of Bradford, UK)

As events unfolded in the autumn of 2001, after the destruction of the World Trade Center on 11 September, media and public attention focused on the use of anthrax by terrorists in the USA. Anthrax bacteria, however, are but one example of the biological agents that have been weaponized in the 20th Century. Alongside anthrax, the 'classical' agents that were weaponized by the USA in the middle years of the century included tularemia, brucellosis, Q-fever, and botulinum and Staphylococcal enterotoxin B toxins.

The best way of viewing the threat from biological weapons is to consider them as part of a spectrum that ranges from classical chemical weapons like sarin, through mid-spectrum agents such as toxins and bioregulators, to classical biological agents such as anthrax.

From this viewpoint, the 'pretty poisonous' entities that are the subject of this issue of *The Biochemist* have a much darker side — they might be subject to malign misuse by those with malevolent intent. Indeed, we know that there have been offensive biological weapons programmes in the recent past in the former Soviet Union, Iraq and South Africa. Toxins and bioregulators were certainly considered and developed as weapons by some of those involved in these programmes. What's more, official statements from major states strongly suggest the existence of current offensive programmes in a number of other countries. When effectively used, biological and mid-spectrum agents could produce casualties on the same scale as nuclear weapons and it is obvious that the most likely way of terrorists obtaining fully weaponized material is through leakage from a state programme. Closing down such programmes and preventing their further proliferation is a major and urgent task for the international community in the coming decades.

**"...the genomics revolution around the world... could be misused."**

Historically, there have been three generations of offensive biological weapons programmes.

In the first, and soon after scientists such as Pasteur and Koch had demonstrated that specific micro-organisms cause specific diseases in humans, animals and plants, both sides in the First World War were attempting to use biological weapons against the valuable draft animal stocks of the other. Between the wars and during the Second World War there were increasingly scientifically rigorous, second-generation, offensive programmes, and the British discovered that the most effective way of attacking people was to spread an agent on the wind so that it was inhaled into the lungs. Among the late-20th Century, third generation, programmes, the former Soviet Union used genetic engineering to modify classical agents.

It is reasonable therefore to suppose that if we do not prevent it, the knowledge gained as the genomics revolution spreads around the world could also be misused. Weapons designers might be interested in, for example, chimeric toxins targeted at novel cell groups, or analogues of key bioregulators being carried into intended victims by viral vectors. It may be difficult, but it is certainly possible to prevent such a distortion of the genomics revolution. One essential factor for success is that scientists become much more aware of, and concerned about, the misuse of their work. Upholding the norm of non-use of biological and toxin weapons, as embodied in the 1925 Geneva Protocol, the 1975 Biological and Toxin Weapons Convention and the 1995 Chemical Weapons Convention, must come to be seen as a particular responsibility of the scientific community.

Malcolm Dando is Professor of International Security in the Department of Peace Studies at the University of Bradford. Professor Dando is a Fellow of the Institute of Biology and co-director of the Department's project on strengthening the Biological and Toxin Weapons Convention. This project, which began in the mid-1990s, is presently funded by the Carnegie Corporation of New York.

e-mail: MRDando@Bradford.ac.uk



 