EDITORIAL

Bioterrorism: how serious is the threat?
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In the aftermath of the attack on the World Trade Center and the Pentagon on 11 September 2001, four or five letters containing spores of Bacillus anthracis were sent to media companies and politicians in various parts of the USA. As a result, 11 persons contracted pulmonary anthrax, and another seven the cutaneous form of the infection. Five of those with pulmonary anthrax died. All of the letters were sent from Trenton, New Jersey, and it seems likely that the same person is responsible for all of them. So far, information about the B. anthracis strain has been sparse, but it seems likely that it is of American origin. Furthermore, there are (when this was written in mid-December 2001) no indications that the terrorists who executed the airplane attack are also behind the anthrax incidents. In fact, it is not unlikely that the anthrax attack is not bioterrorism but rather a criminal act by a single person.

Irrespective of whether the anthrax attack was bioterrorism, several lessons have been learned. First, it seems clear that it is relatively easy to produce contagious material, which can be spread by various techniques. However, it is important to realize that a preparation of anthrax spores that can be spread by aerosol is not easy to manufacture. The spores must be prepared as particles which float in the air. This requires sophisticated techniques. It is therefore not unlikely that the anthrax preparation used in the US attack originated in a laboratory with considerable technical resources. If someone wants access to less sophisticated preparations of anthrax, it is easy to find the organisms, since the infection is endemic in both cattle and humans in most parts of the world.

The second lesson is that, even with limited effects in terms of number of persons infected, an attack like the anthrax one has very considerable effects on society. Thus, in all countries in the world, a copycat phenomenon, with large numbers of letters and packages claiming to contain contagious material, had profound consequences. The laboratories dealing with these samples were faced with hitherto unknown problems, e.g. the decision of how to handle powders of different kinds. The most profound effects were on the persons and organizations handling or receiving the packages or letters. Several postal services, government departments and other organizations were closed for long periods while awaiting test results. Another serious problem was the use of prophylactic antibiotics. Based on experience of an anthrax emergency in Sverdlovsk some years ago, in which the incubation period for one patient was 48 days, the US recommendation was to use prophylactic antibiotics for 60 days, a very long time indeed.

The third lesson was that in no country was there full preparedness for what happened. It took time to mobilize laboratories and other organizations. Supplies of antibiotics were not always sufficient to guarantee prophylaxis and/or treatment for a large number of exposed individuals. This problem was further aggravated by the lack of information about the US anthrax strain. For example, at the annual meeting of the Infectious Diseases Society of America, it was reported that the strain was a potent penicillinase producer, while at the same time the Centers for Disease Control (CDC) recommended amoxicillin for prophylaxis.

Although there were obvious negative consequences with the anthrax attack, a benefit is that our eyes were opened. We are now far better prepared to face a new, and perhaps more serious, bioterrorism attack. If that were to happen, agents other than B. anthracis would have to be taken into consideration. Examples of organisms which are being considered are Clostridium botulinum (dissemination of toxin via water or food), Francisella tularensis (aerosol dissemination), Yersinia pestis (aerosol dissemination), and smallpox virus. Large-scale distribution of any of these organisms

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would require access to rather sophisticated laboratory facilities. It is unlikely that an independent terrorist organization would have access to such facilities. Such bioterrorism would therefore have to be state supported, something which today seems less likely to happen. However, with smallpox, catastrophic consequences would result from a single case anywhere in the world. Moreover, if smallpox virus were available outside the two designated laboratories at the CDC and in Sverdlovsk, it would be relatively easy to infect a few persons.

What will happen if smallpox is used for bioterrorism? Most probably, it will be possible to contain an epidemic by vaccination of close contacts. However, there is likely to be panic in the general population, and in developing countries vaccination campaigns based on tracking of contacts to cases will be next to impossible. Perhaps the most important factor will be to prevent mass immunization of the populations. With more than one-third of the population being unvaccinated and the rest having received their vaccinations 26 years ago or more, the risk of violent reactions to smallpox vaccine is obvious. It is therefore of major importance that research is initiated with the aim of finding and evaluating new smallpox vaccines with less severe side effects. An example of a possible vaccine candidate is the Ankara strain (MVA) of vaccinia virus. This strain has been used for HIV vaccine trials. It has major deletions in the genome, and it is not known whether it conveys protection against challenge with a normal vaccinia strain; even less is known (for obvious reasons) about protection against smallpox.

The final, and most important, lesson in this context is that we need a high degree of cooperation between scientists and between national and supranational agencies, especially the WHO, if we want to improve our preparedness. Even if it is unlikely that we will face an outbreak caused by smallpox or any other agents, we should be aware of the fact that we were unprepared for the anthrax attack. An absolute prerequisite for defending against a new, and perhaps more severe, attack is an improved preparedness.