Bioterrorism: the need to be prepared

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ABSTRACT – Postal distribution of anthrax spores in October 2001 in the USA resulted in cases of pulmonary anthrax. In consequence, interest and concern about terrorist attacks on civilian populations using biological weapons have increased, particularly when one recent authoritative assessment suggested that an attack using some form of unconventional weapon on a Western city was 'inevitable'. This article reviews the steps necessary to minimise the probability of a successful attack. Despite best endeavours, the possibility remains that significant numbers of casualties will arise, emphasising the need to plan for reception, triage, decontamination and treatment of patients. The medical Royal Colleges could assist the education of the wider medical community about aspects of pathology hitherto considered to be primarily military but which have now become important for civilian physicians.

KEY WORDS: bioterrorism, countermeasures, decontamination, detection, disposal, intelligence, planning, prophylaxis, psychopathology, unconventional

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Planning for the attack

There is a pessimistic view that a successful attack by terrorists on a Western city using an unconventional weapon (including the biological) is inevitable.[1] The reason is not necessarily that intelligence (the acquisition of information indicating intent which others wish to remain secret) is necessarily defective but that security (the prevention of such an attack) could never be absolute. Are efforts to maximise intelligence and security therefore futile? On the contrary, while absolute vigilance and security are not possible, some is better than none in both instances. A conscious decision to deploy limited resources strategically could reduce the probability of attack on high value assets and increase the likelihood of attack on low value assets. Whether this is a national or an international strategy is a matter of direction in the former and co-operation in the latter. In both circumstances, it might be possible to increase the attractiveness of a low value asset so that its perception of being a worthwhile target is artificially increased. Such a decoy would encourage attack. Deployment of appropriate resources at that location may permit apprehension of the operatives while minimising the risk to the population. It is these kind of thoughts which must underpin our preventive efforts.

In any health endeavour, the objectives are, first, to define the spectrum of pathology and, secondly, to establish the relative importance of the various diseases that contribute to the morbidity and mortality in a population. Diseases with the greatest impact are – or should be – the subjects for research with the aim that their causes will be identified and effective interventions developed. Wherever possible, these will be preventive but remedies for the established case will be required. The same principle governs thoughts on terrorist attack.

Factors facilitating attack

Terrorists are likely to strike hard when motivation is boosted to the point of action by the application of means and method coupled with opportunity.

Countermeasures

Intelligence

Intelligence is the cornerstone of prevention. The digital age has increased the potential for interception and localisation of remote sources using electronic surveillance methods. This is facilitated by a global satellite network. Provided that there is warning of an attack on a particular target, security in that location can be deliberately enhanced.

Local intelligence systems may provide much useful information. Targets are often reconnoitred before attack. Repeated visits by individuals or vehicles may be identified as unwelcome attention and appropriate action taken.

Planning

Vulnerability

To produce large numbers of casualties in a short space of time, agents transmitted in the air with inoculation of the lungs would be more likely to be used. Administration in a closed space would be most effective, but an aerial attack could be successful provided

Key Points

- Methods to minimise the risk and consequences of a bioterrorist attack must be devised
- Protection is dependent on identifying vulnerability and providing appropriate countermeasures
- Established cases will require security, prioritisation, and infection control measures in addition to medical and nursing facilities
- Provision must be made to deal with immediate and remote psychological consequences of a bioterrorist attack

that a persistent virulent organism with high infectivity and transmissibility was employed. For the purpose of this article, it is supposed that intelligence services warn of an imminent aerial attack employing a biological weapon on a particular large British city. What could be done to provide protection for the civilian population?

Detection

Issuing a warning depends upon detection. The nature of biosensory systems available to the military is already in the public domain[2] and these systems need to be made available for civil protection.

Warning

Audible alarms such as sirens and announcements on radio and television will be necessary. Contingency plans for such warnings need to be in place. Further information is vital once a warning has been issued. In this way, a measure of control over population response will be possible. Without it, panic could paralyse the available emergency services.

Prophylaxis

Protection can be physical, chemical or immunological. Advising people to remain indoors in response to alarms will confer considerable protection. Mobility will be possible only if respirators can be provided. These will prevent transmission of all biological agents. Distributing chemoprophylactic antibiotics will be a major logistic challenge and, even then, provide protection only against the classic agents such as anthrax and plague for as long as the available stocks last. This assumes that no genes conferring resistance to known antibiotics have been transfected into the genome of the agent. If there is no resistance, antibiotics may permit an opportunity for postexposure immunoprophylaxis[3] provided that there are sufficient stocks of a reliable vaccine. For anthrax, a six-month course of injections is required[4] and is not practicable. No reliable vaccine is currently licensed to combat plague, botulinum toxin and most viruses causing haemorrhagic fever such as Ebola and Marburg.

Any mass immunisation programme requires careful consideration to assess potential risks and benefits. For example, the risks of vaccination to prevent smallpox are not inconsiderable,[5] and such vaccination is unavailable to pregnant females and anyone known to be immunocompromised.

Casualty management

One of the features of unconventional weapons is the panic they can cause if release is identified. Any medical facility could be swamped by people who, although well, fear exposure to a biological agent. For this reason, it is essential to provide security for major hospitals designated as the main reception centres for casualties. Only casualties with definite evidence of effects should be allowed through the security cordon. Much public concern could be reduced if there is a good information service. Media relations officers with support staff to handle calls to special telephone numbers will be vital.

Treatment

Decontamination

Cases permitted into the hospital will need prior decontamination. Ideally, temporary decontamination tents should be erected outside the hospital. Here clothing which may be contaminated with agent can be removed and bagged before incineration, and patients can shower preferably with either weak hypochlorite solutions or water. It may be necessary to have fire brigades present to provide water under pressure and also an emergency treatment area staffed by clinicians in full protective clothing outside the hospital. The essential feature is that, apart from the patients themselves, everything possible must be done to minimise the risk of contamination of the hospital. Cleaning staff will be needed within the hospital to maintain vigilance and clean any areas which may become contaminated.

Medical services

Designated hospitals need sizeable infectious diseases departments with sufficient isolation facilities and adequate numbers of well-trained staff. A large intensive care department with the full range of invasive and non-invasive respiratory support equipment is essential. Exhaust gases will need to be filtered. Huge supplies of disposables may be required, including masks, gloves, gowns and alternatives to conventional hospital linen, quite apart from medical items, with safe disposal of everything contaminated with infected biological fluid. Laboratory support will be essential. The on-site diagnostic facilities will be supported by the Public Health Laboratory Service and by national centres with special capabilities such as the Centre for Applied Microbiological Research and Porton Down laboratories. Police forces will make arrangements for transporting biological samples.

Hospitals designated as primary reception centres should adopt a triage system of evaluation (Fig 1) whereby patients requiring less intensive management could be sent to hospitals providing a supporting role. Ambulance transport for these patients will have to be provided.

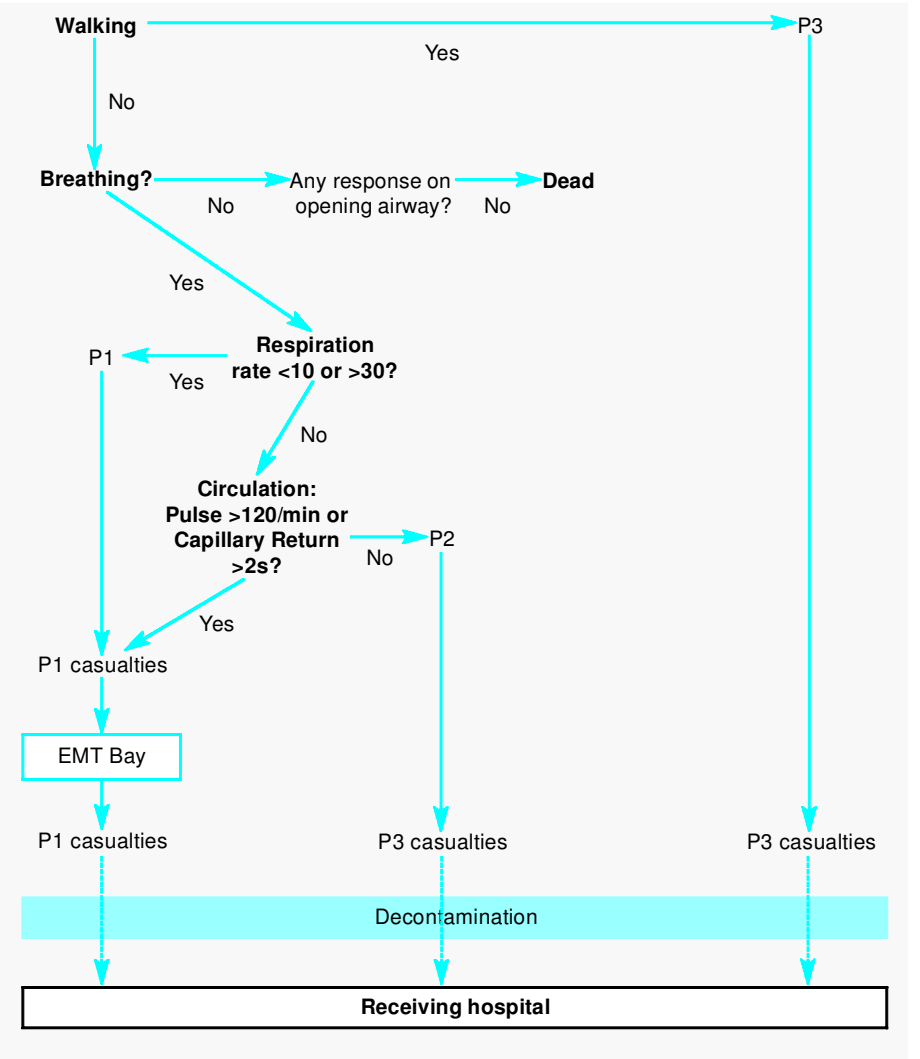

Fig 1. A simple triage scheme for the mass casualty situation (EMT = emergency medial treatment; P1 = casualties requiring urgent attention; P2 = casualties requiring attention soon; P3 = casualties whose attention can be delayed).

During any emergency patients will continue to fall ill with other diseases. It will be essential to identify such cases as soon as possible so that there can be swift transfer to hospitals other than those designated to deal with the extant emergency.

Disposal of corpses

Most hospitals have only a limited mortuary capacity. Body bags will be necessary. Storage of infected corpses before cremation may be supplemented by refrigerated containers. A source of supply must be identified as part of any planning for emergencies where many victims can be anticipated in order to facilitate early implementation of this ancillary storage capacity.

Identification of those who succumb and provision of appropriate means to record deaths will be necessary. Methods to advise surviving relatives of their loss will not be an immediate priority provided that the public are informed of the management policy for those who die. Staff who can undertake this work should be identified. Ultimately, disposal of large numbers of potentially infected corpses will be dependent on cremation. A crematorium may have to be identified where this can be undertaken as a priority.

Coordination

The need for coordinated planning has been made previously[6] but the response has been sluggish. It is a huge effort requiring adequate planning to identify and secure locations, resources and communications. Increasingly, emergency planning officers are being recruited by civil authorities to ensure such plans are well established. Any plan must be exercised in some form on a regular, if infrequent, basis. No assumptions can be made about the availability of staffing additional to the local emergency and hospital services. Wherever possible, prior arrangements for support from surrounding areas should be made and activated as necessary. A national coordinating centre would facilitate such cooperation and a new emergency powers bill may incorporate that capability.[7]

Psychological consequences

Studies have shown that the stress of exposure of soldiers to attack, including the possibility of unconventional weapons, has psychological consequences which may be proximal or remote.[8] The more immediate hysterical reactions may require physical

restraint and counselling. The remote effects can be more complex and enduring. In addition to post-traumatic stress disorder, controlled studies show that there is a higher prevalence of symptomatic complaint unassociated with abnormal physical signs.[9–11] The prevalence is higher in those who may be psychologically more vulnerable[11] but it is apparently unassociated with adverse socio-economic outcome.[9]

The increased prevalence of complaint results in more strain on health services and demands on diagnostic facilities in order to exclude physical causes. This appears to be a generic condition, best termed 'post-conflict syndrome' of which the most recent example was termed 'Gulf War syndrome'. Its genesis is not fully understood but belief that exposure to noxious agents has occurred appears to be a factor.[12] If this is true, it is important to provide regular news of the progress of investigations designed to determine the nature of any attack and to advise about the provision of appropriate treatment. However, if no significant numbers of casualties have occurred, reassurance may well result in a reduced level of requests for medical consultation, thus relieving pressure on healthcare services which might otherwise become overwhelmed.

Conclusions

Concern about unconventional weapons can no longer be confined to military medical practitioners. Awareness of biological agents with the potential for use as weapons against the civilian population needs to be improved in the wider medical community. This would probably best be devised on a regional basis; for this reason, the medical Royal Colleges could facilitate implementation with the greater prospect of success. Incorporation of a session on such weapons during a more general one-day educational programme may be the convenient means to spread awareness. Information about the measures taken to deal with mass casualties on a scale larger than that which this term usually implies could also be given at such meetings so that the provisions appropriate for all unconventional weapon attacks, not just the biological, are discussed.

Recent events in foreign countries indicate that such attacks are no longer hypothetical; they are a real threat. It is essential that planning to deal with such a situation is promoted and made known to all who might be expected to contribute to its implementation.

Finally, the contingencies devised should be a matter of public knowledge, at least in outline, so that plans are known to exist. This should provide some measure of reassurance. None of us needs to be caught unawares if adequate provision for meticulous planning is made available. The cost of neglect could be far greater.

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