



Speed of analysis is clearly of the essence as the first responsibility of organisations is to the welfare of their first responders as well as to the community; this necessitates the increasing use of miniaturised cutting-edge technology in the field.

The impact on the forensic science practitioners does not necessarily end with the front-end prioritisation and subsequent testing of the substances of

interest. Once identified as being pathogenic or non-pathogenic, a full forensic analysis has to follow if there has been a threat (verbal or documented, perhaps in the form of personal mail) associated with the matter.

A forensic examination of mail requires, where possible, the identification of the contents, the identification of the document's specific origin through minute analysis of, for instance, franking

marks, and identification of the suspect. The process is sequential and typically follows the same routine: identification of the white powder, document and handwriting examination, fingerprint location and identification and DNA collection and analysis. If the threat is verbal or electronic, forensic computer or audio experts may be utilised as part of the investigation.

Australia 2001 and the white powders: the Queensland experience

Starting in Canberra and spreading rapidly around the country from 12 October 2001 onwards, the laboratories of the Public Health Laboratory Network (PHLN) were placed on high alert as the nation responded to a heightened fear of anthrax mail attacks¹. This manifested itself in an incredible array of samples being submitted to laboratories for analysis and detection of possible anthrax contamination. Laboratory staff were placed under high stress in the performance of this work.

On very short notice, the PHLN laboratories had to implement a new high-volume testing regime and resource this work to meet the high political expectations that such testing demanded. This placed severe stresses on laboratory staff, who not only had to work with potentially hazardous samples in a high-containment environment, but also had to field large numbers of calls from emergency service providers (police, fire, ambulance, emergency services) as well as political leaders whilst they were conducting this work. In addition, the samples received for analysis were very

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different to those that most laboratories were accustomed to. The nature of some of these samples significantly increased the risk to staff in attempting to obtain cultures from such bulky objects in a confined working space.

At this time, Queensland Health Scientific Services was the only PHLN laboratory that had a PCR test for anthrax in place (the Commonwealth funded a workshop a short time later for this technology to be passed onto all the key players in other States). The sheer volume of testing and the demands placed on a limited number of highly dedicated staff in each State who worked excessively long hours rapidly led to staff burnout. Six weeks after the initial incidents, the PHLN laboratories were close to collapse nationally when authorities finally managed to remove daily reporting of each new incident from the front pages of the newspapers,

thereby eliminating the media feeding frenzies that had driven the sampling up until that time.

Features

There are a number of unique features to these incidents that bear further discussion.

Rapport with emergency services

The laboratory at the Institute of Clinical Pathology and Medical Research (ICPMR) quickly established a strong rapport with the emergency services and their forensic services and implemented a regime of screening of samples for chemical and radiological elements prior to biological assessment. This meant that they mainly received sub-samples of powder and swabs for analysis. Most other States were not so fortunate and were at the mercy of the various emergency services.

Item transportation

The perceived fear associated with possible anthrax contamination meant that emergency responders were reluctant to sample on-site and transported whole items instead. Items received included desks, computers, mail



(especially mail containing suspicious or bulky items such as pens, mail from Iraq, the USA or Pakistan, or mail leaking visible powder), large and small HAZMAT containers, books, office equipment, boxes of food (salami), clothing and emergency responders' protective garments and breathing apparatus.

Crime scene procedures

Every sample collected was part of a crime scene (especially letters containing definite threats) and therefore full chain-of-custody procedures had to be implemented quickly to track samples for possible future legal prosecutions, both upon receipt and subsequent return to

authorities. Unless a laboratory has been involved in forensic work or food/water analysis conducted from a legal framework, such procedures are foreign to the normal flow of work and therefore add an extra layer to the process of sample receipt and registration.

Sample containment

Samples had to be analysed in a physical containment level 3 (PC3) environment because of the potential risk of anthrax spore contamination. Some States did not have a dedicated PC3 facility that could be set aside for this work, and this necessitated working in laboratories that were routinely performing HIV and TB testing.

Whilst *Bacillus anthracis*² is an organism that can be quite safely handled in a biological safety cabinet, the production of weaponised powdered spore material elevates the hazards associated with this organism significantly, placing other staff in the same facility at increased risk from being in this common environment. Had Australian laboratories been in receipt of material similar to that found in the USA, there would have undoubtedly been significant problems in these facilities from a staff safety and decontamination point of view, as well as a significant disruption to routine clinical services.

Threat environment

Although the media were focused on the potential anthrax threat, laboratory staff had to be equally aware of the wide range of powders they were receiving for analysis, and the possibility that some of these might be extremely noxious chemicals that could react with water used to prepare stained slides. The threat environment that PHLN staff were working within also meant that noxious chemicals might be sent to laboratory staff deliberately.

Bacillus anthracis on blood agar.



Lab security

The potentially hazardous nature of this work also necessitated a major re-think about laboratory security, and a number of PHLN laboratories have upgraded their security significantly as a result, including restricted access to the general microbiology laboratory using key-card access or similar, and video monitoring tripped by motion sensors in PC3 laboratories.

Conclusion

To date, there has not been any targeted funding to resource these laboratories, either in terms of dedicated staff to meet the ongoing need for analysis, or for equipment and consumables. It is doubtful whether the PHLN could sustain another major event of this nature without advance planning and adequate resourcing.

References

1. Anthrax Bioterrorism: Lessons Learned and Future Directions. *Emerging Infectious Diseases* 2002; 8(10):1013-1014
2. Anthrax: An Update for Australia. *Australian Journal of Medical Science* 2002; 23(3):92-102.