The role of the forensic science laboratory

Dr Tony Raymond
Director, Forensic Services Group
New South Wales Police Service
Level 7 Ferguson Centre
130 George Street
Parramatta, NSW 2150
Tel: (02) 9689 7692
Fax: (02) 9689 7719
E-mail: raym1mic@police.nsw.gov.au

Every incident attended by police in Australia is always initially considered to be a potential crime scene until evidence dictates otherwise. Consequently, forensic science organisational responsibilities typically include:

- The provision of a coordinated multi-disciplined scientific field and laboratory response in support of both criminal and non-criminal investigations.
- The effective management of a disaster victim identification (DVI) response to a multi-casualty incident on behalf of the Coroner.

In other words, the forensic science mission includes both the crisis (including threat assessment) and consequence of any incident or potential incident.

The introduction of hazardous materials or more specifically bioterrorism-related products simply adds another dimension to the assessment of a perceived threat, the treatment of the crime scene, the subsequent potential evidence and/or casualty triage and, where applicable, the analysis. It goes without saying that the scene and subsequent laboratory analyses must be carried out to standards that would enable a successful prosecution if an incident is shown to be a crime. This has forced a unification of approach and purpose by all response agencies.

The dissemination of *Bacillus anthracis* spores in the USA in October 2001 following the 11 September 2001 assault on the twin towers and then the 12 October 2002 Bali bombing has increased Australia's perception of the likelihood of a terrorist attack on Australian soil leading to a significant loss of life. Even the *threat* of bioterrorism in the nature of anthrax, smallpox or the plague has introduced unprecedented challenges.

To date, no deliberately disseminated *B. anthracis* has been detected in Australia but the incidents in America sparked 1124 incidents across New South Wales alone in just seven weeks, the vast majority of which were 'white powder' incidents.

The consequence of this perceived threat has meant that all first response agencies across Australia – including the respective police forces, the Departments of Health, the Commonwealth Government, the Australian Defence Force, the relevant fire brigades and the Federal and State Emergency Management Committees – have had to build an understanding of the requirements of their partner agencies. This is necessitating integration of all related documentation and disaster plans. These plans and sub plans are having to take account of the forensic issues relating to evidence, that is, contamination, continuity, security and even sample size and collection options.

It also means that forensic science personnel have had to be trained in the use of self contained breathing apparatus and chemical, biological and radionuclear (CBR) protective clothing and the use of this protective clothing has necessitated a significant change in the way the crime scene is processed.

Crime scene practitioners involved in the first stage of analysis in the hot zone are moving towards a photographic recording regime utilising digital cameras with waterproof housing. This allows the images to be easily transferred via satellite to a reach back capability like the Australian Bomb Data Centre for information and/or advice and also allows for the photographic equipment to be decontaminated easily and safely.

The nature of the pathogen of interest may require a totally different approach to the scene analysis. For instance, it may require the scene itself to become a temporary analytical laboratory site whereby the concentration of the pathogen, for instance *B. anthracis*, (not merely its existence), becomes the primary forensic focus. This was the case with the October 2001 dissemination of spores of *B. anthracis* in America where the ease of distribution of the pathogen (for instance via air movement), meant that the scientists needed to establish relative concentrations, not just pathogen identity, to distinguish delivery methodology.

Incidents that involve victim identification, where the victims' clothing, documents, teeth, DNA, prints, scars or tattoos may form part of the identification, are even more complex. Precautions have to be taken to ensure that pathogen contamination is not exacerbated by careless transportation of the deceased and evidence from the crime scene to the mortuary or laboratory.

There is also a major shift in philosophy in relation to attendance at high-end crime scenes as, increasingly, well qualified scientists (for instance microbiologists or chemists) are being used to assist traditional police crime scene examiners in the early detection or identification of biological or chemical substances of interest. This shift to include specialists at crime scenes is a trend that is being replicated worldwide.

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

John Bates
Chief Scientist
Public Health Microbiology
Queensland Health Scientific Services
E-mail: John_Bates@health.qld.gov.au

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 attacks [1]. 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 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