Commentary

The problem of secondary contamination following chemical agent release

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See review by Okumura *et al*., page 397 [http://ccforum.com/content/9/4/397]

In the present issue of *Critical Care*, an article by Okumura and colleagues has been published on the problem of secondary contamination following chemical agent release [1]. The authors' draw on first-hand experience [2–5] of the secondary contamination experienced during the Tokyo sarin release in 1995. This experience is important, both for the care of contaminated patients and for the safety of medical staff.

The Tokyo terrorist attack in 1995 involved the release of the nerve agent sarin, which produced nearly 1500 casualties but only 12 fatalities. The low number of fatalities may have been due to the impure nature of the sarin used, but these figures underline the fact that chemical agent release does not necessarily produce the mass fatalities suggested by the term 'weapons of mass destruction'.

The large number of casualties from the terrorist attack and the analysis of secondary contamination casualties from the transmission of sarin gas formed a significant proportion of the injured in Japan. Of the responding fire workers (who are professionally familiar with the management of released hazardous materials) 9.9% suffered secondary contamination, while the rate among medical personnel at St Luke's hospital (where most of the casualties were received) was 23%. The authors note that the rate of secondary exposure by occupation was 39.3% among nurse assistants, was 26.5% among nurses, was 25.5% among volunteers, was 21.8% among doctors, and was 18.2% among clerks, indicating that the degree of secondary contamination rose in proportion to the length of time a medical worker may have spent in contact with an undecontaminated patient. The data presented by the authors underline the need for awareness, particularly among medical responders, of personal protection (cross-contamination?) and methods of decontamination.

Monitoring of secondary contamination and the level of protection required by medical staff are a matter of continuing debate. The authors express concern about the use of level C protection (comprising a lightweight agent-proof suit and a filtration respirator) and recommend that level B protection (a heavier suit with a self-contained air supply) should be used by medical responders. Readers should be aware that this view is not generally accepted in the international medical community where level C protection is regarded as being the standard for healthcare workers involved in toxic releases [6,7], allowing them to provide essential emergency medical care inside a contaminated area. Level B protection has inherent dangers for the wearer and these should be noted. The time taken to put on the level B protection equipment can be considerable and the system may be overwhelmed with contamination before the staff are protected.

In the United States the author's views about the use of level B protection equipment by medical staff is not supported in a recent consensus. The Veterans Health Administration [8] recently made recommendations for personal protective equipment, for training and operational planning, and for using exposure modeling to develop the relationship between healthcare worker exposure and operational parameters – such as the time and distance from the incident site. The Veterans Health Administration felt that level C personal protective equipment was adequate for hospital-based decontamination for all agents, provided adequate decontamination was performed in a timely fashion.

Concern about the effectiveness of level C protection is based on the possibility that the filter cartridge may not absorb the released agent. It should be noted that level C canisters do have certain deficiencies – particularly in not being able to filter out carbon monoxide, which explains why filtration respirators have not been used in fire fighting. The level C filter cartridges that should be used for chemical warfare agent incidents were developed by the military and are designed to filter out all the known chemical warfare agents, including the nerve gas soman, which is considered one of the most toxic. In addition, manufacturers have published data about the efficiency of the cartridges against industrial compounds.

While there is always a possibility that terrorists may discover a toxic compound that has not previously been investigated by the military, this remains a very unlikely possibility and is not sufficient to force medical responders into protective equipment that poses inherent dangers and in which they are unable to perform simple medical tasks such as maintaining an airway.

Although secondary contamination may be prevented by mass decontamination of casualties, the authors note that decontamination capabilities are limited at many, if not most, medical facilities throughout the world.

To prevent secondary contamination, each hospital should establish an area for victims to change clothes, with replacement clothes prepared in advance. A monitoring device should ideally be used to confirm that the causative agent has been eliminated by the decontamination process; for example, the Chemical Agent Monitor (Smiths Detection Ltd, Watford, UK) that is widely used in Europe. Chemical weapons detectors are relatively expensive, however, and skill is needed to operate and maintain them. Moreover, the addition of detection to the decontamination process risks reducing the efficiency of decontamination.

The problem of secondary contamination may be present right through the chain of hospital care. Intensive care units, which may receive severely injured patients from the Emergency Department in rapid succession, are particularly vulnerable, and staff should be aware of the dangers and should be trained to take appropriate precautions.

Okumura and colleagues have highlighted the need for constant care in handling contaminated casualties by medical responders. Although it must be hoped that the terrorist incident they describe will be a rarity, everyday chemical accidents are not and all emergency and other hospital staff must be considered at risk. The lessons learned from the Tokyo incident therefore have a wider and continuing relevance at present.

Competing interests

The author(s) declare that they have no competing interests.

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