Chemical Hazards and Poisons Report

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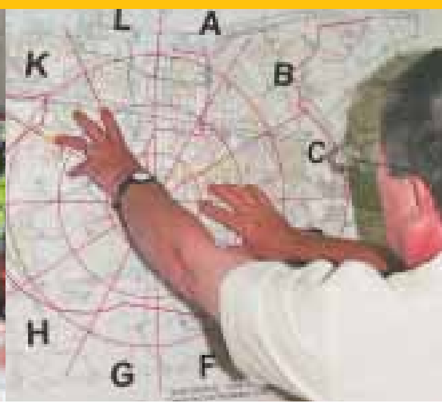







Editorial

Professor Virginia Murray
Chemical Hazards and Poisons Division (London)

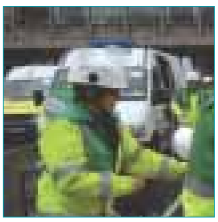
In this second Chemical Hazards and Poisons Report we address issues relevant to Emergency Departments of Hospitals and Public Health. This series of chemical incident reports describes some of the difficult issues encountered by emergency services and front line health staff. I am very grateful to Simon Clarke, our locum Consultant in Emergency Response for all the work he has undertaken to bring together these incident reports.

Other topics covered include an update on Integrated Pollution Prevention Control (IPPC), and an overview of using the Contaminated Land Exposure Assessment (CLEA) model as a human health risk assessment tool. We also include an update on the developing Chemical Hazards and Poisons Division training programme. Please note the HPA Chemical Hazards and Poisons Conference on 7th – 8th December, which will focus on Children's Environmental Health.

As part of the development of the Chemical Hazards and Poisons Report we are looking for papers focusing on children and the environment for the December Report. Our dead line for submission is September 2004. The April 2005 Report will look at more environmental topics, and we would like papers on topics such as water contamination and hydrocarbon contamination in homes. The deadline for submissions for this issue is January 2005. We are happy to consider papers on all topics pertinent to public health protection from chemical exposure. Please forward papers for consideration to Professor Virginia Murray, at virginia.murray@hpa.org.uk

Special Thanks to: Sarah McCrea, CHaPD (London), Edwin Huckle, CHaPD (Cardiff), Matthew Davies, Cardiff NPIS



Contents Page

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Response to Acute Incidents

Guest Editorial: Acute chemical incident response: lessons from the front-line

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The principles of the Health Service's response to acute chemical incidents are undergoing a process of evolution. Toxicological research is primarily animal-based, which is not directly applicable to human physiology; human studies are either derived from research on chronic occupational exposure or consist of military, volunteer studies, the results of which are not accessible to civilian medical practice and therefore their quality (and ethical standards) are not open to critical appraisal. In addition, the process of the response is based on past experience of chemical incidents, such as the sarin attack on the Tokyo subway in 1995, and for obvious ethical and logistical reasons, formal studies are extremely difficult.

In this edition of the Chemical Hazards and Poisons Report, a number of reports of acute chemical incidents have been written, including the lessons learned from them. Common themes run through these lessons and these are described under their appropriate headings.

1. Communication

Interagency

One of the lynch-pins of any major incident response is effective communication. Each organisation must have its 'chain-of-command' [1] with inter-agency communication taking place at specified points in the chain. This was shown to good effect in the mass carbon monoxide event [2] where effective scene management (led by the local ambulance service) protected the local Emergency Department (ED) from a simultaneous influx of a large number of casualties at a time (Friday evening) when its resources were likely to be stretched already.

Health Protection Agency (HPA)

The Chemical Hazards and Poisons Hotline phone number should be readily available and used during any chemical incident [3]:

1. Health Protection Units (HPUs) provide the HPA's local public health emergency response and their actions during a chemical incident can help to limit the size of the incident. Alerting the appropriate agencies (such as the local authority or Environment Agency) to close industrial and commercial premises may reduce exposure to other members of the public. In addition, HPUs have an epidemiological role by collating data from incidents across a region, which may help in surveillance, for example by identifying hotspots of industrial accidents.

2. Chemical Hazards and Poisons Division (CHaPD) provide a national service which includes the provision of rapid toxicological advice to EDs; information about need for decontamination [3,4], identification of chemicals from their HAZCHEM number [5] and clinical features of different chemicals and their specific treatments can be faxed to the ED. Also, the division has a role in collecting data nationally; it is thought that chemical incidents are significantly under-reported and recent capture-recapture analysis has indicated that although approximately 1000 chemical incidents are reported every year in the UK, the true figure probably lies between 6-12,000 [12]. Many incidents will involve casualties attending EDs, and therefore we are strongly recommended to contact ChaPD to report any incident, even if we do not need specific toxicological advice. **The national number for the division is 0870 606 4444.**

2. Recognition

Although chemical incidents may be obvious, it is important to keep an open mind as other situations such as house fires are common sources of chemical exposure (for example, dioxins, vinyl chloride, polyaromatic hydrocarbons, and isocyanates).

3. Containment

Chemical incident plans should take into account what to do with patients who present without warning [9], although where they are to be corralled should take into account shelter from the elements to prevent hypothermia. This should also be a consideration for staff who have prepared to meet the casualties outside the ED, when warning has been given [10]. Not only may the weather be inclement, but it is uncomfortable to be left waiting in the Personal Protective Equipment (PPE) suits if there is a delay in the arrival of the first casualties [10].

Clear signs must be placed around the area containing casualties to warn non-essential personnel away from the area; in the ammonia incident in Manchester [4], visitors and non-ED staff pushed past the plastic barriers to gain access to the corridor outside the resuscitation area (which was a link to the rest of the hospital). It may also be necessary for members of security staff to be positioned at the barriers.

4. Decontamination

Although the majority of EDs now have PPE and the Plysu decontamination tents, a previous article in the Chemical Hazards and Poisons Report warned us of the limitations of this equipment in terms of numbers of casualties that can be processed [10]. Both the ambulance and fire services [9] have been provided with decontamination equipment and EDs are encouraged to contact their local services as part of the planning process, to see if EDs can obtain help with decontaminating self-presenters in the event of mass casualty scenarios.

Other solutions have been proposed, such as the installation of showers outside departments [10] in the event that help cannot reach the department (eg if the roads become grid-locked); although there are concerns about how thorough decontamination would be, and how to achieve an adequate degree of privacy for casualties, it may be that this solution is the best safety-net solution.

The ammonia incident [4] provides us with a timely reminder that decontamination is an external process and that patients may continue to exhale volatile agents that could present a hazard to those in the vicinity, especially those who are managing their airway. At the time of writing there have been no recommendations given about respiratory protection or environmental monitoring for critical care areas; experience in Tokyo [11] suggested that opening windows to ventilate the area and rotation of staff looking after the patients may be helpful in reducing the risk of secondary contamination. In addition, patients requiring artificial ventilation pose the greatest risk, because they are likely to be the most heavily contaminated, and so it would seem to be important that the breathing circuits are attached to a scavenging system.

5. Planning

Hospital trusts are required to plan for major incidents [10] and this should involve whole hospital training so that all staff know what are their roles and, importantly, discourage unauthorised staff from entering the wrong areas [4]. The trust intranet has been found to be a useful means of disseminating information [10].

Exercises have been repeatedly found to be useful and they do not have to be large undertakings; they must have clear aims and can be used to test specific areas or individual components of the emergency response [10]. Also, any deficiencies in the response should be modified and retested at a later date.

Multi-disciplinary responses need to be planned and practised so that individual groups know their respective roles and have an understanding of the roles and problems faced by other organisations [2,10]. It is important that if an ED is served by more than one ambulance service, then emergency planning should include all of the services [4].

As part of the planning process, it would be useful to try to ascertain the risk in the area served by the ED. The Health Protection Units and Local Authorities are useful sources of information about the location of industrial sites and the chemicals that they use. In addition, the Chemical Hazards and Poisons Division has an important role in supporting the NHS by assessing the health impact of industrial processes around the country through the Integrated Pollution Prevention and Control (IPPC) legislation. Lastly, the division and HPUs should be consulted about the safe storage and removal of contaminated items of equipment after an incident, which is an integral part of returning a department back to normal.

Summary

It is important that these incidents have been reported by acute clinicians because every incident has the potential to teach us lessons that we can apply to our own practice. In effect, we all have the potential to be at the cutting edge of this particular area of medicine and our view should be fed back to those who make policy from the safety of 'behind the front lines'. I would strongly recommend all clinicians who are involved in acute chemical incident response to contact the Chemical Hazards and Poisons Division of the Health Protection Agency, not just to obtain the relevant advice, but also to add to the body of evidence and to encourage a less secretive, and more open approach to this subject.

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The multidisciplinary approach to acute chemical incidents: an example of mass exposure to carbon monoxide

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Scene

The incident occurred on a Friday, at a special needs school in North London, which catered for children and young adults (aged 12-19 years) with severe learning difficulties. At approximately 12.00 hours, the catering staff noticed an odd smell in the vicinity of the gas boiler in the kitchen; within a few minutes they began to experience mild headache and cognitive disturbance, which was also noticed by those in the adjacent dining room (which was separated from kitchen by a serving bench). Between 12.30 – 12.40 hours, 43 students and 35 staff members were evacuated from the area and moved to the school gym, and both the police and the Local Authority (LA) were contacted. The LA arrived at 13.00 hours and decided to monitor the air for carbon monoxide because the problem seemed to be emanating from the boiler. Carbon monoxide levels of 100,000 ppm were reported and the boiler was switched off; subsequent examination found that the seal between the boiler and its exhaust pipe at the back had rotted. The room was ventilated by opening all of the windows and at 14.30 hours, the local Health Protection Unit was called and the Consultant in Communicable Disease Control (CCDC) requested an incident meeting at the scene with representatives from the police and ambulance services, LA, Primary Care Trust (PCT), and the Chemical Hazards and Poisons Division (CHaPD) of the Health Protection Agency.

15.00 hours the CHaPD (London) team (scientist, specialist registrar, and consultant) were transported to the scene by the London Ambulance Service. A briefing meeting was held at the school at 15.50 hours, with the CCDC, the school's head-teacher, and representatives of the LA, PCT, emergency services, and CHaPD in attendance. The following information was shared:

1. All of the patients' symptoms were settling, and no-one had been rendered unconscious or had suffered a seizure.
2. Biological sampling would be desirable to confirm that exposure had occurred; concern was expressed at the extremely high value measured in the environment, and questions were raised about the reliability of this measurement.
3. Concern was expressed about the logistical difficulties of sampling all of those who had been potentially exposed and the risk of overwhelming the laboratory at the local hospital. It was also recognised that there would be practical difficulties and distress caused by attempting to take blood from the pupils.
4. Concern was also expressed to try to minimise the effect of the incident on the local Emergency Department by triaging all the casualties at the scene and only send those with significant or persistent symptoms.
5. The parents of the children were being contacted to help with the triage process; information would need to be given to them.

As a result of the meeting, the following action plans were formulated:

1. The students would be assessed, in the presence of their parents/ regular carers, for changes in their normal demeanour and behaviour.
2. An information sheet was designed by the CCDC, PCT and CHaPD (scientist and SpR), typed up by the PCT and faxed to the school for photocopying and distribution to the parents.
3. The school staff members agreed to have blood taken. They were thought to have had the same level of exposure as the children.
4. The biochemistry department of the local hospital was contacted by the PCT and they agreed to provide the equipment and perform the tests. A member of the PCT public health team agreed to collect the equipment, thereby maximising the number of paramedics who could triage the casualties.

The assessment of the pupils was undertaken by the paramedics between 16.00-17.00 hours; the CHaPD consultant was asked to assess five of the students (all of whom had mild conjunctival injection but no other clinical features, and no obvious distress); they were deemed to be fit to be sent home accompanied by their parents and with advice about criteria for seeking further medical help. One child was sent to the local Emergency Department because he complained of persistent headache, he had a significant past medical history (Eissenmenger's syndrome), and no family member could attend the school. He was later discharged after a period of observation, with no active treatment needed.

At 17.15 hours, the last of the students left the scene, either with their carers or by transport arranged by the LA. Bloods samples were taken from the staff members, by paramedics and members of the public health team. They were all discharged using clinical criteria. The blood results were later returned and were all <6%, indicating, at most, only mild exposure.

On the following day, a combined team from the HPU/PCT followed up all casualties using a telephone questionnaire and no on-going problems were reported.

Lessons Learned

This incident could have had a significant impact on the local healthcare resources. The sudden arrival of 78 casualties (45 of whom had significant behavioural difficulties) would have constituted a major incident for the local Emergency Department. A number of lessons can be learned from this incident.

1. Multidisciplinary Approach

The response to chemical incidents requires skills that cross boundaries between different professional groups. A mixture of clinical, public health, toxicological, and scientific expertise may be required; clinical and laboratory data needs to be interpreted on behalf of the casualties, and the impact of the incident on the surrounding population and environment must be assessed.

2. Communication

This is essential for the multidisciplinary approach to work effectively. The initial briefing meeting allowed problems to be identified and for a clear agenda to be determined; tasks were allocated and responsibility for each of them was agreed between the parties involved.

A chain of command also evolved, with designated members of each team liaising with other agencies; this helped to avoid tasks being both missed and duplicated.

3. Risk Assessment

This should follow the 'source – pathway – receptor' model employed by environmental scientists. Carbon monoxide is odourless so it was interesting to note that the catering staff noticed a smell at the beginning of the incident in the vicinity of the boiler. Carbon monoxide was rapidly confirmed as the source by the LA, and the cause of the leak was rectified. The pathway was broken by moving the casualties out of the affected area.

Although the receptors were also identified, there was some uncertainty about the degree of exposure of the casualties. The environmental monitoring and clinical picture seemed to contradict each other; a level of 100,000 ppm would be expected to cause rapid loss of consciousness and death [1] and levels as low as 50 ppm have been reported as being fatal in less than 30 minutes [2] whereas the casualties seem to have been exposed for 30-40 minutes with only mild symptoms.

The first option for resolving this dilemma was to rely on the clinical features and follow the clinical maxim of looking at the patient and not the test result. The second option was to undertake biological sampling; venous carboxyhaemoglobin levels are relatively easy to obtain and are available in most hospital biochemistry laboratories. Carboxyhaemoglobin levels have to be interpreted with care; they are useful in confirming the diagnosis and values >40% are one of the criteria for hyperbaric oxygen therapy [3]. The half-life of carboxyhaemoglobin in room air is approximately 5 hours [4], so it was argued that normal or minimally elevated levels measured within that time would help to exclude significant exposure.

It was agreed that it was undesirable to take blood from the students because it would have been technically difficult and unnecessarily distressing to them. The teachers and kitchen staff agreed to have samples taken and it was likely that, if their results were acceptable, then the students and their families could also be reassured. All levels were within an acceptable range (<6%); 3-5% can be found in urban-dwelling non-smokers and 6-10% can be found in smokers [4].

4. Response

The risk assessment provided a clear set of priorities and tasks that were then undertaken. The result of the response was to reduce the impact of the incident on the local emergency services without compromising the safety of the casualties. Only one out of the 78 people exposed to the carbon monoxide required transport to and assessment in the local Emergency Department. The local public health team has subsequently followed up the patients, undertaking a health questionnaire and providing written information and advice to all concerned.

Carbon monoxide (CO) - 76 incidents 2003

- Carbon monoxide is a colourless, odourless gas.
- Severe exposure causes coma, convulsions and cardiovascular collapse.
- After acute exposure delayed neurological sequelae can occur.
- Low-level exposures cause non-specific symptoms which can often be mistaken for other illnesses.
- Use: Manufacture of petroleum-type products, metal carbonyls and recovery of nickel from chemical processes [8].

Total of 1049 chemical incidents for this period, chemical - data based upon the National Surveillance programme data for 2003.

Summary

There are estimated to be more than 1000 chemical incidents/ year in the UK that pose a risk to human health [5,6] (although this may well be an under-estimate). 80% of these involve fewer than 4 people [7]; however, larger incidents do occur, and the important factors in providing an efficient response are:

1. To recognise the need for a multidisciplinary approach.
2. To organise an agreed, interagency communication structure.
3. To carry out a risk assessment using expert (in this case both toxicological and public health) advice, having undertaken a rapid identification of the causative agent.

This article describes the multi-agency response to a difficult incident, which prevented the development of a major incident for, and possible closure of, the local Emergency Department

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Fumes under the bank: Report on a chemical incident in a high street bank, Banbury, Oxfordshire

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The Incident

Two men were working underground below a bank (designated the 'first bank') laying a pipe. They were using a petrol-powered electricity generator and had drilled into a sewer. One of the men (the 'second man') left the vault for 10 minutes. On his return he found the first man had collapsed and was fitting - he subsequently vomited and was incontinent of urine and faeces.

Rescue was attempted by the second man and the bank manager but there were difficulties in accessing the area and they were unable to remove the casualty from the vault until a crew of two paramedics arrived. The paramedics extricated the collapsed patient, but the first paramedic had to exit the vault suffering from severe dizziness. Despite these difficulties, the paramedics transported the casualty to the emergency department of the local hospital. The second man who had been working in the vault was also taken to hospital and he arrived 9 minutes later. The bank manager had been in the vault for about 30 minutes but he did not present to hospital until three and a half hours later. Over the course of the afternoon and evening, 17 more casualties who had been close to the incident attended the emergency department.

On arrival in the emergency department, the first patient was taken to the resuscitation room. The history given was of poisoning by petrol or diesel fumes from a generator. TOXBASE was accessed and Chemical Hazards and Poisons Division's (CHaPD) office in London was contacted. The symptoms seemed to be compatible with petrol or diesel intoxication and, after discussion with CHaPD (London), preparation was made to decontaminate the casualties. A chemical incident was declared. The department was very busy but medical patients were quickly moved to wards. The first seven victims were washed or showered.

Meanwhile, at the scene, the fire brigade and police were called. The area was cordoned off and the first bank was evacuated. It was then noted that a neighbouring bank ('the second bank') shared a ventilation system with the first bank and therefore neighbouring buildings were evacuated. More casualties were identified for hospital assessment.

The duty consultant anaesthetist attended the emergency department and suggested that the toxic agent was likely to be carbon monoxide from the generator's exhaust. News was later received via the liaison ambulance officer that the fire brigade had suspected carbon monoxide and hydrogen sulphide (also highly toxic) might be at the scene.

Carbon monoxide is a colourless, odourless, tasteless gas. It is produced during incomplete combustion of carbonaceous products e.g. by petrol and diesel engines, heating systems, house fires, cigarette smoke etc. It is highly toxic. It is absorbed through the lungs and binds avidly to haemoglobin. It thereby reduces the oxygen-carrying capacity of the blood. Features include headache, dizziness, ataxia, impaired consciousness, respiratory failure, cerebral oedema, and less commonly, rhabdomyolysis, renal failure, pulmonary oedema, myocardial infarction and other neurological sequelae. In mild poisoning, there are rather non-specific symptoms of headache, dizziness and nausea [1,2,3,4].

We urgently measured the carboxyhaemoglobin (COHb) level on the first, most severely affected patient on the departmental blood gas analyzer and confirmed the diagnosis of carbon monoxide poisoning. Decontamination was then deemed to be unnecessary. The COHb levels were measured on all but the last four patients. All patients with a COHb>10% were treated with oxygen from a mask-bag reservoir until their COHb level fell below 10%.

The most severely affected patient (our first patient) was a male aged 35 years. On arrival in hospital, he had a depressed conscious level - GCS 10-11. His pulse was 104, BP 120/70, RR 23/minute and temperature 36.6 oC. He had fitted on scene and had been given diazepam by the paramedics. He had also vomited with possible aspiration and had been incontinent of faeces and urine. There was no history of epilepsy. He had received oxygen in hospital for nearly one hour prior to his first COHb reading, which was 35.3%. Hyperbaric oxygen was not considered for treatment as the most seriously patient improved with conventional therapy. Later, when his condition improved, he was able to remember working below the bank and feeling unwell. His next memory was of finding himself in the Emergency Department. He denied headache.

The four other most severely affected patients (COHb >10%) had all entered the room below the bank. All had a headache and three felt dizzy or shaky, one complained of shortness of breath (SOB) and one of unsteady gait.

The least-affected patients (COHb <5%) also complained of symptoms e.g. headache, dizziness, wooziness, fuzzy or light headedness, fatigue, weakness, nausea, vomiting, SOB. Headache was the most frequent symptom (8/17 cases). Dizziness was second (7/17 cases). One patient was pregnant.

Figure 1 shows the patient arrival times in the emergency department, the patients' locations during incident and the first measured COHb levels. The COHb level was not measured in the last four patients, because medical staff on duty at that time reasoned that other patients who had been in the same location had not had significantly raised levels or required treatment.

Oxygen therapy is used to speed up the dissociation of carbon monoxide from haemoglobin. The half-life of COHb is five hours in subjects breathing air, 1.3 hours on 100% oxygen therapy and 0.3-0.4 hours on hyperbaric oxygen therapy [1]. We were able to plot the rate of decline of COHb during oxygen therapy in the five patients from the incident who required treatment and who had an initial COHb concentration of more than 10% (figure 2).

Hydrogen Sulphide (H_2S) - 4 incidents 2003

- Hydrogen sulphide is a gas with a characteristic pungent 'rotten egg' odour.
- It is rapidly absorbed almost exclusively by inhalation.
- It is irritant to the respiratory tract, eyes and skin.
- In high concentrations hydrogen sulphide causes rapid collapse, respiratory paralysis, imminent coma, followed by death within minutes.
- Use: Manufacture of sulphuric acid, elemental sulphur and other chemicals; also used as an analytical reagent [5]

Total of 1049 chemical incidents for this period, chemical - data based upon the National Surveillance programme data for 2003.

Discussion

Delayed neuropsychiatric symptoms

Up to 40% of patients with severe toxicity will experience neuropsychiatric symptoms starting 3-240 days after apparent recovery. These include impaired memory and concentration, apathy, disorientation, personality change, gait disturbance, incontinence etc. The majority improve markedly or recover completely within 12 months [2,4]. We advised our most severely affected patient to attend his general practitioner if he felt unwell after leaving hospital and we wrote to his general practitioner to warn him of the possibility of such symptoms.

Risks in pregnancy

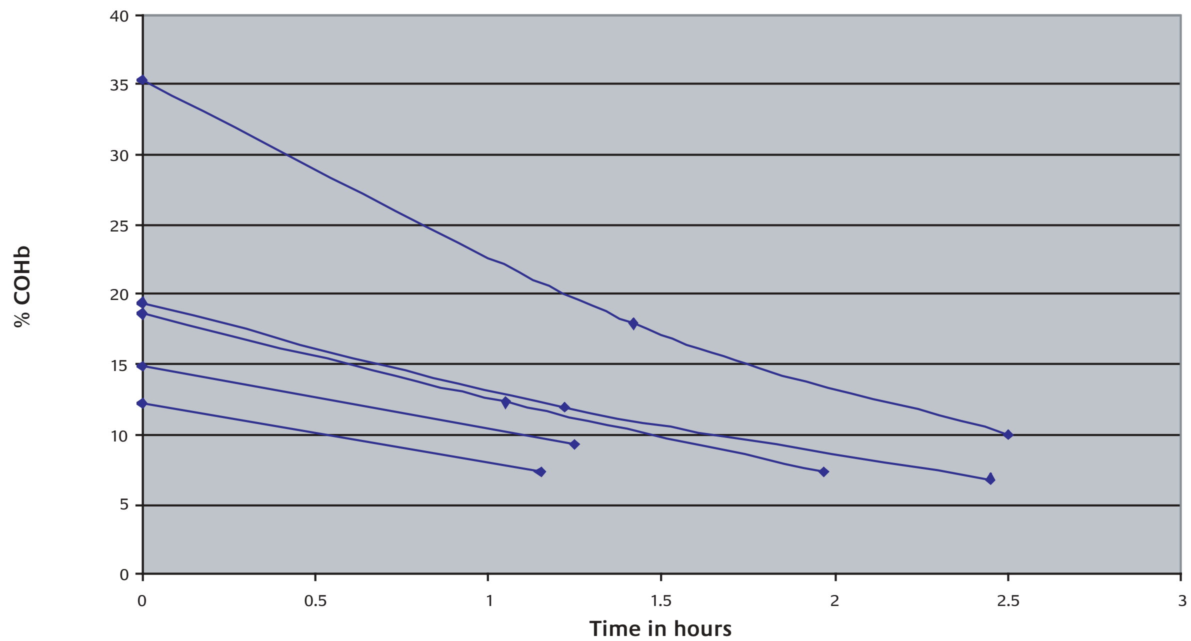
Carbon monoxide has a very high affinity (200-300 times greater than oxygen) for haemoglobin, including foetal haemoglobin, and it can cross the placenta. In severely poisoned pregnant women there have been reports of intrauterine death, neurological deficits and dysgenesis [3]. Our one pregnant patient was mildly affected (figure 1) but we referred her to the duty obstetrician for foetal monitoring as a precautionary measure.

Lessons learned

- Unfortunately, the CHaPD phone number was not listed under useful numbers beside our emergency telephone, but it was quickly found on TOXBASE and it is also listed in the hospital's major incident plan, and on our departmental action cards.
- Few of the Emergency Department staff were familiar with generators and, when told the toxic agent was petrol or diesel, did not immediately think of carbon monoxide in the exhaust fumes.
- A variety of toxic substances had been implicated in this scenario i.e. petrol, diesel, hydrogen sulphide and carbon monoxide, and specialist equipment needed to confirm the chemical involved is not always readily available; chemical incidents are not straightforward.
- COHb/Arterial Blood Gases should be measured urgently on all patients with a depressed conscious level of unknown cause.
- The first patient was taken straight into the resuscitation room and if rigorous decontamination had been required, this would have led to closure of the department.
- Seven patients were decontaminated unnecessarily and unfortunately this may have delayed oxygen therapy but, if in doubt, we believe it is better to decontaminate.
- A large number of hospital managers offered assistance. They informed the Health Protection Unit and arranged diversion of 999 ambulances responding to unrelated incidents. This was invaluable during the incident which went on into the evening and continued

Figure 1

Rate of decline of carboxyhaemoglobin in the five most severely affected patients during oxygen therapy



after the official stand down as other patients from the vicinity continued to present.

- We needed office accommodation and communications (telephone, fax and e-mail) for hospital managers who had congregated in the clinical area.
- The advice and support received from CHaPD (London) and the Health Protection Unit was invaluable and included personal telephone calls and faxed information. They kept in touch with us throughout the incident.

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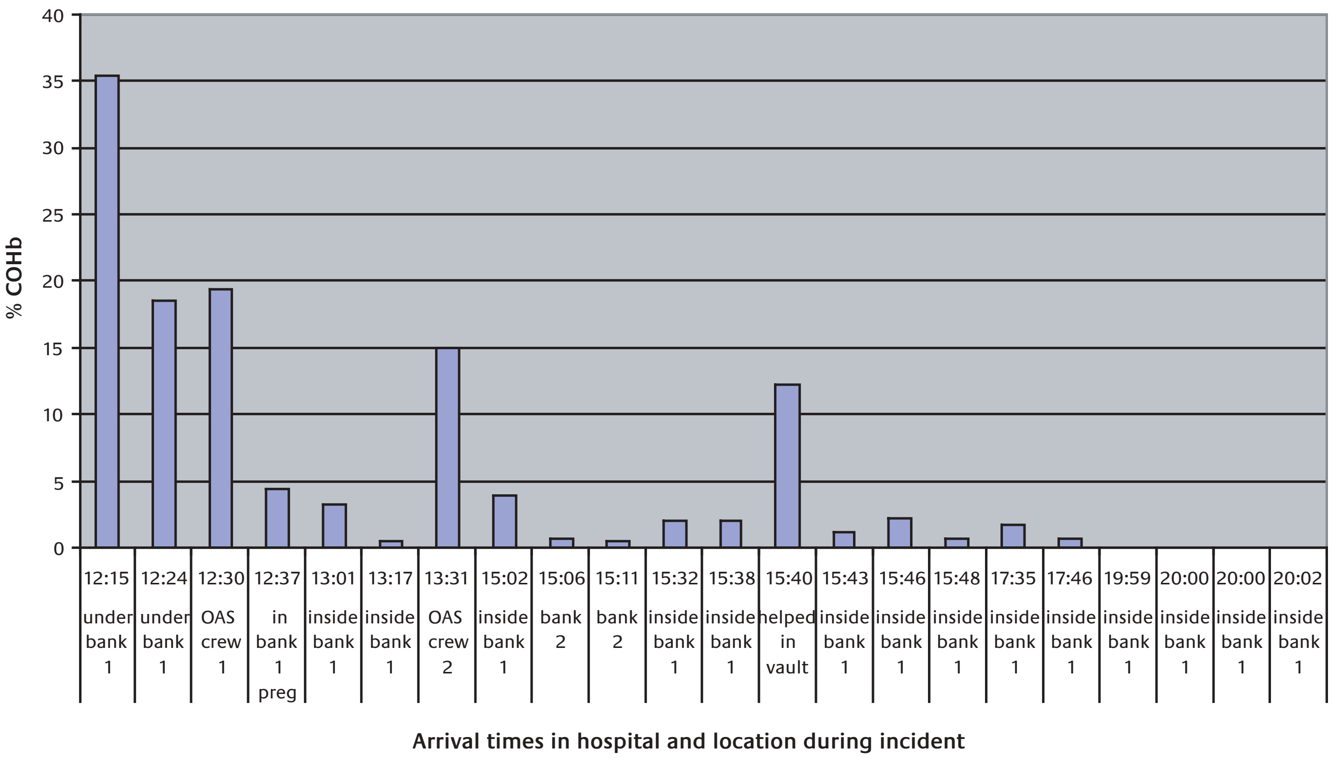
Figure 2

Carbon monoxide incident: patient location during incident, COHb levels and arrival times in hospital (COHb levels were not measured for the last four patients)

Key

- OAS - Oxford Ambulance Service
- Bank 1 - primary bank
- Bank 2 - secondary bank
- Preg - pregnant



Ammonia release in superstore

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The Incident

At about 14.30 hours, staff working near the food section of a local out-of-town superstore noticed a strong smell of ammonia, which rapidly spread to other areas of the store. The premises were evacuated about 10 minutes later and after a further 10-15 minutes, an ambulance was called to the scene; the Emergency Department at South Manchester University Hospital received a call from the ambulance service with a warning that six casualties, who had been exposed to ammonia vapour, were en route to the department. The estimated time of arrival given was six minutes, during which time the following preparations and information gathering were undertaken:

1) Patients in the six bay resuscitation room were moved to other areas of the department, to provide one contained area in which all six patients could be managed.
2) Medical and nursing staff were briefed and allocated specific roles.
3) Initial advice was obtained from the Chemical Incident Management Handbook [2].
4) The Chemical Hazards and Poisons Division (CHaPD) was contacted regarding advice on the need for decontamination.
5) The local Health Protection Unit was notified of the incident.

Ammonia (NH_3) - 38 incidents 2003

- Ammonia is a colourless gas with a characteristic pungent odour (ambient conditions).
- It is a highly water-soluble gas that reacts with moisture to form alkaline ammonium hydroxide (also known as ammonia water), which is corrosive and can cause severe damage to eyes and skin. The extent of dermal injury ranges from mild erythema to full thickness burns.
- Inhalation may cause local irritation of mucous membranes, acute pulmonary oedema or chronic obstructive pulmonary disease.
- Contact with liquid (compressed gas) may cause frostbite damage to lungs, eyes, skin, mucous membranes, oesophagus or any other tissue with which it is directly in contact.
- Use: Manufacture of nitric acid, explosives, synthetic fibres and fertilizers; in refrigeration [1].

Note: Ammonia water is used as a detergent, for removing stains, bleaching, calico printing, extracting plant pigments and alkaloids; manufacture of ammonium salts [1].

Total of 1049 chemical incidents for this period, chemical - data based upon the National Surveillance programme data for 2003.

At 1550 hours a single ambulance arrived at the Emergency Department with four patients receiving supplemental oxygen, and a further two receiving both oxygen and nebulised bronchodilators. There was a strong smell of ammonia in the vehicle and the ambulance crew were wearing respiratory protection. It was confirmed that the patients had been exposed to ammonia vapour for no more than ten minutes, the source being ammonia, which had been spilt on the roof of the premises close to an air-conditioning intake. On the advice of the Health Protection Agency, four of the patients were taken to the decontamination room via its external entrance where they disrobed and sealed their clothes in double plastic bags. They put on hospital gowns and were taken into the resuscitation room. The remaining two patients disrobed in the ambulance and were also taken via the decontamination room entrance to the resuscitation room. There was no discernable smell once the patients had removed their clothes and at no time did they come into contact with other patients.

All the patients were female staff members at the store and were suffering from respiratory symptoms. Five of them (age range 20-39 years) were previously fit and well non-smokers who were suffering symptoms of mild respiratory tract irritation, which had already improved; their examination findings were entirely normal. The sixth patient was a fifty year old smoker with mild asthma who was found to have bilateral expiratory wheeze, but otherwise normal vital signs. All six patients maintained oxygen saturations of 97% or more after thirty minutes of breathing room air.

Following further consultation with CHaPD, five of the patients were discharged home with advice to avoid smoky atmosphere for 48 hours and to re-attend should any further symptoms develop. The sixth patient was admitted for observation and her wheeze resolved with nebulised bronchodilators. She was discharged later that evening with the same advice.

None of the patients subsequently re-attended the department.

Learning Points

This was a relatively minor incident, but it highlighted several areas of concern.

1. Communication

Although the incident had already been underway for over one hour, the department was only given six minutes to prepare; it was fortunate that the department was relatively quiet, with only three patients in the resuscitation room who were all stable and could readily be moved to lower dependency areas. The ambulance service involved was not the service that most regularly use our department and contact has already been made to improve communication.

2. Containment

This presented a problem because, in spite of screens being erected across the corridor outside the resuscitation room, both members of the public and other hospital staff continued to push past them to use the corridor for access to other

Figure 1: A &E Department © South Manchester University Hospital

departments. A pharmacist entered the resuscitation room whilst the casualties were being assessed, as did members of the Emergency Department staff other, than those allocated to that area. It became apparent that clear warning signs were required to deter such intrusions, along with plastic tape to put across corridors and entrances. The procurement of these, along with staff education regarding restriction of access to potentially contaminated areas, has been instituted to help to resolve these problems and reduce the risk of secondary contamination.

3. Monitoring

The Emergency Department currently has no means of monitoring the concentration of exhaled vapour, with the consequent risk of gaseous concentrations building up in the working environment. Whilst there is no facility to monitor this there may be a place for respiratory protective equipment to be provided in the Emergency Department; until such a time, it would be advisable for emergency staff to be regularly rotated, and for the resuscitation area to be ventilated by opening the windows if available (unfortunately our department has no external windows).

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Closure of A&E department at a district general hospital due to chemical scare

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Scene

The Emergency Department (ED) of Maidstone General Hospital came to a standstill and was closed for eight hours due to a chemical scare. The events unfolded in the early hours of a November morning, as described below.

The Incident

At 00.30 hours, a man was found wandering in a local village; the police were called by a member of the public and they took custody of him. He told the police that he was a lorry driver and that he had unloaded unknown chemicals in a factory on the previous day. He claimed that during the process of unloading, a glass container had broken open and he had come into contact with a white/yellow powder. He had subsequently returned home by train.

The patient was transported in a police car to the ED, but on the way to hospital (at about 01.20 hours) he complained of chest pain; the police stopped the car and called for an ambulance and 20 minutes later the patient was taken directly by the ambulance to the ED. The department was not alerted about the possible chemical contamination of the patient, who was taken directly into the Majors Area of the department. As soon as it became apparent that the patient might have been exposed to a chemical, he was taken out of the area for decontamination (at 01.45 hours). He started to complain of breathlessness and irritation of the throat. By this stage, the only Senior House Officer (SHO) on duty, six ED nurses, two ambulance crew and two police officers had come into contact with the patient.

A major incident was declared by the site practitioner at 02.00 hours; the ED was closed, with all emergencies being diverted to the nearest department, which was 20 miles away, and the local Fire Brigade was informed. During the course of decontamination the patient had a seizure, which resolved spontaneously after a few minutes.

Senior ED staff arrived at 02.30 hours and NPIS was contacted. The patient was noted to be confused. However, the area of contact with the alleged chemical was not painful, no blisters or burns were noted, his pupils were reacting equally and his vital signs were normal. FBC, U&E, LFT, and CK were all within normal levels. He gave a HAZCHEM number as identification of the chemical involved, but a TOXBASE search of the HAZCHEM number did not correlate with any known agent.

At 02.42 hours Bronze command was set up in the Emergency Department and both members of the ambulance crew and two police officers complained of throat discomfort. At 03.10 hours the public health on-call consultant was informed.

At 04.40 hours the patient was further questioned by police. He gave a different version now, claiming to have travelled by train with a sealed bottle containing unknown chemicals; he had changed trains during the journey. He also claimed to have come into contact with the chemicals when the bottle broke open and that he had left the container in the second train. Ten minutes later, Silver command met at police headquarters. Police had cordoned the area where the patient was picked up and train carriages running on the relevant lines were also searched by British Transport Police for possible contamination.

Further investigation ascertained that the factory that the patient claimed to have visited did not exist. The patient was searched and a small packet with white powder was found in his pocket. The police confirmed at 07.20 hours that the white powder was possibly a recreational powder and blood and urine samples were taken for analysis, and was subsequently detected in the patient's urine.

Figure 1: A&E Consultant planning to reopen department. © Maidstone General Hospital

Figure 2: Police car being checked for chemicals © Maidstone General Hospital

Figure 3: Media reports heighten public awareness

The department was deemed safe and reopened at 10.20 hours. The patient made an uneventful recovery, and was discharged at 19.30 hours, having been seen by the psychiatric team.

Lessons Learned

1. Communication

There were a number of delays in appropriate communication; this was understandable given the unusual presentation of the patient. The Emergency Department was not given prior warning of this patient, who managed to get into the main body of the department before it was realised that he might pose a risk of secondary contamination. Regular exercises have been planned to test the robustness of the communication systems, both within the department and with the other emergency services.

Rapid identification of a chemical agent can be obtained from the Chemical Hazards and Poisons Division, if a HAZCHEM number is known. Early discussion with the fire service can also be beneficial if the number is not known.

2. Training

The incident highlighted the need for regular training and exercises; the patient was decontaminated in the departmental shower room because of a technical problem with the decontamination unit. Regular drills are carried out to test the equipment, such as the decontamination tent. In addition, further training of Emergency Department staff in recognising a potential chemical incident and in activating the Major Incident Plan has taken place.

Summary

This single patient created havoc in the county: police resources were used unnecessarily and the Emergency Department, which treats an average of 150 patients per day, was closed for more than eight hours. This put a strain on the patients and their relatives, the ambulance service and the receiving Trust. A number of valuable lessons were learned from this highly unusual case.

Caustic comments: Report on a multiple casualty chemical incident at the Bristol Royal Infirmary

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The Incident

In the early hours of a weekend morning during December, a patient arrived by car at the Emergency Department (ED) of the Bristol Royal Infirmary stating that he had had acid thrown over him. He had extensive facial burns, with ocular involvement. He was sent for immediate ocular and facial irrigation. Shortly afterwards a further 23 patients arrived, all by car, with an identical complaint. They alleged that they had all been in a pub when an individual threw the substance over them.

Before the nursing and medical staff knew what was happening, there were patients in reception, and in the shower room of our observation unit, where they were irrigating themselves. Patients were guiding each other to and from the shower room.

It was clear that the patients had been attacked with a caustic substance. This substance later turned out to be a strong alkali.

Initial control was achieved by shepherding all patients back to the area outside reception. Our observation unit was cleared of patients and beds. All patients were then triaged at a desk set up outside reception, and sent down to the now-empty observation unit. Here they were assessed thoroughly. Any patients with ocular symptoms underwent ocular irrigation. Three patients had significant facial and ocular burns. The remainder had partial and full thickness burns of varying extent, mostly over their limbs and trunks, but also with facial involvement.

It was clear that all of our patients required thorough irrigation of their burns. We determined that the shower in our observation unit was already awash. We therefore elected to set up our decontamination unit and use it for irrigation. Each patient was put through the decontamination unit and sent down to the minor end of the department, where they were re-examined by the ED team, offered analgesia, and tetanus prophylaxis, and assessed by burns specialists and ophthalmologists who had been called in to the department. Three patients required admission, and the remainder were discharged with treatment and follow-up arrangements in place.

Lessons Learned

There were several lessons from this incident, with respect to the management of chemical incidents.

1. Containment

a) None of our patients arrived by ambulance, and there was no warning. If this had been a chemical which posed a contamination risk, significant areas of our department would have been contaminated in a matter of minutes. Plans for dealing with chemical

Figure 1: Decontamination Tent at CHaPD (London)

incidents need to consider the scenario of pre-alert, and the scenario of no-alert, with contaminated patients arriving at reception. In our case we elected to reverse our planned flow of chemical casualties, from a secure internal "warm" area back outside through the decontamination unit, and then onwards to a "cold" part of the department.

b) This incident happened at 2am, on a bitterly cold night. The patients had been at a party and the women in particular were scantily clad. Plans for dealing with chemical incidents need to take external environmental factors into consideration. Had we kept our patients outside until they had gone through a decontamination procedure, they would have had significant cold exposure.

Corrosive Chemicals

Chemicals labeled as corrosive may be strong alkalis, e.g. sodium, potassium, or ammonium hydroxide and calcium oxide; or strong acids e.g. sulphuric, nitric or hydrochloric acids.

Skin exposure or ingestion of any quantity of a corrosive chemical can be dangerous. The exact nature and location of damage depends on whether the substance is acid or alkali. When ingested all corrosives can cause immediate burning of the mouth and throat, drooling, difficulty swallowing and abdominal pain. Strong alkalis often cause more damage to the oesophagus than the stomach, with effects such as ulceration, perforation and mediastinitis. Strong acids can cause severe damage to the stomach, particularly to the pyloric region, but may also damage the oesophagus.

On the skin alkaline solutions can produce deep, full thickness, liquefaction burns. Alkaline solutions may penetrate all layers of the eye and find their way into the chambers. Alkali burns to the eyes should be considered an ophthalmic emergency. Skin exposure to strong acids can cause severe burns, which may, however, be less deep than an alkali burn, with severe scarring. Acids can cause severe damage to the eyes. Aspiration or inhalation of strong acids or alkalis in vapour form may cause respiratory distress, stridor and pulmonary oedema.

2. Decontamination

There was an acute need for our patients to be irrigated as soon as possible after arrival. We were unable to meet this need. The decontamination tent was set up rapidly, but it still took over two hours to get all patients requiring irrigation through. The question arises as to whether departments should have an external system set up to enable immediate and safe initial irrigation for contaminated patients, which they can use themselves whilst staff don PPE (e.g.).

3. Generic Management

Our initial reactions were based on the assumption that we were dealing with an acid attack, as stated by our first patient. This turned out to be incorrect, although it did not materially affect management. Initial reactions to multiple casualty chemical incidents should be determined on the basis of "chemical unknown." Until there is absolute certainty about the nature of the chemical, appropriate measures should be taken to protect staff, other patients, and facilities from the risk of contamination.

4. Equipment

a) Adequate numbers of modesty kits are essential as part of equipment stocks. These should consist of plastic bags for clothes/belongings, towels to dry off after decontamination, gowns, blankets, and protection for feet. We found theatre overshoes very useful. The disrobe and rerobe packs issued to the fire service would seem to be a suitable pre-packaged alternative.

b) Patient notes for chemical incidents need to be kept in a waterproof jacket if they are to follow the patient around, as ours did.

5. Disposal of Contaminated Items

Departments need to have in place, as part of their plans, arrangements for removing used decontamination tent liners and PPE. This proved problematical in our case.

Toluene di-isocyanate spill

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The Incident

On a mid-week morning, a telephone call was received by the Emergency Department (ED) of the Royal Oldham Hospital from the Occupational Health nurse on duty at a large, foam-packing factory 3-4 miles from the hospital. She stated that a worker had been doused in toluene di-isocyanate (TDI), and that he was being brought to the department by private transport, having been decontaminated at work.

The patient arrived at the reception desk 45 minutes later and he was immediately asked to go back outside, where he was assessed and triaged by the charge nurse, who was not wearing PPE. The patient was noted to be well, as was his colleague who had driven him to the hospital and there was no abnormal smell (TDI has a pungent odour), so he was then allowed into the resuscitation room.

The Chemical Hazards and Poisons Division of the Health Protection Agency was contacted for advice about the clinical features and treatment of TDI exposure. He had been under a vat containing four tonnes of isocyanate that had burst and he was drenched from head to foot as the chemical poured on to the factory floor next to him; his routes of exposure were primarily dermal and respiratory, with some ocular contamination. He immediately removed his outer paper coveralls, and went to the changing rooms at the factory, where he disrobed, showered off with soap and water, and put on clean clothes before having his eyes irrigated with saline for 15 minutes. By the time he reached the ED, his eyes had stopped stinging, his vision remained normal and he felt well, with no respiratory symptoms. Clinical examination was unremarkable, except that his hair still felt slightly sticky, so he was showered off again in the shower in the department. He did not wish to be admitted for observation, so he was discharged home with the warning to re-attend if any symptoms developed; he was specifically warned that clinical effects can be delayed for a number of hours.

On further questioning before he left the ED, it became clear that the company was registered under the Control of Major Accident Hazard (COMAH) legislation, 1999 and so had a robust emergency plan, which included containment and clearing up of large on-site spills. He also stated that he would return to the site to fill out an incident form that would be sent to the Health and Safety Executive (HSE).

Toluene 2,4-diisocyanate ($C_9H_6N_2O_2$) - 0 incidents 2003

- Toluene diisocyanate (TDI) is a colourless liquid at room temperature that has a strong pungent odour. Upon exposure to sunlight it darkens. It reacts with water to form carbon dioxide. Products of combustion include cyanides and oxides of nitrogen.
- TDI vapour is irritating to the respiratory tract and is a potential respiratory sensitiser. High concentrations may lead to pulmonary oedema.
- TDI is a strong irritant to the eyes, mucous membranes, skin and gastrointestinal tract.
- Use: Manufacture of polyurethane foams and elastomers [1].

Total of 1049 chemical incidents for this period, chemical - data based upon the National Surveillance programme data for 2003.

The Consultant in Communicable Disease Control on-call for the local Health Protection Unit was contacted, but, on further discussion with the factory and the HSE, determined that no more needed to be done, as the spill had not spread beyond the premises, and there was an Occupational Health Department that regularly screened the workers for signs of chronic respiratory disease. No further factory staff attended the department.

Learning Points

1. Preparation

As a result of this incident, the HSE and Local Authority were contacted to try to ascertain what chemical hazards were present in the catchment area of the hospital. Although it was recognised that this probably identified only a small proportion of the industrial sites in the region (small companies do not have to be registered), it identified a number of chemicals, including a store of 13 tonnes of chlorine in a factory at the head of a valley containing a large residential area. A list of chemicals and the fact-sheets produced by the Chemical Hazards and Poisons Division were incorporated into the Chemical Incident Plan folder for rapid and easy reference.

2. Containment

This incident highlighted the difficulties of containing such incidents; in spite of receiving a warning telephone call from the factory, the patient did not arrive for nearly an hour and had entered the waiting room to register before being asked to wait outside. If he had still been contaminated, he could have secondarily contaminated the reception area with the staff and other patients in there. Although, in theory, he could have been greeted outside the department, 45 minutes is a long time to keep a member of staff standing in the cold and rain!

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[1] Merck & Co. Inc. 2001. The Merck Index – An Encyclopedia of Chemicals, Drugs and Biologicals, 13th edition.

Draft proposals for the management of the chemically contaminated dead

Adrienne Edkins[1] and Virginia Murray[2]

[1] King's College Forensic Science Student on attachment to CHaPD (London). Also a Beit Fellow for Zimbabwe 2002/2003 and supported by the Beit Trust (CC registration 232478).
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Introduction

This is the second paper addressing the issue of chemically contaminated bodies. Three examples of chemical incidents which have caused concern are summarized in Table1 and include the Crymlyn Burrows incident [10], phosphine suicide incident [11] and a dimethylmercury spill [12].

The purposes of this paper is to consider the information available in the literature and any legislation, what type of secondary contamination can occur from checmically contaminated bodies and to offer a draft process for the management of chemically contaminated bodies. Comments on this would be welcome (Virginia.Murray@hpa.org.uk)

Review of Current Literature and Legislation to Manage Chemically Contaminated Bodies

There is no single defined guidance or policy for the management of chemically contaminated bodies. The policies that do mention the issue of chemically contaminated bodies are largely 'case histories' and do not provide consolidated guidance on how best to cope with the situation. Policies and legislature to regulate the disposal of human bodies does not consider the potential risks associated with the chemically contaminated victim.

The review [13] of relevant literature and discussions with key personnel has indicated a lack of policy and guidance to manage chemically contaminated bodies. Subsequently, it can be concluded that:

- There is no single defined guidance or policy for the management of chemically contaminated bodies
- The current policies and guidelines available for the management of chemical or other incidents (that may result in a chemically contaminated victim) do not account for this eventuality.
- The policies that do mention the issue of chemically contaminated bodies are largely 'case histories' and do not provide consolidated guidance on how best to cope with the situation.
- Policies and legislature to regulate the disposal of human bodies do not consider the potential risks associated with the chemically contaminated victim
- There is no definition of which agency or authority would be responsible for management of the chemically contaminated body, although currently the responsibility is that of the coroner in charge.

The lack of guidance for the management of these situations results in lack of preparedness and communication problems that lead to unnecessary confusion. A defined and practised plan for dealing with these situations will ensure more efficient management.

Secondary Contamination and Chemically Contaminated Bodies

Secondary contamination is the term used to describe exposure of people and the environment to chemical substances by an alternative route other than the chemical incident [1]. The greatest risk of secondary contamination is to those responding to the chemical incident and those responsible for handling the body after death [2,3]. Secondary contamination can occur from a patient even after death. Hazards associated with the management of chemically contaminated bodies may affect:

- Human receptors [4-6]: Serious health risks have been associated with those attending the incident, particularly if a chemical incident is not initially recognised. This would include health professionals, emergency responders and any other people associated with the victim or the scene of the incident. The Health and Safety Law indicates that employers have a legal duty to ensure the safety of their employees at work. Health professionals and emergency responders, therefore, have the right to be protected from the hazards associated with a chemically contaminated victim. The toxic effects of many chemicals have not been fully characterised, making a realistic risk assessment for every situation difficult.
- Environmental receptors [7]: Disposal of the contaminated victim by cremation or burial may have a negative impact on the atmosphere or water systems, depending on the number of bodies and the type of chemical involved.
- Facilities and resources [1,2,8]: Secondary contamination from a chemically contaminated victim can result in a serious impact on healthcare facilities and resources. Events such as the closure of A&E departments and mortuaries may have significant repercussions and may have a knock-on effect on other facilities and people. This eventuality places additional pressure on health professionals and emergency responders having to work for extended periods of time under these difficult conditions. Lack of specific resources, such as chemical-resistant body bags or knowledge/database of local resources creates confusion. It increases the time taken to efficiently manage these incidents and may place economic pressure on the organisation involved with the incident (related to the closure of key facilities, decontamination requirements and the use of personal protective equipment).

Defining a draft process of management of chemically contaminated bodies

The process of managing the chemically contaminated victim has six major components that need to be considered when defining guidance:

- Defining roles and responsibilities during the process
- Identification of the chemical agent and potential for secondary contamination
- Decontamination and containment of the chemically contaminated bodies
- Transportation of chemically contaminated bodies
- Temporary storage of chemically contaminated bodies
- Disposal of chemically contaminated bodies

Efficient management at each stage will ensure that the chemically contaminated victim is handled to prevent associated secondary contamination and adverse health effects. Figure 1 highlights the process and issues to be considered at each stage. This research [1] is the first major attempt to identify a strategy to manage chemically contaminated victims. The research [1] undertaken has indicated a significant need for further research to provide superior, complete guidance.

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Table 1: Characteristics and Situations that may lead to Secondary Contamination

PROPERTY	SECONDARY CONTAMINATION HAZARD
A) Residual material on clothes/skin of the victim	Residual chemicals on the clothing or body of the victim may produce toxic emissions. The Crymlyn Burrows Incident: Two local authority workers found immersed in sewer sludge. Bodies were covered in sludge containing chlorinated hydrocarbons and were giving off noxious vapours. Three hundred people suffered secondary contamination and adverse health effects.
B) Ingestion of large quantities of solid or liquid substances that do not rely on physiological processes to generate toxic compounds	Generation of a toxic gas/compound from a solid substance (usually from contact with water, acid or alkali). Victim may continue to produce toxic compounds even after death, when enzymatic, physiological processes cease. Body fluids, such as vomit, may also be contaminated and emit toxic fumes.
	Phosphine Suicide Incident: Ingestion of solid aluminium phosphide lead to production of toxic phosphine gas in the gastric environment, and off gassing of these fumes from the body and body fluids. The A&E department had to be evacuated and decontaminated and was unavailable for routine use for 15 hours.
C) Agents capable of permeating routine safety equipment (such as latex gloves)	Certain chemicals, such as organic lead and mercury alkyls are capable of permeating standard protective equipment, such as latex gloves. The toxic and persistent nature of this chemical and its ability to be absorbed directly through the skin means that it is fatal in small doses and that adverse health effects are not immediately obvious.
	Dermal Absorption of Dimethylmercury: Scientist exposed to single drop of dimethylmercury died a few months later. The substance permeated latex gloves worn by the victim at the time of exposure. Absorption of small quantities of mercury or lead alkyls would be hazardous to those handling the victim.
D) Substances that do not cause immediate adverse health effects or have no obvious indicators of presence	Hazards may be unsuspected, as those in contact with the victim may only exhibit adverse symptoms at a later time. Personnel may no be aware of chemical in the absence of obvious indicators, such as smell or immediate adverse health effects

An incident does not need to be a mass terrorist chemical fatality event to have an impact on human health and resources. The negative impacts, as encountered with these cases, will be significantly greater in the event of a mass fatality chemical incident, particularly if the chemical involved is persistent and highly toxic.

Figure 1: Draft process of management of chemically contaminated bodies

Chemical Incident

Awareness of the potential of secondary contamination from chemical incidents.
Intentional Release (Terrorist attack, suicide) or Unintentional Release (Industrial accident).

Fatalities

Identification of Chemical Agent

Identification by detectors or colorimetric test kits.
Tentative identification by type and location of incident e.g industrial accident or suicide.
Tentative identification from clues at scene of the incident.

Consultation with Coroner and Relevant Authorities

Coroner has authority over the body and therefore authorisation required prior to any movement of the victim.
Consultation with the Police Service will be essential, especially in the event of criminal investigation.
Consultation with other authorities such as Occupational Health, Poison Units and Burial and Cremation Authorities may provide useful information during the process.

Decontamination and Containment

It may not be the efficient or economically viable to decontaminate a singe fatality, containment may be the best policy.
Decontamination of mass fatalities at a large scale event may be more feasible.
Decontamination is superficial and there may still be risks associated with internal organs of the body.
Containment of hazard in specialised gas tight chemical resistant body bags.
Bags are designed to be resistant to certain chemicals, but permeation will occur. Rates of permeation will vary for different chemicals.

Transportation

Transportation by refrigerated vehicles considered better than ambulances.
May be procured either by prior arrangement or at the time of the incident.
Awareness/Database of local facilities and availability of such vehicles essential.

Temporary Storage

Refrigerated vehicles may be used as temporary storage units, depending on the number of fatalities. These are a good option as they are mobile and easy to secure. Fate of the vehicle subsequent to use will need to be determined (destruction or decontamination)
Pallets will be required for the bodies to prevent freezing to the refrigerated surface.

Disposal

Burial

- Airtight, metal coffins are encouraged
- Charcoal in coffin or to line grave
- Burial within chemical resistant body bag
- Burial depth and location determined with respect to potential receptors, such as ground water. Consultation with the British Geological Survey in this regard is encouraged
- All personnel involved in disposal should wear the correct PPE

Cremation

- Cremation in chemical resistant body bag
- Chose a crematorium in a remote area to reduce the number of human receptors as the risk will be associated with an acute release of fumes
- Ensure the crematorium is fitted with the regulation air filters to reduce emissions
- Cremation of a single body at a time is only possible in UK facilities, therefore may not be a feasible option in the event of mass fatalities
- Ashes should be collected and sealed in an airtight container as they may contain residual chemicals (this will vary with the nature of the chemical involved)
- All personnel involved in disposal should wear the correct PPE
- Decontamination of the crematorium will need to be considered

Environmental Response

IPPC update

Dr Pat Saunders, Chemical Hazards and Poisons Division

1 Introduction

The Division is committed to ensuring that the HPA can meet its commitments to provide support to PCTs and others in assessing the public health impact of IPPC processes and to establishing and monitoring quality standards for this input. It is vital that HPA input is independent of the Regulators, evidence-based and consistent. The importance of these values has been demonstrated recently in dealing with a number of highly contentious applications, including a hazardous waste site and the burning of recycled liquid fuels in cement kilns. HPA input in the former led to the application being refused (the first such refusal) and in the latter, permission being granted to run a trial despite vigorous local objection. In addition, there have been two key recent developments in IPPC management:

- Publication of guidance for PCTs and Local Health Boards on IPPC (http://www.hpa.org.uk/hpa/chemicals/IPPC.htm);
- Appointment of three new staff for an Environmental Health and Risk Assessment Unit based at Divisional HQ.

2 IPPC Guidance

The IPPC guidance has been through a vigorous and extensive peer review and consultation process. These guidelines/standards will be modified in light of experience and formally reviewed annually and will form the basis of performance standards.

3 Environmental Health and Risk Assessment team

An Environmental Health and Risk Assessment (EHRA) unit is being established at Divisional HQ, comprising a Head (Patrick Saunders currently in acting role) and three scientists. The unit has a responsibility to develop the environmental health resource of the Division, including supporting the HPA and others in providing an IPPC service to the Health Service. The IPPC burden, by its nature, is cyclical and the HPA has to contend with surges of demand. A number of services have developed in England and Wales to support the NHS and there will be regional variations in demand as some process sectors cluster geographically. The EHRA will support local units at times of peak demand, enabling an effective and efficient HPA service.

4 Performance Standards and Auditing

The existing IPPC network will be used to develop audit standards based on the IPPC guidance document and as an informed means of sharing experience and best practice. A peer review panel is being established to oversee the auditing of HPA responses and to provide expert support to units, including arbitration if necessary in cases of disagreement. Senior figures from the Regulators have already agreed to participate.

An on-line database to include details of applications, anticipated demand and other issues is also being established. The database will enable each unit to post real demand and predicted surges/cases for special support.

5 Training

There is currently no recognised qualification or training for professionals working in IPPC. A variety of disciplines are working in the field, including EHOs, environmental scientists, medical staff and marine toxicologists. A set of appropriate learning objectives and a programme to deliver the objectives are being developed. It is anticipated that the course will be delivered over two days and accreditation will be sought from the Chartered Institute of Environmental Health and Faculty of Public Health.

Evaluating human health risk assessment

Southampton, 9-10 December 2003

Environment Agency (EA), Chartered Institute of Environmental Health (CIEH) and the Department for Environment, Food and Rural Affairs (Defra)

Adrienne Dunne, Environmental Scientist, Chemicals and Environmental Team HPA, East Midlands
Charlotte Grey, Environmental Scientist
Chemical Hazards and Poisons Division (London)

Course Format

An intensive two-day course on the Contaminated Land Exposure Assessment (CLEA) model developed by the Environment Agency (EA), in conjunction with the Chartered Institute of Environmental Health (CIEH) and the Department for Environment, Food and Rural Affairs (Defra) took place in Southampton on 9th and 10th December 2003. It provided a general overview of how human health risk assessment techniques should be applied when dealing with land affected by contamination.

The course integrated lectures with supporting seminar-groups. This interactive style left the delegates with a feeling of hands-on experience, the confidence to apply Contaminated Land Exposure Assessment (CLEA) theory and the capability to review and analyse site assessment reports written by third parties once back in the office.

Course Content

In March 2002, Defra and the EA published a series of reports and guidance providing a scientifically based framework for assessing the risk to human health from land contamination based on existing or intended use of that land. This package, known as CLEA, consists of four main reports (Contaminated Land Report- CLR 7, 8, 9 and 10), supporting toxicology reviews and Soil Guideline Values for individual chemicals. CLEA aims to provide a coherent and consistent approach for assessing the risks to human health from contaminated soil, and is typically used to support Part IIA of the Environmental Protection Act 1990 and the Town and Country Planning Acts, the legislative instruments available to Local Authorities for dealing with contaminated land.

In the UK, the main tool for assistance in human health risk assessment with respect to contaminated land is the CLEA model. This model can be freely downloaded from the Defra website [1]. As with any model, it requires some user input such as site characterisation, levels of contaminants, potential pathways and receptors. The CLEA model is then able to estimate contaminant intake from soil as a function of the contaminant concentration and the potential exposure of adults and children living, working and playing on potentially contaminated land.

The Principles behind CLEA

The definition of contaminated land as set out in Part IIA of the Environmental Protection Act 1990 is based on the principle of risk and the probability of significant harm occurring as a result of chronic exposure. In order for significant harm to occur, there needs to be three elements: a source, a pathway and a receptor, and a link between these must be strongly established (see Figure 1). Source is the contaminant in, or under the ground, which has the potential to cause harm.

Pathway is the route by which a receptor could/ or is exposed to or affected by the contamination. For example, vegetables may uptake contaminants from soil, followed by a receptor ingesting contaminated vegetables and contaminated soil adhered to them. Receptor is defined as a living organism, a group of living organisms, an ecosystem or a piece of property, which is being, or could be harmed by a contaminant. For example within CLEA, receptors are considered to be human beings that are or could be harmed by a contaminant, of particular concern are susceptible sub-groups of the population, such as young children between 0-6 years old.

A series of Soil Guideline Values (SGV's) have been derived by comparing the calculated contaminant intake against Tolerable Daily Intake or Index Dose (see Table 1). These represent 'intervention values' which indicate to an assessor that soil concentrations above this level could pose an unacceptable risk to the health of site users. SGVs have been developed for a series of standard land uses (e.g. residential (with and without vegetable growing), allotments and

Figure 1: Typical exposure pathways considered within CLEA 2002 [2]

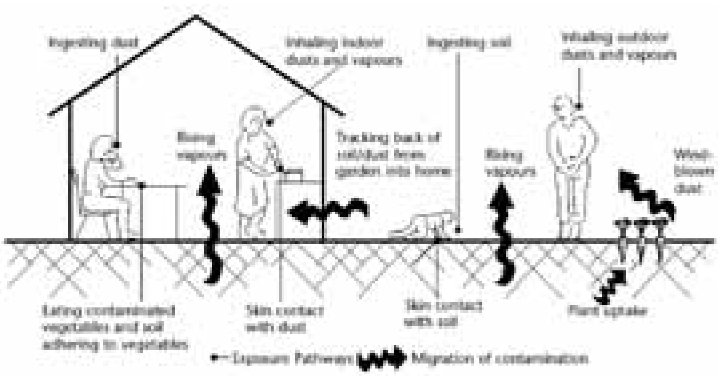

Table 1: Soil Guideline Values (mg/kg) [3]

Contaminant	Standard land uses considered within CLEA			
	Residential		Allotments	Commercial/ Industrial
	With plant uptake	Without plant uptake		
Arsenic	20	20	20	500
Cadmium	1-8*	30	1-8*	1400
Chromium**	130	200	130	5000
Inorganic Mercury	8	8	15	480
Nickel	50	75	50	5000
Lead	450	450	450	750
Selenium	35	260	35	8000

* pH dependant
** Assumes all Chromium is Chromium VI

commercial/ industrial). Non-standard land uses (e.g. playing fields) may require Site-Specific Risk Assessments (SSRA). It should be noted that the sensitivity of the CLEA model is limited as only superficial site-specific changes can be made, such as changes to soil pH, the critical receptor and the exposure pathways considered, therefore it cannot unequivocally function as a human health SSRA tool.

Limitations

What must be remembered is that CLEA is not a panacea for assessing risk to humans from contaminated land in the UK. The development of the CLEA model and generation of SGV's is ongoing. But for those who use CLEA it is essential to be able to recognise and understand its limitations. Perhaps the principal drawback to the model is that it only covers a limited number of contaminants. To date only seven SGV's have been produced, for arsenic, cadmium, chromium, mercury, nickel, selenium and lead (see Table 1). Toxicological reports including Tolerable Daily Intakes and/ or Index Dose are also available for benzo(a)pyrene, inorganic cyanide, phenol, benzene and dioxins, furans and dioxin-like PCBs. Even where a SGV has been published it should only be used if the assessor is satisfied that the conditions assumed in its derivation are appropriate for the particular site.

In some cases where no SGV has yet been developed, in order to consider the risk from other pathways or to assess the risk to non-human receptors within a SSRA, there may be a need to apply guidelines or models that have been developed in other countries. These include Dutch Intervention Levels, US EPA Soil Screening Levels (SSL) and the Risk Based Corrective Action (RBCA) model. However, these will have been developed and derived differently to CLEA, making it essential to know the legislative context for which the models were developed, as well as the toxicological approach, and pathways and receptors used to derive any assessments. To use a non-UK developed model for valid assessments in the UK it must be adapted to take into account UK policy.

Further information:

CLEA Reports available from Defra website:
http://www.defra.gov.uk/environment/landliability/pubs.htm#new

References

[1] (www.defra.gov.uk/environment/landliability/clea2002.htm).
[2] Taken from Department for Environment Food and Rural Affairs, The Contaminated Land Exposure Assessment (CLEA) model: Technical Basis and Algorithms, CLR10, DEFRA/EA (March 2002)
[3] Taken from Department for Food and Rural Affairs, Soil Guideline Value Reports: SGV1 Arsenic, SGV3 Cadmium, SGV4 Chromium, SGV5 Inorganic Mercury, SGV 7 Nickel, SGV 9 Selenium, SGV10 Lead

Exercises

Exercise Ellesmere Port 2: Cloudburst

Matthew Drinkwater, Chemical Hazards and Poisons Division (London)

Figure 1: CHaPD (London) was invited to observe the work of the Health Advisory Group (HAG). ©CHaPD (London) 2004

On Friday 2nd July 2004, the Cheshire Multi-Agency Control of Major Accident Hazards (COMAH) Planning Group ran Exercise Ellesmere Port 2 to test Cloudburst, a multi-agency plan for response to accidents at a COMAH site.

Box 1 - Control of Major Accident Hazards

COMAH legistlation applies mainly to the chemical industry, but also to some storage activities and other industries where threshold quantities of dangerous substances identified in the Regulations are kept or used. The legislation exists to ensure measures are taken to prevent major accidents and to limit the consequences should an accident occur. This includes the operator taking measures to prevent major accidents by undertaking a risk analysis to understand and predict the circumstances that might lead to a major accident and the potential consequences of such an accident http://www.hse.gov.uk/comah/

Exercise Ellesmere Port was a major exercise with four components: a simulated accident at the Shell UK Stanlow site, a simulated multi-agency Silver command at the Police Headquarters (HQ), a simulated Local Authority tactical command at the Ellesmere Port & Neston District Off -Site Emergency Centre (DOSEC) and health tactical command centres, set up by the Health Protection Agency (HPA), the Strategic Health Authority, Acute Trust and Primary Care Trust (PCT).

Box 2 - District Off-Site Emergency Centre (DOSEC)

Under the Cloudburst plan DOSEC is where, during the acute phase of the incident, the Local Authority will provide support to the Joint Tactical – Silver command. Once this phase is over, DOSEC's role is to manage the return to normality for the community. The DOSEC included a Health Advisory Group (HAG).

The exercise involved an accidental release of hydrofluoric acid to atmosphere at the Shell site. Initially reported as a single leak, it later became clear that the leak was ongoing and casualty figures rapidly rose from single to triple figures.

Box 3 The Health Effects of Hydrofluoric acid [1]

- Hydrofluoric acid is a colourless to almost colourless fuming liquid that is extremely corrosive and has a strong pungent odour, and is gaseous (hydrogen fluoride) at room temperature.
- All routes of exposure to hydrofluoric acid may be fatal; all exposures must be taken seriously.
- It can cause severe burns to any tissue it comes into direct contact with.
- Inhalation exposures may lead to severe respiratory irritation and pulmonary oedema that may be immediate or delayed.
- Systemic effects are possible from all routes of exposure, but are most likely from oral and dermal routes. It is toxic by all routes; depresses the CNS; inhalation may cause coughing, choking, hoarseness and shortness of breath.
- Effects include electrolyte imbalances, particularly hypomagnesaemia and hypocalcaemia, which can lead to cardiac arrhythmias and cardiac arrest.

Uses include the cleaning of cast iron, copper, brass; removing efflorescence from bricks and stones; frosting and etching of glass and enamel; polishing crystal glass; decomposing cellulose; increasing the porosity of ceramics; enamelling and galvanizing iron. [2]

The role of the HAG was to provide health advice to the Police Silver Commander. Unfortunately, he was located in another building. This meant that health advice from the HAG to the Police Commander had to be communicated by telephone and fax.

The restriction of communication to these methods was the cause of an early misunderstanding. Initially, Silver command instructed Bronze commanders to tell those in the plume to shelter (Go in, Stay in, Tune in). However, news at the HAG that some people had reported adverse health effects inside their homes led them to advise the Silver command that if this was the case evacuation should be considered. Amongst the confusion of the exercise, the nuance of this message was misunderstood, and there was ongoing discussion between Silver command and the HAG on whether evacuation had been recommended.

Communication is regularly identified as an issue of concern following exercises. However, it is often difficult to identify mechanisms to improve it. This was not the case here. The debrief clearly recommended that the HAG be moved to Silver command, where the Police Commander could communicate face to face with the HAG Chair.

Figure 2: Observation the work of the Health Advisory Group (HAG) as the incident progressed © CHaPD (London) 2004

An occupational health physician working for Shell proved a good source of information to the HAG. However, his initial location in a separate room meant that his expertise was not initially available. The movement of the occupational health physician into the HAG would be of great assistance.

Exercise Ellesmere Port 2 was a huge success. The scenario fully tested the HAG and presented a great opportunity to observe health's role in a pressured emergency context requiring rapid decision-making with minimal information.

References

[1] Chemical Hazards and Poisons Division (London) Incident Response Handout

[2] Merck & Co. Inc. 2001. The Merck Index – An Encyclopedia of Chemicals, Drugs and Biologicals, 13th edition.

Exercise Magpie – A simulated release of sarin in Newcastle Civic Centre

Matthew Drinkwater, Chemical Hazards and Poisons Division (London)

On Wednesday 28th April, the Health Protection Agency's (HPA) Emergency Response Division (ERD) ran Exercise Magpie, a simulated deliberate release of the nerve agent sarin in Newcastle Civic Centre.

Box 1: Sarin [1]

- Sarin is a chemical warfare agent that is colourless and odourless in its pure form
- It is a typical organophosphate cholinesterase inhibitor which has a rapid onset of action
- Effects from exposure can be divided into three types:
  1. Muscarinic (parasympathetic) effects: Bradycardia, bronchospasm, bronchorrhoea, sweating, salivation, lacrimation, vomiting, diarrhoea and constricted pupils may occur.
  2. Nicotinic (motor and post-ganglionic) effects: Tachycardia, hypertension, muscle fasciculation and cramps, weakness and respiratory paralysis may occur.
  3. Central Nervous System: CNS depression, agitation, confusion, psychosis, delirium, coma and convulsions may occur; the CNS effects may be slowly reversible or irreversible.
- The constricted pupils and subsequently blurred vision can persist for several months
- Death is usually due to respiratory insufficiency and paralysis

Exercise Magpie consisted of three concurrent programmes: a field exercise, a table-top exercise and an observer programme. Whilst it was designed specifically to test the health service's response to a terrorist incident, the exercise was a multi-agency event involving the participation in the field and table-top exercises of all the blue light services.
During the course of the day-long exercise, 197 volunteer casualties were decontaminated at the Civic Centre site. Ambulant casualties were decontaminated by the Fire & Rescue Service, through a New Dimension Mass Decontamination Unit. Nine non ambulant casualties were decontaminated by the Ambulance Service, which then converted its decontamination units to process ambulant casualties in support of the Fire & Rescue Service.

The ability of the Accident and Emergency (A&E) Department of the designated receiving hospital, Newcastle General Hospital (NGH), to receive casualties from the incident whilst maintaining normal services was also tested. Nine stretcher cases and 21 ambulant casualties were transported to, and processed by, NGH A&E, Department where the hospital's decontamination unit and procedures were successfully deployed to deal with six potentially contaminated self-presenters.

To ensure that the wider health community was tested, the exercise spread further with "worried well" members of the public presenting at two GP surgeries in Newcastle and the Minor Injuries Unit at the Royal Victoria Infirmary. In tandem with this, Newcastle Primary Care Trust and Newcastle-upon-Tyne Hospitals Trust activated their major incident plans and control rooms.

The Chemical Hazards and Poisons Division (CHaPD) London, Chiltern, Newcastle and Cardiff were strongly represented at all three levels of the exercise and staff from the Division fulfilled diverse roles. CHaPD

Figure 1: Volunteer casualties queuing to enter mass decontamination units © ERD, Health Protection Agency, 2004

Figure 2: Firefighters in gas tight suits. © ERD, Health Protection Agency, 2004

provided essential technical advice in the Joint Health Advisory Cell (JHAC), acted as umpires at the table-top exercise, participated in the observer programme and provided high-level assistance and advice in the field exercise.

Exercise Magpie was a high-profile event held in the centre of a major English city in full view of the public and the media. Both organisers and participants were mindful of this during the exercise.

In the event, the response of the media and public was positive and understanding. This reflects the response to the Osiris II exercise at Bank Tube station in London and generates the impression of a wide acceptance of the need for such exercises post 11th September.

The exercise was followed by a detailed debriefing process. An executive summary with full details of lessons identified from Exercise Magpie is available from the HPA's website.

Figure 3: The Ambulance Service erecting showers
© ERD, Health Protection Agency, 2004

References:

[1] Nerve agents, Guidelines for action in the event of a deliberate release, Department of Health
http://www.hpa.org.uk/infections/topics_az/deliberate_release/chemicals/nerve_agents.pdf

Planning for a live casualty exercise involving decontamination at hospital

JJM Black
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John Radcliffe Hospital
Oxford

Introduction

This article focuses on the preparing, planning and running a live casualty exercise following experienced gained after an exercise run in Oxford in November 2002. This primarily assessed modifications to our hospital's major incident plan to quickly manage contaminated mass casualties self-presenting to hospital.

All acute hospitals in the UK were instructed by the Department of Health in October 2001 to revise their hospital's major incident plans to accommodate mass casualties in the light of the tragic events of September 11th. For us, this principally involved developing systems to secure the emergency department and hospital site rapidly, identifying suitable patient-holding and decontamination areas on, and adjacent to, the hospital site, and then designing a new patient journey from these areas to the Emergency Department (ED) and survivor reception areas within the hospital. A major learning point was the need for the hospital to be managed by the hospital staff and all the emergency services as a secondary major incident site. The lessons learnt have previously been reported [1].

It is important to consider at the outset what level of disruption the hospital can cope with, and whether it will be necessary to curtail any scheduled or emergency care, dependent on the scope of the exercise. We elected to terminate the exercise for the casualties post-decontamination on arrival at the emergency department, hospital wards, or survivor reception areas.

Every consideration should be given, if possible, to joint participation of other external support agencies, for example Local Authority, Emergency Services, and Public Health, as these exercises present an invaluable opportunity for joint training as well as providing an assessment of plan development for such incidents. With multi-agency input in the exercise planning this should be feasible. We took the opportunity on this occasion and subsequently to test the Thames Valley Police response in helping to secure the hospital site while wearing class A personal protective equipment (PPE). Mass decontamination facilities were set up at a predetermined site (hard standing) in the hospital grounds by our Regional Fire Services, and our Ambulance Service colleagues undertook clinical decontamination, in parallel with the Fire Service to support NHS staff in the decontamination of seriously injured/poisoned casualties (figures 1&2). It is important to distinguish between training objectives and assessment aims for such exercises. Finite resources may preclude the opportunity to achieve such objectives on separate occasions.

Exercise Aims

- It is important to have a clear aim and list of objectives that you wish to assess and ensure, as far as possible, that your exercise will actually assess this.
- It is important to have an appropriate exercise script that defines a time log of key events for the exercise. We used the same multi-disciplinary team that was brought together to advise in the writing of the new mass casualty plans, which included:
  - Regional and hospital Health Emergency Planning Officers
  - Emergency Department senior medical and nursing and administrative staff with a background interest in, and lead responsibility for, major incident planning
  - Consultant in Communicable Diseases Control and Public Health teams
  - Infection control teams
  - Microbiology/haematology/blood transfusion/biochemistry and medical physics senior clinical and technical laboratory staff
  - Hospital estates and facilities managers, including hospital switchboard, security and portering managers
  - Fire, Police, and Ambulance Service representatives from the regional tactical working group for CBRN incidents, including New Dimension and UK Resilience
  - Advice was sought from the Health Protection Agency and its Chemical Hazards and Poisons Division, which included a site visit prior to the exercise
  - Hospital's media/communications team

Exercise script

Key components:

- Briefing and tasking of exercise participants by exercise director(s)
- Exercise initiation
- Time line for principle exercise feeds
- Defined roles and locations for:
  - Exercise Director(s)
  - Players (mock patients and hospital staff in role)
  - Observers (multi-agency experts with defined role in collecting and logging exercise activity)
  - Spectators (interested multiagency passive observers with no defined exercise role).

Triggers and code words for initiation, suspending and ending the exercise, should be agreed and disseminated at pre-exercise briefings.

It is essential that all exercise participants wear clearly labelled tabards (ideally colour-coded) that would be used in a live incident.

Observers should be provided with log sheets and clipboards to accurately record log of key events / problems. Consideration should be given to the additional use of photographers and video cameramen from the emergency services and the hospital's medical illustration departments to record activity at key locations (Figure 4).

Exercise components that may require specific expert observation/assessment:

- Hospital command and control
- Safety Communications (for both players and exercise directors), and with external agencies

Figure 1: Senior hospital managers briefing the media on exercise progression – a valuable opportunity to educate the public on the hospital's response to such incidents. © John Radcliffe Hospital

- Incident assessment
- Triage, containment and disrobing of casualties
- Decontamination
- Pre- and post- decontamination emergency treatment (e.g. antidote administration)
- Transport to definitive care (ED) and survival reception centres
- Media management (Figure 3)

Debriefing

- The **players** should be collectively debriefed immediately after the exercise and encouraged to submit a written report of observations to a named individual. We intentionally asked both clinical and non-clinical members of the hospital staff to volunteer as patients. It is important that the exercise directors wrap up the morning, commenting on the value of the exercise and expressing thanks to the very large numbers of people who have been involved, especially the patient volunteers. It may be useful to share one or two key immediate lessons with all the participants at this early stage, but focus predominantly on the positive points.
- Ask all **observers** to submit written record and log sheets to a named individual and encourage them to attend an observer debrief within a few weeks of exercise to collate observations and prioritise recommendations. Ideally agreement should be sought from the observers to participate in a debrief prior to the exercise date, as this will be essential to effectively enhance future plan development.
- **Directors** should agree to collate all the responses and to oversee further development and refinements to the core plans, and to ensure their implementation. It would be desirable to disseminate the lessons leant with adjacent hospitals within the region. Further joint agency exercises, both table-top and live casualty, should be organised to test that the modifications to the plans are practical and appropriate. Ideally uniform decontamination training programmes should be developed regionally (hospital and Ambulance Service) to ensure that all health staff involved in such incidents approach these incidents in the same way. Joint training is essential for successful management of these complex incidents.

The Fire Service New Dimension team can have a key role in the development of hospital site-specific plans, coordination and liaison role between hospitals, and the coordination of mutual aid in a large incident.

The hospital's intranet (a major incident website) may be an ideal medium to store and update the hospital's chemical plans as such a site will be potentially accessible by staff in all areas of the hospitals. It may also be an ideal location to store individual departmental action cards, which could be printed out in an emergency. Educational training packages and aide-memoires for the use of the PPE could also be usefully accessed at such a site, to facilitate refresher training for individual members of staff for exercises and during live incidents.

Reference

[1] Black JJM. Exercise Alex: lessons learnt from live casualty exercise involving contaminated and injured patients self-presenting to hospital. Chemical Incident Report. 2003; 28; 16-19.

Figure 2: Expert 'observers' logging decontamination exercise activity © John Radcliffe Hospital

Book reviews

Jane's Unconventional Weapons Response Handbook

J Sullivan, R Bunker, E Lorelli, H Seguine, M Begert
First Edition, Jane's Information Group, USA, 2002.

Francesca Garnham
Specialist Registrar in Emergency Medicine,
University College Hospital, London

Jane's Unconventional Weapons Response Handbook is a guidebook designed to help first responders plan and manage incidents involving less commonly found threats in the prehospital setting. It is part of a series of handbooks on subjects such as mass casualty management and chemical and biological weapons. This handbook is divided into sections on pre incident planning, weapon types, incident types and post incident management. Clear descriptions of a variety of weapons, including improvised explosive devices, conventional military weapons, radiological weapons, lasers and radio frequency weapons, are provided along with photographs to help first responders to identify them. Although, as pointed out in this handbook, it is not the role of the first responder to identify these weapons, minimum safe distances are mentioned for the majority of the weapons, which is important so that the first responders can ensure that they remain at a safe distance. Jane's Unconventional Weapons Response Handbook provides a strategy for responding to deliberate use of these weapons.

This is a very interesting publication that provides sensible information on a subject that may not be familiar to many first responders in Great Britain. Unfortunately, in its current form, the handbook refers to the relevant authorities in the USA and would be more useful in this country if it were adapted to the UK agencies and systems. Parts of this handbook are very repetitive and although the index system is fine once you are familiar with the book perhaps a traditional index at the rear would be helpful if this text is aimed at first responders who might be anxiously trying to find clear guidelines at the time of an incident.

Overall this handbook highlights the important aspects of incident management peculiar to these types of threats but does not provide specific health guidance on most of the scenarios.
For more information on this series of handbooks email: info@janes.co.uk

Jane's Mass Casualty Handbook: Hospital emergency preparedness and response

Barbera JA and Macintyre AG (Eds).
First Edition, Jane's Information Group, USA, 2002.

Francesca Garnham
Specialist Registrar in Emergency Medicine,
University College Hospital, London

Jane's Mass Casualty Handbook is a guidebook designed to help prepare and manage incidents involving large numbers of casualties. It is part of a series of handbooks on subjects, such as unconventional weapons response and chemical and biological weapons. This handbook is divided into sections on the role of the hospital, emergency planning within the hospital and relevant aspects of specific events such as explosives, chemicals and radiation and biological events.
This is an excellent publication that suggests a sensible "all hazards" approach for hospitals to manage staff, patients, public, press and the actual incidents leading to the increased attendances. Each chapter very clearly addresses the different aspects of management in a very thorough manner for such a small handbook. The only criticism of it in its current form is that the agencies and comments on finance are not appropriate for the UK, but overall this handbook is very good.
For more information on this series of handbooks email: info@janes.co.uk

Chemical Hazards and Poisons Division

Health Protection Agency Conference & Provisional Training Days 2004

7th – 8th December 2004
CHaPD International Conference on "Childhood Exposure to Environmental Chemicals: Implications for Public Health". Hilton Cardiff, Cardiff, Wales, UK.
For further details call 029 20 416 388,
email chemicalconference@hpa.org.uk.

The Chemical Hazards and Poisons Division recognises that training in non-infectious environmental hazards is a priority. A programme of work is being prepared. The current plans are to continue with our training programme with flexibility to support local and regional initiatives as requested.

Training Days - London

28th September
Contaminated Land

Land incidents are either acute events (leaks, spills etc) or chronic long-term contamination issues (waste disposal, abandoned factory sites etc) that have resulted in chemical contamination of the soil and present, or have the potential to present, a risk to human health. It is anticipated that this training day should provide delegates with the tools and information required to provide an appropriate and timely response to chemical incidents that result in land contamination.

(For Consultants in Health Protection, CsCDC, CsPHM and Specialist Registrars in Public Health Medicine and Local Authority Environmental Health Officers).

26th October
How to Respond to Chemical Incidents

This basic one-day course is an introduction to chemical incident response. The course aims to make you ‘safe’ on call. Topics covered include a review of recent chemical incidents and lessons learned; sources of information, checklists and other guidance and decontamination, sheltering and evacuation and other issues. The day will include case studies and exercises.

(For all on the on-call rota including new PCT DsPH, other generic public health practitioners, Accident and Emergency professionals, paramedics, fire and police, and environmental health).

10th November
Coastal Oil Spills
(For Consultants in Health Protection, CsCDC, CsPHM and Specialist Registrars in Public Health Medicine and Local Authority Environmental Health Officers).

30th November
Ethical Issues for Environmental Management
(For Consultants in Health Protection, CsCDC, CsPHM and Specialist Registrars in Public Health Medicine).

Those attending CHaPD (London) courses will receive a Certificate of Attendance and CPD/CME accreditation or points

Places will be confirmed as reserved upon a receipt of a £25 deposit to cover lunch and administration costs. For those working in organizations outside the Health Protection Agency a charge of £100 for attendance at each course will be made.

For booking information on these courses and further details please contact Amber Groves on 0207 771 5383

CHaPD staff are happy to participate in local training programmes. Please call Virginia Murray on 020 7771 5383 to discuss.

Training Days – Cardiff

28th September 2004
Training Day for National Public Health Service for Wales. The Metropole, Llandrindod Wells, Powys, Wales. For further details call 029 20 416 388

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Chemical Hazards and Poisons Division Hotline: 0870 606 4444

Available to Government Departments, allied Agencies and Organisations, First Line Responders, the NHS and other HPA Divisions.