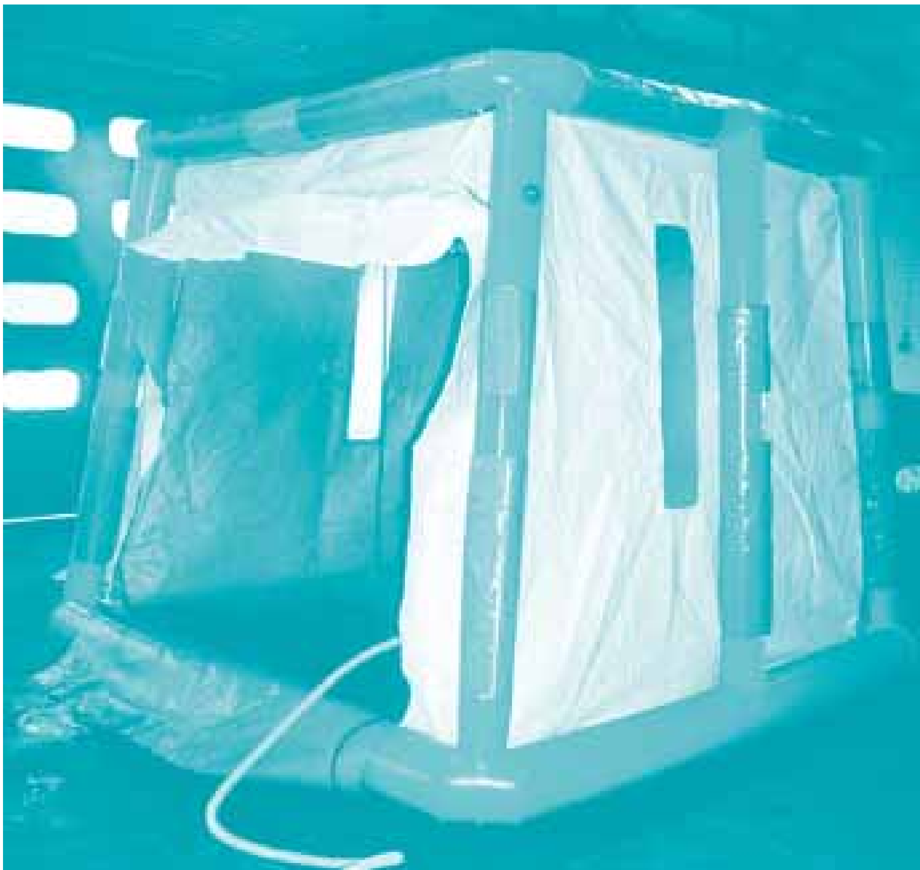
Chemical Hazards and Poisons Report

From the Chemical Hazards and Poisons Division

May 2005 Issue 4



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Editorial

Professor Virginia Murray
Chemical Hazards and Poisons Division (London)
Editor Chemical Hazards and Poisons Report

In this fourth Chemical Hazards and Poisons Report we report a series of recent incidents. These are the January flooding in Carlisle, a transport incident causing problems for an Emergency Department and a school closure resulting from potential chemical risks.

Emergency response issues are again identified as important. Articles cover the West Yorkshire early alerting programme, how to improve early triggers in Emergency Departments for chemicals, biological and radiation and concerns about leaking decontamination tents. A report from the London Resilience Team on their programme for handling fatalities from the Tsunami shows the need for a coordinated approach. Following the increase in deaths during the 2003 heat wave, a heat waves plan has been developed.

Three exercise reports are included. The first is a summary of the major international exercise of 2005, Atlantic Blue, which involved the US, Canada and the UK.

A series of articles on land contamination includes information from the Environment Agency on special sites. A report on a land contamination incident involving allotments demonstrates the need for identification of areas where the public health may be put at risk by soil contamination. The Merseyside Health Protection Unit have had considerable experience in responding to contaminated land issues and offer a useful approach that may help others. A review of contaminated land sites that are being identified in the North West offers a system and questionnaire to develop understanding of these issues elsewhere in the country.

The Chemical Hazards and Poisons Division (CHaPD) has been developing: two papers report on this work. One covers the transfer of responsibilities from the Department of Health to CHaPD and the other reflects research into skin as a route of environmental contamination transfer.

As always education and training remain high on the agenda for CHaPD and developments are reported. A new distance learning course on health emergency planning has been developed at the University of Manchester with support from the Health Protection Agency. Distance learning via a Doctors.net course, in collaboration with the HPA, has proved to be very effective in providing wide coverage of the country. An update on the CBRN training by the Emergency Response Division, Health Protection Agency is provided which links to the HPA web site. The back page of this Chemical Hazards and Poisons Report provides a summary of some of the courses we are proposing to run in 2005. Let us know if you would like us to consider other topics and in other areas outside London.

The next issue of the Chemical Hazards and Poisons Report is planned for September 2005. The deadline for submissions for this issue is July 1st 2005. Please do not hesitate to contact me about any papers you may wish to submit or if you have any comments on those in this issue by e-mail on Virginia.Murray@gstt.nhs.uk or call on 0207 771 5383.

I am very grateful to Professor Gary Coleman for his support in preparing this issue. I thank Dr James Wilson and Amber Groves at CHaPD, London for all their help in preparing this issue.

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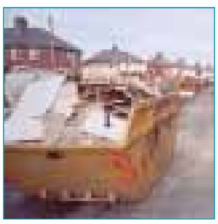
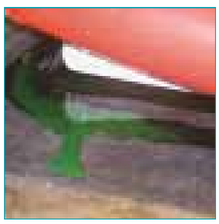


Recent chemical incidents

Chemical aspects of the Carlisle floods 2005

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Photograph 1: Flooding through the Willowholme Industrial Estate, Carlisle.

Introduction

Carlisle, in Cumbria, was subjected to severe flooding in the early hours of Saturday 8th January 2005. Approximately 200mm of rain fell in 48 hours accompanied by hurricane-force winds. Homes were affected from about 3.00am onwards and by 10.00am, 3,500 domestic properties and much of the city centre was flooded. Two thousand people were evacuated. The current estimated cost of the incident is in the region of £400m.

A county major emergency was declared and the Health Protection Agency was heavily involved in the acute response. The immediate health protection concern was protection of vulnerable members of the community who were flooded. To complicate matters, many properties also lost their electricity supply. Public health advice was given using a variety of media. Issues addressed included the risks from water-borne infections and food safety issues, for example the importance of hand hygiene and advice about frozen food that may have thawed out. As well as these biological issues, advice was also given about the possibility of chemical contamination most probably with fuel oils and diesel. On this, advice was sought from the Chemical Hazards and Poisons Division. This paper describes the chemical-related issues that arose from the incident.

Short Term Issues

Immediate advice on diesel oil contamination was distributed via local radio & TV, local press and the Health Protection Agency and Radio Cumbria websites. General practitioners were asked to look out for rashes, skin & mucous membrane irritation. No reports were made. Experience with previous floods showed a risk of carbon monoxide poisoning from space heaters, inappropriate i.e. indoor use of barbecues etc. Advice was given about this potential hazard.

Willowholme Industrial Estate

In the two weeks following the floods, there were some concerns expressed at public meetings in the west end of the city about the possibility of chemical contamination from flooding of a large industrial estate (photograph 1). GP-based surveillance at the time had failed to detect any potential chemical effects. This went some way towards reassuring residents but a great deal of public disquiet remained.

A site visit by the Chemical Hazards and Poisons Division was arranged so that a proper assessment of likely risks could be made (Photographs 2 and 3). The site visit confirmed the information obtained from local investigations that most of the industrial units were light engineering companies and motor-vehicle workshops. Initial advice about diesel, oil, etc was felt to have been appropriate. The local television station and newspaper carried features about the visit and appropriate reassuring public messages were delivered.

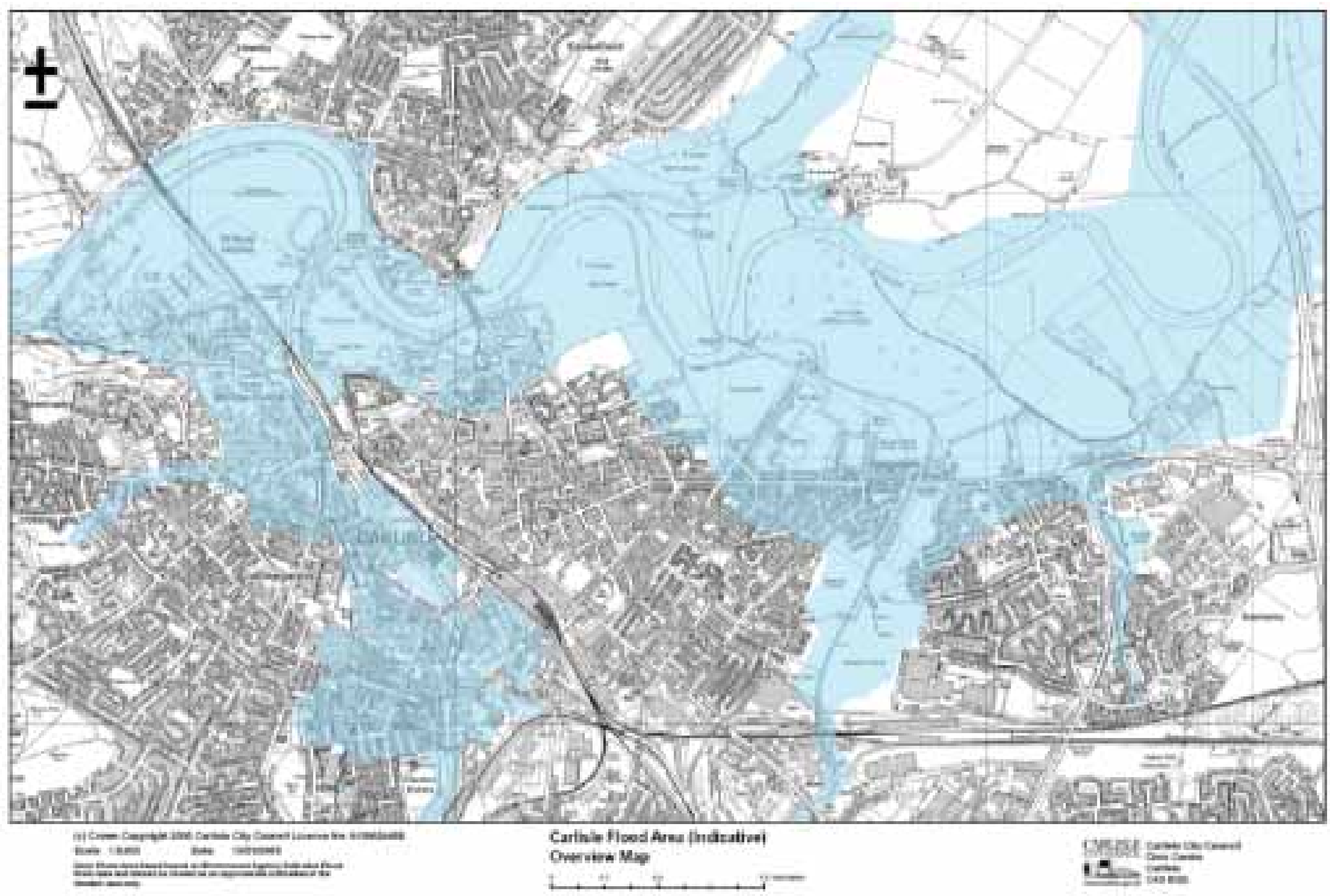
In addition to these low-hazard operations, one of the units in the industrial estate was operated by a chemical waste company. Additionally, the local council has a pesticide store. In the case of the chemical waste company, the site fortunately contained mainly domestic waste. Enquiries by the council showed that there were small amounts of waste solvents being stored but that these were all accounted for. The chemical inventory at the council's pesticide store was also accounted for.

Conclusion

Although the chemical effects from this flood appear to have been extremely minor, public concern meant that they had to be taken seriously. That an industrial estate, a waste water treatment plant and the main electricity substation for much of the Carlisle area were in the flood plain (Map 1), is an unfortunate accident of history as we may undoubtedly face floods on a more frequent basis in the future. It is therefore important to establish a full inventory of the processes taking place and chemicals stored on the Willowholme site, and to ensure that proper plans are in place. To this end, a multi-agency meeting has been arranged and will take place shortly.

Photograph 2: Skips containing flood damaged materials in a Carlisle street.
© Chemical Hazards and Poisons Division.

Photograph 3: Materials damaged by flooding.
© Chemical Hazards and Poisons Division.



Map 1: Area of Carlisle in the flood plain.

Chemicals in the drains, carbon monoxide poisoning or interpretations of laboratory results? Closure of a school in Lincolnshire

Dr Fiona Neely, SpR in Public Health on secondment to Chemical Hazards and Poisons Division (London) and Dr Andrew Rixom, SpR in Public Health, Newark & Sherwood PCT

Introduction

On Thursday morning 3rd March 2005 at around 10:45 hours, a year 11 pupil (age 15-16) participating in an art class in a secondary school of 700 pupils, began to feel unwell. In the remaining half hour of the lesson, the teacher and the teaching assistant also reported feeling unwell, describing a sweet, 'toxic' odour in the room (Art Room 1, Figure 1). There were also sixth form students passing in and out between art room 1 (AR1) and art room 2 (AR2) working on their exam assignments with a fast approaching deadline. Most pupils were working with water-based paints. One of the sixth-formers was working with polystyrene and PVA glue. Otherwise, no volatile substances were in use. The same odour was noted by a further teaching assistant joining the class at around 11:20 and shortly afterwards a further pupil began to feel unwell. At 11:35 all students and teachers were evacuated from AR1 and AR2.

The first three affected were immediately sent to the local A&E, with symptoms of nausea, dizziness, headache and lethargy. One pupil vomited and another complained of chest tightness. Over the next seven hours, seven more staff and pupils attended A&E with similar symptoms (apart from one asymptomatic 6th former).

Out of the total of 10 attendances that day, all were treated with 100% oxygen and nine were admitted with a working diagnosis of carbon monoxide (CO) poisoning. One teacher was discharged. Carboxyhaemoglobin levels were reported as raised and repeat results were in some cases higher than initial ones. The A&E department was part of a small rural hospital that had no laboratory and no paediatric beds. All blood samples and children under the age of 16 who required admission were sent to the District General Hospital 30 minutes drive away.

The local hospital declared a major incident at 19:30 hours and the police set up a silver command. Initial advice from the hospital physician was that all 700 pupils and staff would need to be contacted and asked to attend. The police then considered initiating a gold command. This was in part because of standard protocols that when three or more people at an incident have common symptoms from an unknown cause (the cause of the sweet, 'toxic' odour was as yet a mystery and the source of CO unknown) a malicious incident should be considered. There were also heightened sensitivities following the possible release of a chemical in a nearby shopping mall the week before.

Over the next three days four further pupils attended local A&E departments complaining of similar symptoms. Three were admitted, assumed to have carbon monoxide poisoning, including one with concomitant tonsillitis and pyrexia. Table 1 summarizes the incident timeline.

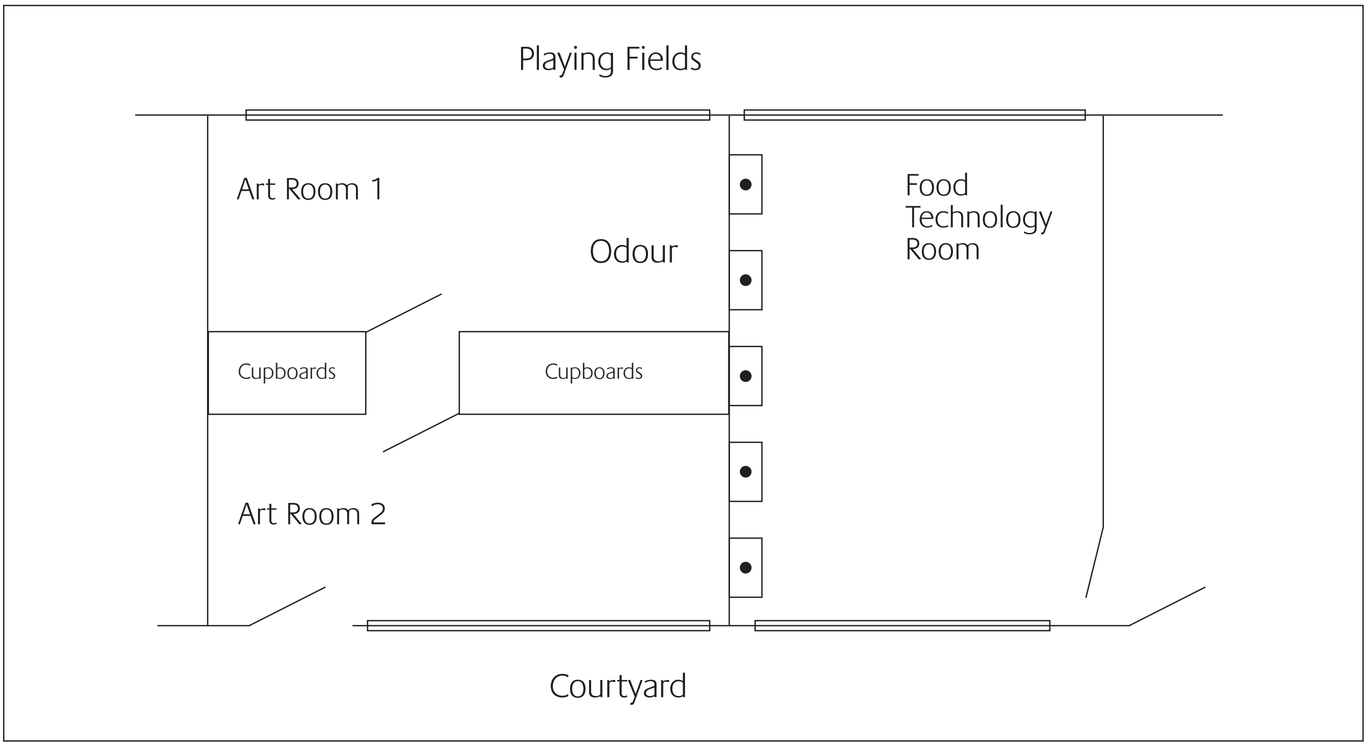


Figure 1: Floor plan of Art Room 1 (AR1), Art Room 2 (AR2) and Food Technology Room (FTR)

Table 1: Chronology of events

Thursday 03.03.05	
09.15	Morning class registration for 25 pupils in Art Room 2 (AR2) Class begins in Food Technology Room (FTR).
10.15	Art class begins in Art Room 1 (AR1) – 9 pupils, 1 teacher, 1 assistant. New class of 25 pupils in AR2. Two sixth form pupils also passing between AR1 and AR2.
10.45	First pupil in AR1 declares feeling unwell and leaves class.
10.45 - 11.35	Teaching assistant and then teacher notice sweet, "toxic" odour in AR1 and report feeling unwell. Sixth form pupils notice odour each time they enter the room. Smell does not appear to be as strong for those remaining in the room. Odour reported strongest in the vicinity of the sink at one end of AR1.
11.20	Second teaching assistant enters room and notices odour that causes a metallic taste.
11.30	New class of 25 in AR2. A further pupil in AR1 feels unwell.
11.35	AR1 and AR2 with its third group of pupils also evacuated. Windows in AR1 and AR2 opened by facilities manager who also notices sweet odour. Fire Service called as emergency.
11.45	First pupil, teacher and teaching assistant sent to A&E.
11.50	Head teacher inspects the art rooms – report same sweet, "toxic" odour. Head teacher remains asymptomatic.
12.08	Fire Service arrive. Decide to return the following day to test for CO.
12.45	Diagnosis of acute carbon monoxide poisoning made by hospital clinician on basis of serum COHb levels & symptoms of headache, lethargy, nausea and dizziness.
pm	Staff & pupils feeling unwell told to attend local A&E. Seven more people (2 staff and 5 pupils) attended A&E. All those attending reported having been in AR1 or FTR. None of those who had *only* been in AR2 reported symptoms (some had moved between AR2 and AR1 or FTR). All had similar symptoms to the first three who had already attended A&E, except one of the sixth formers moving in and out of AR1, who had no symptoms. All those sent to hospital treated with 100% oxygen.
pm	Facilities manager tests atmosphere in all rooms in school for CO. All readings low at 1-2 ppm.
17.00 – 18.30	Head teacher visited A&E to discuss incident, and returned to the school to obtain class timetables and pupil lists. Arrived back at A&E at 18.30.
18.00	PCT notified and discussed situation with CCDC. Initial advice was that this had been a public hazard, the hazard (CO) had been dealt with, affected people had received treatment and there was therefore no further public health response needed.
18.30	10 pupils and teachers now attended A&E. Consultant covering A&E suspects mass CO poisoning and suggests whole school should be tested.
18.30	Police and county offices notified. Police issued statement indicating that this was CO poisoning.
19.30	Local on-call public health called by ambulance service. On-call public health alerted a different on-call CCDC who advised calling the 24 hour Chemical Hazards and Poisons Division (ChaPD) of the Health Protection Agency (HPA).
20.30 20.00 – 22.00	Hospital declared major incident and silver command set up. Police considering moving to gold command. CHaPD scientist on-call advised that mass CO testing not necessary with such low levels of serum COHb but that school should be closed and tested for CO. This information passed to Silver command. Silver command accepted this advice but decided that the 70-75 pupils and teachers present in AR1 & 2 should be contacted. Decision taken not to move to gold command.
22.00-01.00	75 pupils present in AR1 & 2 at some time during the morning were telephoned to enquire about symptoms and told to attend one of three other A&E departments if feeling unwell (Other departments contacted the following day). Four people discussed symptoms with an A&E doctor on telephone and were reassured.
23.00	Fire Brigade and EHOs inspected school. Fire brigade carried out CO testing of environment and appliances. No raised levels of CO detected.
24.30	Silver command stood down.
Friday	
08.00	CHaPD (London) alerted to the incident through BBC news website "School closes over gas poisoning".
am	Gas appliance maintenance engineers test appliances in school and find one in a kitchen 150ppm from AR1 that has raised levels but only at initial start up.
pm	Sink trap in AR1 found to have failed. Sink is little used and trap has dried out. Pipework connects through wall to sink in FTR and there is a hole in the wall.
pm	Samples taken from sink water traps in AR1, AR2 and FTR sent to specialist lab. Urine and serum samples taken from those admitted to hospital and sent to Guys toxicology lab. Commercial company retested for environmental CO.
eve	Remaining in-patients questioned about their symptom history, history of exposure, smoking and past medical history.
	Local GPs contacted – reported no related attendances or enquiries NHS Direct reported approx 10 related calls, all from worried well.

(continued overleaf)

Table 1 continued

Friday eve/ Sat/Sun		3 further school pupils admitted and treated with 100% oxygen (1 had concomitant history of pyrexia, acute tonsillitis)
Sunday		All original 10 admissions now discharged.
Monday	am	All patients now discharged from hospital.
	13.00	Incident meeting at school.
Tuesday	am	Dye tests show drains from chemistry laboratories connect with sink from AR1, AR2 and FTR. Connection 50m from AR1 and 20m from laboratories. There is potential for gaseous flush back.
	pm	Remedial work carried out on AR1 sink water trap. Work begun in cleaning up AR1.
Wednesday	am	School re-opened.
		All affected pupils and teachers except three (1 teacher, 1 assistant and daughter) returned to school. The three remaining complain of continuing symptoms and are questioning the possibility of chronic carbon monoxide poisoning.
1 week later		1 remaining teacher off work.

Difficulties experienced

The management of the incident was problematic in two ways: (1) there was some confusion regarding the interpretation of carboxy-haemoglobin (COHb) data and (2) CO monitoring was conducted by 4 different organisations, with conflicting results.

Carboxy-haemoglobin Analysis

Confusion arose over the “normal” limit for COHb. At the time of the incident, the hospital laboratory involved took the normal COHb level to be 2%. The patients admitted showed levels of 2.4-4.9% (mean of 3.8%). On the basis of this data, 10 patients were treated with 100% oxygen, by which time CHaPD had been asked for advice. CHaPD stated that only levels of >5% COHb require treatment and that levels of up to 9% can be measured in smokers. Even after advice from CHaPD, existing patients and new patients were treated if their levels were above 2%.

An additional complication was encountered, in that COHb levels appeared to rise in 4 patients (2 of them smokers) after treatment. Repeated analysis indicated that this was not analytical error. The cause of this was unidentifiable, although potential causes considered included: (1) patient exposure to dichloromethane (found in paint stripper), even though this appeared not to have occurred and (2) contamination of hospital oxygen supplies (which were not tested until 12 days after the incident, although the tests found no impurity).

Subsequent to the incident, CHaPD and toxicology staff at the National Poisons Information service agreed that the binding coefficient for COHb is very variable within an individual and levels are expected to change over time.

Environmental CO Monitoring

Carbon monoxide concentrations were measured by 4 organizations: (1) facilities manager of the school (day 1); (2) Fire Service (days 1, 2); (3) gas appliance maintenance engineers (FTR, days 2 and 4); (4) independent contractor (day 2). The tests conducted by the fire service and facilities manager showed no elevated levels.

The tests conducted by the gas appliance engineers found elevated concentration (109ppm) near a cooker. This resulted in HSE recommending a private contractor measure CO, who measured elevated levels around a hob, deep fat fryer and hot plate (up to 5000ppm). On day 4, testing near appliances found only slight elevation around a hob from a different cooker. The extremely high concentration of 5000ppm (which is in the toxic range) was found in an area where people had worked for several hours during the day of the incident without ill effect. Repeat testing by a different organization prior to the school being reopened gave normal concentrations.

Hypotheses on possible causes of the incident

It has not been possible to ascertain the cause of the symptoms exhibited by the patients admitted during the incident. However, several hypotheses were considered:

CO poisoning was initially suspected. Much time and effort was invested in CO analysis. Firstly, there was no plausible source of CO in AR1 where the majority of casualties had been. The only possible pathway from other sources of CO to AR1 was from the cookers in FTR where two of the casualties had been. This would have been through a very small sink drain connection and seemed unlikely. WHO guidance recommends a maximum occupational exposure of 10ppm for 8 hours. All environmental sampling was essentially negative except that undertaken by the commercial company, and although several people had been present in this area and were asymptomatic, the company declined to discuss their results or sampling protocols. Repeat testing by a different organization prior to the decision to re-open the school confirmed essentially normal results.

Chemically contaminated land at the site of the school was considered but ruled out on the basis that a) the site was previously greenfield, b) there was no apparent cause for a sudden peak in release of chemical pollutants on the day of the incident c) there were concrete floors with membranes throughout the school and d) contamination seemed to be limited to AR1 and the FTR.

Chemical release caused by a person gluing or using a hot knife on polystyrene or styrene-containing foam in AR1 was considered as a potential cause of the incident. However, the odour was reported to be strongest nearest the sink, not near his work. It turned out there was no hot knife used and he was not the first to become ill. His urine sample showed no metabolites of styrene, although the sample was taken too late to be certain of this.

Gaseous chemical back flush from the drains into AR1 and FTR. This is possible. However, the rooms were not used in any way which was out of the ordinary.

'Hysteria' may have contributed. Approximately 1% of all school-based incidents reported to CHaPD (L) are found to be caused by 'mass psychogenic illness' which is characterized by the sudden appearance of symptoms, usually in response to some 'trigger factor' and may result in the spread of apparent 'illness' with non-specific symptoms like headaches, dizziness, and nausea[i ii]. This must, however, remain a diagnosis of exclusion to be used only after all other plausible causes have been ruled out. In view of the mildness and vagueness of symptoms and the lack any conclusive evidence as to what the chemicals were or from where they originated, it is likely that there was at least an element of mass panic in this incident, not just from pupils and staff, but also from hospital staff.

Discussion and lessons identified

Communication

- The incident began at around 11am. Patients started driving themselves to the local hospital almost immediately and throughout the afternoon. The hospital should have been notified of the particulars of the problem and the expected number of casualties. The possibility of chemical exposure, issues of contamination of the hospital and other patients could have been considered.
- Earlier liaison of the school with the PCT would also have been useful. Class details (pupil names, times and location of classes) should be readily available in a "grab pack" for times of emergency.
- The PCT should have been informed quicker than in the early evening.
- Communication between the CCDC, public health physician, the hospital and the ambulance service could have been better and advice from CHaPD should have been sought earlier. This may have prevented the police from considering the establishment of a gold command (in response to the recommendation that 700 people would require testing) and could have saved much deliberation.

Multi-agency working

- Many different agencies were involved in the incident. Multi-agency working was vital to the management of this incident.
- Earlier involvement of relevant agencies would have been beneficial. As a result of the incident, the Director of Public Health is arranging a multi-agency meeting to discuss improvements in alert and management issues of future incidents.

Biological and environmental sampling

- Biological and environmental samples were taken too late to show up any volatile substances or their metabolites. Some of the analytical results were unexpected and difficult to explain e.g. the rising COHb levels after oxygen therapy and the differing results of environmental CO monitoring.
- Normal concentrations of serum COHb should have been easily obtainable and might have prevented the local hospital declaring a major incident on the basis of mildly raised serum COHb levels in several casualties.

References:

[i] Asgari, N. et al. Investigating an unknown illness in a comprehensive school. Chemical Hazards and Poisons Report from the Chemical Hazards and Poisons Division of the Health Protection Agency. Jan 2005, Issue 3, p 4-5.

[ii] Asgari, N. Summary of CHaPD (London) chemical incidents at educational establishments with unknown aetiology. Investigating an unknown illness in a comprehensive school. Chemical Hazards and Poisons Report from the Chemical Hazards and Poisons Division of the Health Protection Agency. Jan 2005, Issue 3, p 6-7.

Chemical incident – We thought we were ready!

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Incident summary

On 28 February 2005 at approximately 23.50 hours, our A&E was informed by telephone from Lancashire Ambulance headquarters that 2 patients were en route to the hospital who had been contaminated with chemical(s) as a result of an moving vehicle accident (MVA) on the northbound carriageway of the M6 motorway. The chemicals involved were believed to be formaldehyde and another solution that eventually was identified as car wash liquid (methanol).

One casualty (the driver of one of the 2 tankers involved) had been intubated and ventilated at scene by a BASICS (British Association of Immediate Care) doctor whilst the other patient had only been partially decontaminated by removing his clothes at scene.

I as the chemical, biological, radiation and nuclear (CBRN) lead for the A&E department and our duty consultant were immediately informed of the incident and we both attended from our homes.

The decontamination action plan was partially initiated with the Decontamination Unit (DU) being erected by the portering and security staff. One member of the A&E nursing staff was actioned by the shift leader to don PPE immediately.

The first casualty arrived at the hospital at approximately 00.05 hrs before the DU was fully functional. The patients and crew were advised to stay in the vehicle until the DU and staff in full PPE were available to accept the patients. This took approximately 25 minutes – during which time a second staff member was tasked to immediately don PPE. The DU was made ready with all showers working and trestles placed in the unit for the fully immobilised ventilated patient to be placed on to facilitate decontamination.

I assumed the role of Safety Officer (SO) with the duty consultant assuming the role of Hospital Chemical Incident Officer (HCIO). The Hospital Duty Manager was present in the department and with the shift leader co-ordinated the continued service provision of the hospital. Staff wearing PPE were inspected and the time of their entry to the decontamination tent was logged. The walk-in entrance to the A&E was locked and Chemical Incident sign boards were placed at the appropriate entrances. All other self-presenting patients were re-directed in and out of the main hospital entrance.

The duty shift leader had already obtained relevant information from the TOXBASE system and had contacted the Chemical Hazards and Poisons Division (CHaPD) for appropriate advice on decontamination. This advice was passed to the SO and HCIO.

The first patient who had already been ‘partially’ decontaminated at scene i.e. clothing removed, entered the DU at 00.32 hours and decontamination was undertaken following the standard procedure. As the DU became operational a 3rd member of staff was placed in PPE to act as a rescuer in case of problems. The first patient was fully decontaminated and transferred to the resuscitation area for assessment by the duty registrar at 00.42 hours. The immobilised and ventilated patient was then transferred from the ambulance by the paramedics and delivered to the DU. Decontamination was commenced with clothing being cut off and bagged. However as one rescuer had to maintain hand ventilation of the patient the remaining rescuer had to work single handed. The SO and HCIO made the decision to send the reserve staff member wearing PPE to assist in decontamination.

Communication between the DU and the clean zone proved impossible without someone standing at the clean exit of the DU wearing minimal PPE and shouting into the unit. The decontamination team felt it was unsafe to log roll the patient on the spine board whilst still on the trestles so the board was lifted onto the floor. The decontamination was completed and the patient transferred from the DU to a waiting trolley by porters and the SO and then to the resuscitation area of the A&E at 00.52 hours.

Further information was received from the scene that a further 3 casualties were to be expected. However they had been fully decontaminated at the scene by Lancashire Ambulance Service (LAS). Advice was also received from the Environment Agency that the water used for decontamination should be retained and not placed into the foul drain as had previously been planned.

CHaPD were contacted again to enquire about the decontamination of the ambulance, the paramedics and the BASICS doctor who had all been wearing minimal PPE. The advice given was that clothing should be removed and bagged and a shower taken. This was done in the department. However CHaPD were unable to advise on how to remove/dispose of the contaminated DU liner and PPE suits. The Environment Agency was also unable to advise on this.

Staff wearing the PPE decontaminated themselves and the DU with flooring and showerheads being thoroughly rinsed prior to being removed from the DU. All water removed from the DU was retained in the appropriate reservoir.

All PPE including the filters was placed in the floor of the DU and the pump removed after running with clean water for 10 minutes.

The DU liner was then closed and folded down and around all the suits/patient clothing etc. The Environment Agency were contacted once again to ask how to dispose of the liner etc as well as the water but were unable to offer any advice saying that the department should contact them again in the morning.

In conjunction with the HCIO the SO made the decision to place the DU liner etc in a large clinical waste bin and store in a secure area until advice could be obtained as to its disposal.

A new liner was placed in the DU and the unit deflated at approximately 04.00 hours, 4 hours 10 minutes after the initial call was received. Two patients were decontaminated in the DU with the ambulance personnel and BASICS doctor also requiring advice and showering following the incident. Both patients were detained in hospital. The ambulance staff and BASICS doctor were advised to seek medical aid if they exhibited any signs or symptoms as outlined in the TOXBASE information. The three personnel decontaminated at scene by LAS were assessed in A&E and discharged the same night.

Throughout the incident the department and hospital dysfunction was minimal with no patient treatments or investigations delayed.

All hospital personnel involved have been contacted by the SO to check that they have not exhibited any ill effects and a log has been maintained of all personnel on duty and involved either directly or indirectly with the incident.

Whilst the incident appears to have been managed effectively and safely a number of issues needed to be addressed. Some of these key points are outlined below:

Learning Points/ Discussion

- Decontamination of casualties is the responsibility of the ambulance service (ASA 2003). Why, when the incident occurred approximately 2 hours prior to the patients presenting at A&E, was the department then faced with the task of having to facilitate decontamination, with its cost implications?

- The initial incident occurred nearly 2 hours prior to the A&E department receiving a call. In the event of an incident such as this should the department at least be put on standby allowing appropriate personnel and staffing issues to be addressed earlier?

- The hospital chemical incident plan should have been instigated via switchboard once the decision was made to erect the DU. Although switchboard was informed, the plan was not activated in its entirety. Full activation of the plan would ensure that all necessary personnel were informed about the incident.

- Although the DU had been partially erected before the arrival of the CBRN lead, and was almost certainly functional as it stood, none of the staff involved had previously been involved in its assembly. The step by step guide previously designed by the CBRN lead needs to be reviewed and clarification and modification done in some sections. Further training should be facilitated with multidisciplinary groups to ensure rapid and complete assembly of the DU in the future.

- The slippery surface of the DU made the use of trestles unsafe for patients on a spine board to be decontaminated effectively and safely. Either an alternative to trestles needs to be found, or patients need to be placed on the floor on their spine boards. However decontamination on the floor is extremely difficult and undesirable.

- Initially only two personnel wearing full PPE are allocated to the DU with a 3rd being on standby as a 'rescuer'. If patients have been immobilised on a spine board due to injury or are ventilated more personnel need to be made available in PPE. This has a significant staffing implication in an A&E department at night, with minimal staff on duty, if a near normal service is to be maintained.

- Communication between the DU and the clean zone as well as between persons wearing PPE is virtually impossible without radios. In this instance, the SO and HCIO could have placed themselves at risk trying to maintain communications between those staff in PPE and the clean zone as only minimal PPE was worn.

- Once the incident had been completed there were major difficulties in trying to establish what should be done with the tent liner suits, etc. The Environment Agency could offer little advice until the morning. It took numerous telephone calls before this problem was eventually resolved with the aid of LAS, some 10 hours after the incident was stood down. Even then the advice given was questionable as the department was advised that the liner of the DU could be reused if it had been 'washed out thoroughly'. This was not an option as a new liner had already been placed in the DU once the incident had been declared closed. In addition, the advice given was against the Plysu guidelines/recommendations as the use of the unit had invalidated the integrity of the floor of the liner.

Since this incident occurred a multi agency debrief has been held and a number of the issues outlined above have been resolved and acted upon.

Reference:

Ambulance Service Association (2003) The National Decontamination Provider Manual National Ambulance Services CBRN & Hazmat Faculty.

Emergency Response

Acute and massive building collapse Health and environmental consequences

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Background

On September 11th, 2001 a terrorist attack on New York City's World Trade Centre (WTC) towers resulted in an acute environmental disaster of enormous magnitude (photographs 1 and 2). The combustion of more than 90,000 litres of jet fuel at very high temperatures released a dense and intensely toxic atmospheric plume containing soot, metals, volatile organic compounds (VOCs) and hydrochloric acid.

It has been reported that the WTC towers' central steel spines were weakened by the intense heat from the burning aviation fuel, and eventually gave way when they could no longer support the weight of the floors above the crash zones. When the upper floors began to fall, they forced everything below them to collapse in a 'piledriver' effect. The collapse of the towers pulverized cement, glass and the building contents and generated thousands of tons of particulate matter (PM) composed of cement dust, glass fibres, asbestos, lead, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), organochlorine pesticides and polychlorinated furans and dioxins. The resultant dust cloud was enormous.

The huge dust cloud was not confined to the site of the WTC but entered nearby offices, schools, residential and other buildings for miles around.

Objectives

The objectives of this article are:

1. To identify the most likely chemical hazards in such an incident
2. To identify the most likely populations at risk in such an incident
3. To outline the health effects arising from exposure to such an incident
4. To present a summary of the response to the immediate challenges

Chemical Hazards

The exact chemical hazards, while difficult to predict, are likely to include:

Particulate Matter

- Cement dust
- Glass fibres
- Asbestos
- Lead
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Polychlorinated biphenyls (PCBs)

Photograph 1: The impact, fireball and atmospheric plume.
© REUTERS/Steven James Silva.

Products of combustion

- Asphyxiants (methane, nitrogen, hydrogen cyanide, carbon monoxide)
- Inorganic acid gases (hydrogen chloride, nitrogen chloride, hydrogen bromide, hydrogen fluoride, nitrogen oxides, sulphur dioxide and phosphorous pentoxide
- Organic irritants (formaldehyde, acrolein, and crotonaldehyde)
- Dioxins

Populations at Risk

The most likely groups at risk of exposure include:

Occupational Exposure Risks-‘First Responders’

- Fire Service
- Police
- Ambulance Service
- Volunteer Rescue
- Construction Workers
- Clean-up personnel

Residential & Workplace Exposure Risks

- Offices
- Shops
- Hospitals
- Schools/Colleges
- Residential houses

Special Risk Groups

- ‘Passers by’
- Pregnant women
- Nurseries
- School children

Health Effects

Acute (Hours)

Smoke and dust consist of a mixture of gases, liquid droplets and particulate matter representing the decomposition and combustion products from fires. These products can generally be viewed as asphyxiants and/or irritants. It is somewhat inevitable that the immediate clinical effects on those involved in such an incident will involve irritation of the eyes, nose and throat, progressing to various levels of coughing, wheezing, dyspnoea, sputum production and possible chest pain. In severe cases bronchospasm, atelectasis, pneumonitis and pulmonary oedema may also occur. The early clinical and epidemiological assessments that were completed following the attack on the WTC would seem to confirm this. A high prevalence of respiratory symptoms in firefighters and rescue workers exposed to WTC dust (persistent coughing in particular) was reported. Firefighters described walking through dense clouds of dust and smoke in the hours immediately after the attack in which “the air was thick as soup”.

Acute (Days to weeks)

Heavy exposures to high levels of dust and smoke as well as to gaseous products of combustion are likely to continue for at least the initial few days but is very much dependent on the rate at which flammable building contents (fuel for example), are consumed and also on the weather conditions such as the prevailing wind direction.

A large proportion of the outdoor dust produced during the WTC disaster was eliminated over the first weekend by rain that fell during subsequent days. Over the next few weeks airborne particulates continued to decline but rose intermittently at night and when the air was still. Transient increases were also noted when the pile was disturbed and fires flared. Diesel exhaust became an important contaminant with the arrival on site of scores of cranes, heavy trucks and other construction equipment. An acrid cloud hung over lower Manhattan and areas of Brooklyn until the fires were finally extinguished in December of 2001.

Chronic (Years)

The chronic health effects will ultimately be determined by a combination of the timing, duration and chemical composition of exposures as well as proximity to the site of the event. It is very likely that people will have breathed in a varied mix of substances. The long-term effects of this are uncertain due to the lack of data surrounding combinations of intoxicants. Possible toxicological effects of some of the constituents that were found in the WTC dust cloud are summarized in table 1.

The Response

It is not the purpose of this document to detail roles and responsibilities that are generic across any major incident plan but rather to highlight the areas that will need specific action in the event of an acute building collapse.

Table 1: Toxicological effects of the WTC dust constituents

Dust constituents	Source	Possible toxicological effect
Dioxins and other persistent organic pollutants	Jet fuel/polymer combustion	Carcinogen
Benzene	Jet fuel	Dizziness, headaches and tremors (short-term), carcinogen (long-term)[2]
Mercury	Office equipment	Neurotoxin (myelin or direct neuron damage)
Lead	Paint, office equipment	Neurotoxin (myelin or direct neuron damage) and anaemia
Sulphuric acid	Combustion	Irritant
Bio-hazardous material	Victims of the attack	Possibility of disease transmission
Fibreglass	Building materials	Irritant
Asbestos	Fire retardant	Fibrosis of lung and carcinogen (mesothelioma)
Silica	Building materials	Lung parenchymal fibrosis and carcinogenicity
Particulate matter	Building materials and combustion products	Possibly carcinogenic in nature if derived from the jet fuel combustion otherwise asthma trigger
Combustion product aerosol	Combustion	Respiratory irritant possible carcinogenic effect

Acute Response

The acute scene will present an immense challenge to 'first responders' who will typically be the blue light services. It is likely that the event will be ongoing over a period of hours and days and if on the scale of the WTC attacks possibly extending into months. First responders will be faced with dead bodies, a variety of injuries, the innocent 'passer by', the uninjured, eager volunteers, all against a background of panic and uncertainty.

The WTC disaster has told us that the population at greatest risk of exposure are the 'first responders' and that respiratory and ocular irritation will be the immediate clinical symptoms. Wearing appropriate personal protective equipment is essential in preventing exposure to contaminants. This was something that was not always apparent in the aftermath of the WTC.

Shelter versus Evacuation

One of the priority decisions is whether the surrounding population should be advised to shelter or should be evacuated in the event of an acute building collapse. There is no simple answer that will fit every circumstance as the decision will be determined by a number of factors including:

- Population profile
- The nature and duration of the threat
- Unnecessary exposure/duration of exposure
- The size of the evacuation zone
- Logistics-the how, by who and when

A considerable degree of protection will be afforded by sheltering. Buildings dampen fluctuations in atmospheric turbulence, reducing infiltration by gases. Even in a poorly sealed building infiltration may be reduced by a factor of 10 and when windows and doors are sealed, this increases to a factor of 30 to 50.

Effective sheltering entails:

- Closing doors and windows
- Minimising draughts by sealing windows and doors with paper/tape or damp towels
- Turning off central heating
- Turning off mechanical ventilation
- Going to an upper floor, if possible to an interior room
- Avoiding bathrooms and kitchens (tend to have higher ventilation rates)
- Breathing through a wet cloth over the face if the atmosphere becomes uncomfortable
- Having access to a radio to tune into the local radio station for further information and advice

Irrespective of whether the decision is to shelter or evacuate the aim should be to avoid the situation depicted in photograph 2.

Decontamination

Decontamination procedures should aim to ensure that dust is not tracked off site into clean areas, houses and hospitals for example, by casualties, volunteer rescuers, clean up personnel and construction workers. Vehicles crossing into and out of the site will also need to be decontaminated as this will prevent debris being transported off-site.

Environmental Monitoring

Environmental monitoring for exposure assessment is a complex technical task and needs to be co-ordinated and integrated to ensure risks are adequately assessed. Issues that need to be decided include:

Photograph 2: Pedestrians and police run as the tower of the World Trade Centre collapses. ©REUTERS TV.

- Substances to be sampled on the basis of risk
- Risk assessment standards
- Location of monitors
- Sample collection methodology
- Analytical techniques for laboratory analyses
- Collation and analyses of sampling results

Epidemiological follow up

There will very be long term impacts associated with a massive building collapse. It is somewhat inevitable that an epidemiological study will need to be undertaken in the aftermath of any such disaster.

The approach taken following the events of September 11th 2001 was to establish a World Trade Centre Registry, by the New York Department of Health and Centres for Disease Control and Prevention (CDC). Those eligible for enrolment included:

- World Trade Centre survivors
- People who were in a building, on the street, or on the subway
- People involved in the rescue, recovery or clean-up
- People living in South Manhattan
- Children enrolled in schools or day care centers
- Staff employed or volunteering at schools or day care

Following initial telephone interviews, a 20 year follow up is proposed in an attempt to elicit the long term consequences of this disaster. Some of the questions that will hopefully be answered include [4]:

- Will pulmonary disease persist in workers exposed to dust?
- Will an increased incidence of mesothelioma result from exposure to asbestos for responders, clean up workers and residents of Manhattan?
- Will exposure to airborne dioxin in Manhattan after 9/11 increase risk of cancer, diabetes or other chronic disease?
- Will the increased frequency of small for gestational age observed in babies born to women within or near WTC on 9/11 result in long term adverse effects on growth and development?
- What will be the spectrum of psychological effects?

Clean-up

In the aftermath of a building collapse there will be the inevitable clean-up operation. Large building debris should be straightforward to remove; the biggest challenge is likely to be the clean-up of settled dust, components of which include cement dust, glass fibres, asbestos, lead and other particulate matter. If asbestos is present it will require certified asbestos clean-up personnel. All buildings and surfaces contaminated by the dust plume will need to be cleaned. Proper dust clean-up is essential as it will prevent dust and its contaminants from being entrained back into the air. There are important points to note about dust clean-up:

- The best way to remove dust from surfaces is to use a wet rag or wet mop (wet wiping). Sweeping the dust dry may result in its inhalation.
- A dust mask should be worn when cleaning up dust. This will reduce inhaling dust that can irritate your nose, throat and lungs.
- A vacuum cleaner fitted with a highly efficient particulate arrester (HEPA) should be used to clean dust from carpets, upholstery, and other materials that cannot be cleaned by wet wiping. A regular (standard) vacuum cleaner will simply blow dust around the room.
- Hands should be washed before eating, drinking, and before smoking or using the bathroom.
- As dust from outdoors can be carried home, footwear should be removed or wet wiped before going inside
- Cleaning rags used for wet wiping should be placed in plastic bags while they are still wet. The rags can be discarded in the sealed bag, or washed separately from other clothes and re-used.

Conclusion

This article is not a substitute for emergency planning activities and is not intended to replace existing emergency operations plans, procedures or guidelines within local regions. It is intended to highlight some of the unique aspects of an acute building collapse, particularly the chronic aspects of the event including decontamination and clean up, environmental monitoring, and epidemiological follow up.

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Does the NHS decontamination unit hold water?

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Abstract

Suggestions that contaminated water could be leaking from NHS DECAS mobile decontamination units, led the Health Protection Agency, North East Ambulance Service and the Environment Agency to test the water holding capability of the NHS chemical liner through the application of Fluorescein dye to the contaminated water in the DECAS mobile decontamination unit. After 45 minutes of conservative use there was evidence of significant leakage from the unit.

Background

Since their introduction in 2002, the NHS issue decontamination units used by acute hospital and ambulance trusts (Photographs 1 and 2) have been successfully deployed at numerous exercises and incidents. However, following several large exercises, Ambulance Service personnel noticed large quantities of water surrounding the tents and began to question whether this water was clean or contaminated.

The uncontrolled movement of contaminated water from the units presents the risk of accidental contamination of the cold zone at sites of chemical incidents. Therefore emergency service personnel and those persons undergoing decontamination, risk exposure to the same hazardous material that the units are expected to remove.

Aim

To test the hypothesis that contaminated water is leaking from DECAS mobile decontamination units.

Methodology

Fluorescein, a fluorescent water dye used by the Environment Agency to trace water movement, was placed in the base of an erected decontamination unit prior to the introduction of water. The 'contaminated' water was initially placed within the unit's chemical liner prior to being pumped to a water containment unit. The decontamination system was operated for one hour.

Photograph 1: The DECAS mobile decontamination unit.

Photograph 2: The DECAS mobile decontamination unit.

Results

Forty-five minutes into the test, there was evidence of leakage from the front left corner of the unit (Photographs 3, 4, 5 and 6). Further investigation showed extensive leakage under the unit. Once water was pumped from the unit and the floor pallets removed, a search of the chemical liner clearly showed that there was leakage from one of the stitched and bonded seams.

Photograph 3: Water leaking from a mobile decontamination unit.

Photograph 5: A leaking chemical liner in a mobile decontamination unit.

Discussion

The test conditions did not reflect the volume of water nor level or activity that would occur during the real deployment of the DECAS mobile decontamination unit. Buckets of water used to apply detergent and water were not put through the system. There was no movement of personnel or simulated casualties within the unit. The tent was erected in an Ambulance Station on a level concrete surface. Therefore, the test conditions were conservative. The liner used in this exercise had only been erected once before and no water was used on that occasion. However, this was a sample of one liner and results may not be repeatable in all DECAS mobile decontamination units presently in service.

Conclusion

The failure of the chemical liner in a mobile decontamination unit under conservative conditions indicates that leakage of contaminated water from existing DECAS chemical liners may occur. This would be problematic in a real incident where water may spread from the hot zone into the cold zone, thereby making the delineation of the hot zone unclear. This study indicates that further testing of the integrity of chemical liners in mobile decontamination units is urgently required.

Photograph 4: Water leaking from a mobile decontamination unit.

Photograph 6: A leaking chemical liner in a mobile decontamination unit.

"To Come In Please"
A generic approach to CBRN hazards and casualties

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Introduction

This article is intended to present a generic approach to the classification and management of chemical, biological, radiological and nuclear (CBRN) casualties. A generic approach can be applied at a tactical level when assessing casualties. In addition to the spectrum of CBRN agents, the assessment of trauma causing combined injuries needs to be included for any CBRN incident. The proposed system should augment current major incident management systems, such as MIMMS, rather than replace them[1].

Generic approach to CBRN incidents – 'T.C.I.P.'

The T.C.I.P. approach can be applied to an incident and individual casualties and uses the following assessments, remembered as "**T**o **C**ome **I**n **P**lease":

- **T**riage
- **C**ontamination and / or **C**ontagious
- **I**ntoxication / **I**nfection / **I**rradiation / **I**njuries
- **P**rophylaxis (and Treatment)

The first, second and fourth assessments remain the same for all four incident types, while the third is dependent upon the incident type. The TCIP system can be inserted into the Major Incident Medical Management and Support system, if a CBRN threat is identified (Figure 1).

T. TRIAGE

Triage is the first assessment to be made; clinical priority is also a priority for decontamination. Triage can also be carried out prior to the arrival and deployment of decontamination facilities. Decontamination reduces further absorption of certain hazards (chemical/toxins), allows better access for primary survey and life saving interventions, and definitive care to be provided within a clean environment. Each category is preceded with the letter T to denote triage category. CBRN prioritisation uses the same triage categories as conventional triage – immediate (T1), urgent (T2), delayed (T3) and expectant (T4). A variety of triage systems are available but are beyond this article to describe. Questions associated with the triage assessment are:

- What is the TRIAGE category of this casualty?
- Which casualties should be decontaminated first, if required?
- Are life-saving interventions required?
- Is early antidote treatment required?

C. CONTAMINATION / CONTAGIOUS

Safety is one of the key areas covered by most, if not all, contingency plans. The risk of secondary contamination or contagion needs to be considered. Depending on the type of incident, this is likely to be *contaminated, possible contamination* or *not contaminated*. The same applies to the risk that a casualty is contagious; these principles can be applied during an epidemic. Contamination can be external, internal and in a wound. The requirement for decontamination, decorporation (removal of internal radioactive contamination) and isolation can be determined.
Questions associated with the contamination / contagious assessment are:

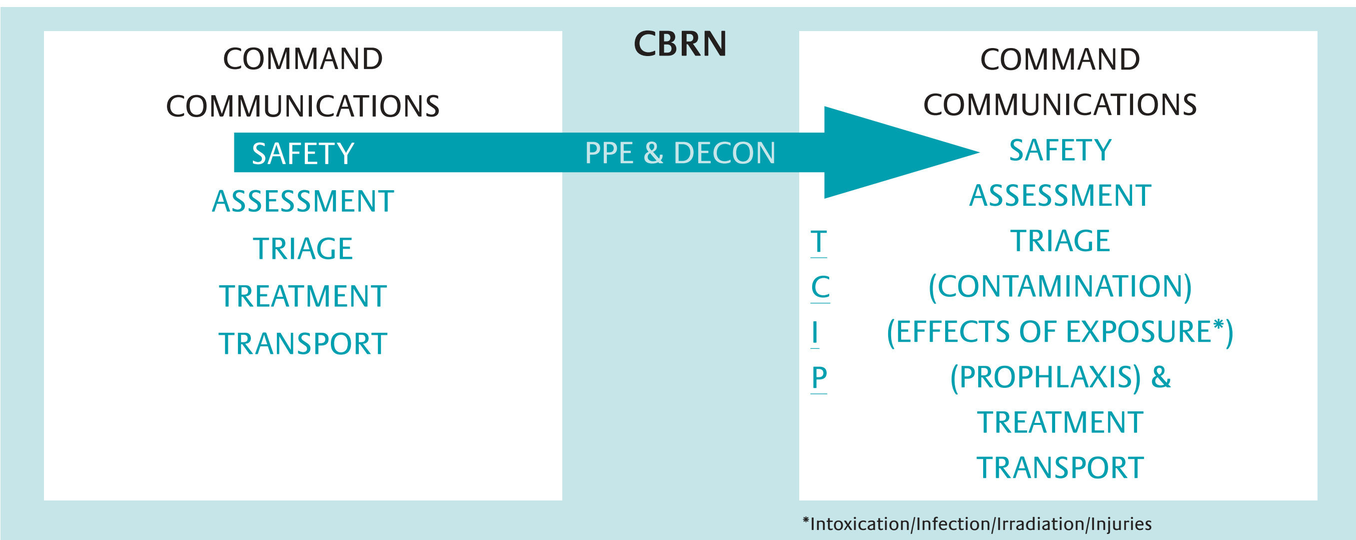

Figure 1: MIMMS and CBRN principles.

- Is the casualty CONTAMINATED (external/internal/wound)?
- Is the casualty CONTAGIOUS?
- Does the casualty pose a threat to emergency responders?
- Does the casualty require decontamination?
- Does the casualty require isolation?

I. INTOXICATION / INFECTION / IRRADATION / INJURIES

This third assessment looks for signs of exposure and is the only assessment to depend on the incident type. As well as the effects of the exposure to CBRN agents (intoxication/infection/irradiation) the assessment also includes the effects of trauma (injury) – the four **I**'s. Examples of the assessment of exposure include a trauma and chemical primary survey, and a syndrome approach to the assessment of biological agents. The requirement for supportive and definitive management can be assigned as a result of this assessment. Questions associated with the contamination/contagious assessment are:

- **What are the effects of the exposure?**

Chemical	INTOXICATION
Biological (live agents)	INFECTION
Biological (toxins)	INTOXICATION
Radiological / Nuclear	IRRADIATION
Trauma	INJURIES

P. PROPHYLAXIS (& TREATMENT)

This final assessment ensures that any previous pre-treatments or prophylaxis are documented. Treatment is guided by the requirements for supportive treatment (i.e. airway compromise, hypoxia and hypotension)[2] and definitive management based on likely agent, toxidrome, further investigations and specific indications and injuries. Questions associated with the prophylaxis and treatment assessment are:

- What PROPHYLAXIS has been given (i.e. NAPS or potassium iodate)?
- What supportive TREATMENT has been given or is required?
- What definitive TREATMENT has been given or is required?

Summary

A generic approach to CBRN incidents, using existing conventional systems, provides a systematic and reproducible template to respond to these incidents. 'To Come In Please' can be used as a training tool both within the pre-hospital and hospital environment, as well as a guide for operational commanders on scene. The assessments are dynamic and can be repeated further along the casualty evacuation chain from the warm zone through to the resuscitation room.
A summary of the TCIP system is in Figure 2.

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	C	B	RN	Trauma
TO	TRIAGE			
COME	CONTAMINATION / CONTAGIOUS			
IN	INTOXICATION (Chemical)	INFECTION (Biological)	IRRADIATION (Radiological/ Nuclear)	INJURIES (Conventional)
PLEASE	PROPHYLAXIS (AND TREATMENT)			

Figure 2 – Generic approach to CBRN incidents.

Heat waves: health impacts and acute responses

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Introduction

Extreme temperatures can affect health. In this paper, we briefly review the evidence on the impacts of heat waves and current practice in the UK on public health aspects and emergency responses, and consider some possible future changes.

Heat waves in England

No operational definition of a heat wave exists in the UK but, by any description, a heat wave occurred from 4 to 13 August 2003. On 10 August, Brogdale, Kent, registered the UK's highest ever recorded temperature of 38.5°C (101.3°F). In the south east of England, maximum temperatures exceeded 32 °C (89.6 °F) on three consecutive days between 4th and 6th August and then on five consecutive days between 8th and 12th August. Average August daily maximum temperature in the south of England is around 21.2°C (70.2 °F). The Office for National Statistics estimates that 2091 deaths were attributable to the heat wave in England.[1] The impacts were greatest in the South of England, where temperatures were highest (Table 1), and where high ambient levels of particulates and ozone were also recorded.[2] The excess mortality for England was 17%, while in London it was 42% with a figure of 59% for deaths in the over 75s.

The heat wave of 1976 (which was actually hotter for longer) was associated with approximately a 10% increase in total mortality (and 15.4% increase in deaths in Greater London).[3] Mortality increased by similar proportions in the 5-day heat wave in July 1995.[4] This may indicate that the British population is becoming more, rather than less, vulnerable to extreme temperatures.

Who is at risk?

Four types of persons are most at risk of heat illness, or dying in a heat wave:

- Medically and physically unfit individuals, including those with obesity or with chronic disease (e.g. COPD, diabetes).
- Disabled persons who cannot move away from heat source, or have some cognitive impairment.
- Infants and children.
- Elderly persons.

Cardiovascular fitness may be more important than age in determining risk for an individual. The elderly can have reduced numbers of sweat glands and so rely more on vasodilatation for cooling, putting extra stress on the cardiovascular system. Discrimination of temperature is also poorer in the elderly and so early signs of heat illness are likely to be undetected. There is some evidence that it is the elderly in institutions and inpatients in hospitals who are particularly vulnerable in the UK as these buildings are usually not well adapted to high temperatures.

Heat waves and emergency departments

Overall, increases in emergency hospital admissions during heat waves (an indicator of heat-related morbidity) are not comparable with the dramatic increases observed in mortality. In 2003, the overall increase was modest, except in London where admissions increased by 6% in all age groups, and by 16% in the over 75s (Table 1), although there were reports of problems in some emergency departments during the heat wave.

An analysis in London found that hospital admissions in the elderly for respiratory disease dramatically increase at higher temperatures.[5] A much smaller (but statistically significant) effect of warmer weather was found for emergency admissions in children, and admissions for renal disease. The contrast between impacts on mortality and hospital admissions during heat waves indicate that the health of persons dying in heat waves deteriorates rapidly and that this deterioration is neither noticed by the persons themselves nor by others, either because they live alone or because of failures in care, institutional or otherwise. This clearly has implications for the development of public health measures.

Urban heat island effect

Urban areas are warmer than surrounding rural areas because of increased solar heat gain, lack of evaporative cooling from vegetation, and waste heat. The London heat island effect by day is +0.3°C, and at night 1.8°C, and is maximal during summer nights.[6] Additionally in London, temperatures in parts of the underground tunnel network during the evening rush-hour can be as much as 10°C higher than on the surface.

Climate change

Another risk to be addressed is that of higher temperatures associated with climate change. The UK Climate Impacts Programme (UKCIP) projections show increases of 2.5 to 4.5°C rise in average summer temperatures in central England by the 2080s, depending on whether greenhouse gas emissions follow a low or high scenario.[7] The increases in extreme temperatures are greater. For a medium-high emission scenario in the 2080s, the temperature exceeded on 1% of summer days rises from 31 to 39°C, and 31°C will be exceeded on 11% of summer days. In general, the more of an extreme is considered, the greater will be the elevation of that extreme. Stott et al. (2004) showed that while August 2003 was extraordinarily hot for Central Europe in the twentieth century, such an August will be absolutely normal in forty years.[8]

Risks to health service infrastructure

Much of the National Health Service's infrastructure is old, and most has been designed with historical temperatures as a design guide. Hospitals being built now will still be in use when the summer temperature regime is considerably different from today's. It is not yet clear that the infrastructure is being designed to be fit for purpose even halfway through this century. A number of incidents in August 2003 were reported in the press and apocryphally to one of us (CW); Some at least of these may have a temperature-related cause; many others will undoubtedly have been addressed without exciting comment:

- Nurses and administrative staff walked out in protest at high temperatures in the new PFI hospital "We can't work in this- we're suffering from heat exhaustion and everything".
- Angry relatives claimed a hospital could not provide for its most vulnerable patients. People on a strict nil by mouth diet were left to lie in pools of their own sweat and their limbs swelled in the heat.
- Vital equipment was allowed to break down forcing the cancellation of scores of operations.
- Nurses on the cardiac ward were in tears at their inability to keep patients as cool as they should have been.
- Public Health (Pathology) Laboratory stopped work as machines failed in the heat.
- Freezer failure destroyed sperm samples taken from male cancer patients.

The UK heat wave plan

A heat health warning system (HHWS) is here defined as a system that uses meteorological forecasts to initiate acute public health interventions that reduce heat-related impacts on human health during atypically hot weather. HHWS are often adapted to individual cities and therefore vary widely in structure, partner agencies, the approaches used, and the particular temperature thresholds employed to trigger warnings.

The UK heatwave plan was launched by the Department of Health in July 2004.9 The plan has four levels, each triggered by a different temperature threshold (Table 2). Different thresholds are also applied for different regions. Level 4 of the UK heat wave plan is to invoke a major incident plan.

As part of the warning system, public health messages will be disseminated to all age and risk groups to increase awareness of symptoms of heat-related illness. As mentioned above, there is good evidence that perception of ambient temperature is poorer in the elderly. Further, the most susceptible individuals to heat wave mortality are socially isolated, elderly, and may have a mental illness or disability that causes cognitive problems. An understanding of human behaviour and physiology during heat events is therefore needed before the most appropriate messages can be developed and targeted. However, it is clear that the passive dissemination of heat avoidance advice is insufficient to prevent many deaths.

The 2003 heat wave event in Central Europe has underscored the need for the development and implementation of public health measures to reduce the health burden associated with high temperature. Public health measures implemented post 2003 are centred almost exclusively on Heat Health Warning Systems that identify high risk weather conditions during heat waves to trigger public warnings.

Climate change introduces additional factors: not only will the incidence of heat waves increase, but 2003 should suggest that the health delivery system is itself vulnerable to climate change, and all parts of the system will need to test their vulnerability to climate risks in the expectation that some will be greater and will require some adaptation of hospitals, care homes, equipment, and practice.

Table 1: Excess mortality and emergency hospital admissions in England during the heat wave 4 to 13 August 2003.

Government Office Region	Mortality (all ages) Number (%)	Mortality (>75s)	Emergency hospital admissions (>75s ages)
London	616 (42)	522 (59)	464 (16)
South East	447 (23)	345 (26)	-53 (-1)
South West	282 (21)	221(25)	304 (11)
Eastern	254 (20)	226 (27)	94 (3)
East Midlands	169 (17)	133 (21)	322 (14)
West Midlands	130 (10)	114 (14)	14 (1)
Yorkshire Humber	106 (8)	122 (15)	36 (1)
North West	74 (4)	84 (8)	260 (7)
North East	13 (2)	13 (3)	50 (3)
England	2091 (17)	1781(23)	1490 (6)

Source 1 . Excess mortality % is estimated as [observed – expected]/[expected], where the expected mortality is deaths in the same 10 day period in previous years (averaged 1998 to 2002).

Table 2. UK heat wave plan: levels of response.

Level	Trigger	Response
Level 1 – Awareness	No warning required unless there is 50% probability of the situation reaching Level 2 somewhere in UK in next 5 days.	• Minimum state of vigilance. • Department of Health issues general advice to public and health care professionals. • Regional directors of public health review utility suspension policies. • PCTs and Social Service departments review the identification of individuals at risk. • NHS Trusts review resilience of infrastructure and equipment.
Level 2 – Alert	Met Office forecast of threshold temperatures for at least three days ahead in any region, or 80% chance of temperatures exceeding threshold on 2 consecutive days.	In addition to above: • Department of Health issues specific advice to general public. • Targeted media strategy. • PCTs and Social Service departments distribute advice to at-risk individuals and managers of care homes.
Level 3 – Heat wave	Met Office confirms threshold temperatures exceeded in any one region.	In addition to above: • Regional directors of public health ensure no utility suspensions. • PCTs and Social Service departments commission additional care and support to ensure daily contact with vulnerable individuals. • Hospitals and trusts alerted in case there is increase in admissions.
Level 4 – Emergency	Heat wave is "very severe or prolonged".	In the event of a "major incident" being declared, all existing emergency policies and procedures will apply.

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The UK mass fatalities response to tsunami disaster

David Donegan, Deputy Director, London Resilience Team Government Office for London

On 26th December 2004, an underground earthquake (registering at 9.0 magnitude) occurred 160km off the northwest coast of Indonesia, triggering an unprecedented tsunami. The wave measured up to 15 meters in height and travelled at speeds of up to 1000km/h,causing wide scale destruction on the coasts of the Indian Ocean, resulting in the deaths of over 170,000 people and the displacement of millions.

The UK response was coordinated at a national level, led by the Foreign and Commonwealth Office (F&CO). London found itself with a prominent role, supporting the injured, bereaved and deceased. This required a significant and coordinated response by the London Resilience Partnership, including the Police, NHS, Ambulance Service, Transport agencies, Local Authorities, HM Coroner, LRT and the Voluntary Sector. The metropolitan police also played a significant role in supporting national and international F&CO operations.

The London Resilience Team (LRT) Duty Officer and Duty Director were contacted that afternoon by both the Police and the F&CO. In anticipation of a large number of UK victims, and with early indications that London would be the focus of operations, the Duty LRT Team prepared to activate the London Resilience Mass Fatality Plan. In line with the plan, an urgent meeting was called between the F&CO, H.M. Coroner, Local Authority Mortuary staff and the Metropolitan Police. This was chaired by the LRT Duty Director, and conducted within 2 hours of the first call, via teleconference.

The LRT worked with H.M. Coroner, Police, Home Office and F&CO to put a strategy in place for the repatriation of deceased victims. It was decided that all UK deceased would be dealt with by London, and brought through Heathrow Airport to Fulham Mortuary, one of London’s 8 designated disaster mortuaries. Plans were also made, if numbers of UK deceased were higher than expected, to activate a Resilience Mortuary (a bespoke demountable structure capable of dealing with thousands of deceased. It was also decided that the Coroner for West London, would act as the lead Coroner for the incident within England and Wales. LRT obtained Home Office ministerial authority for a lead Coroner to be appointed and for appropriate advice on jurisdiction to be issued. LRT also worked with the Office of the Deputy Prime Minister to provide ministerial authority for special funding from Her Majesty’s Government so that the Local Authority could proceed in activating the London mortuary plan for the UK.

A small demountable structure was set up in at Fulham mortuary, providing reception, working and chilled storage. This was particularly necessary as the bodies returning to the UK were stored in special lead lined coffins, which could not be stored within the main mortuary. It also provided more privacy. LRT arranged for specialist equipment to be provided from a new strategic stockpile and also briefed key staff on the plan. They also provided a 24/7-point of contact at the site, deploying staff from the mass fatalities planning team within LRT. LRT provided portable video conferencing equipment for the Coroner to participate in “Gold” and other meetings. The LRT worked with Hammersmith & Fulham Local Authority to provide welfare support from the Voluntary Sector (WRVS and The Salvation Army) to those working in the mortuary and on call to provide support to any families who decided to view at the Mortuary. Regular briefings and updates were provided to various Government departments including the Cabinet Office and Department of Health.

At one stage the F&CO and the Thai Government requested the preparation of arrangements for the London Resilience Mortuary Plan and emergency equipment to be flown to Thailand, along with staff to man a demountable mortuary. This plan was put in place in London post 9/11 to deal with thousands of fatalities, and involves erecting an entire mortuary operation in 48 hours. Body storage, and mortuary, autopsy and radiology equipment is now held in a special stockpile. This was put in place, and arrangements made for air mobilisation within 48 hours. In the end the support was not deployed due to the logistical challenges presented by the incident.

The Department of Health (DH) took the lead in forming a strategy for survivors of the disaster. LRT have supported the F&CO and DH, including developing welfare advice and leaflets for survivors. This incident tested our arrangements, at no notice and at the most difficult time of the year. Not only did specific plans come into play often for the first time, but LRT/Government Office for London’s alerting procedures were tested too. While much has been learnt, the plans and procedures were found to be practically workable and robust.

Chemical incidents and major fires in West Yorkshire

Dr Emmanuel Nsutebu, Public Health Specialist Registrar, Bradford SW PCT

Dr Fiona Day, Public Health Specialist Registrar, East Wakefield PCT

Introduction

In the event of a chemical incident or major fire, the key local public health professionals likely to be involved are Consultants in Communicable Disease Control (CCDC) working in the Health Protection Agency (HPA) and consultants in public health, working within primary care trusts (PCTs). However there are no clear trigger criteria that emergency services can use to decide on whether to involve their local Health Protection Units or PCT public health teams. Whilst the role of it in chemical incidents is undisputable, it is important that public health is informed about those chemical incidents which are of public health importance. In addition it is equally important that public health involvement enhances the role of other agencies and that there is no confusion over who does what.

This piece of work is being carried out on behalf of CCDCs in West Yorkshire and Humber. The main objective is to develop local criteria and an early alerting system that can be used to involve public health in the event of a chemical incident or major fire.

Why improve public health involvement?

Firstly, health protection against biological, chemical and radiological hazards is a key function of public health. Secondly, there have been many examples of chemical incidents where early involvement of public health, has been invaluable[1]. Thirdly, because public health specialists are trained in management of incidents, multi-agency working, epidemiology and research methods and in public relations, which are all key skills needed when dealing with chemical incidents. Lastly, if public health specialists are not involved, there may be no organisation or person taking an objective, detached and holistic public health view. In addition the long-term follow-up of people who are exposed may not be organised. This notwithstanding, concerns that developing criteria and an early alerting system may lead to local health protection units and PCTs being flooded with calls about trivial incidents cannot be ignored.

Suggested alerting criteria for West Yorkshire

The suggested criteria are shown in figure 1. The criteria were based on published literature, discussion with experts at Chemical Hazards and Poisons Division, and information obtained from the West Yorkshire Fire and Rescue Services.

- **Major Fires which involve 6 pumps**
- **Chemical incidents involving a HAZMAT officer with any one of the following**
  - Vulnerable people involved
  - Casualties present
  - Media involved
  - Water or food contaminated
  - Biological or environmental sampling carried out
  - Members of the public evacuated or sheltered
  - Other agencies involved (Environment Agency, Local Authority, Food Standards Agency, Water companies, Police)

Figure 1: Suggested alerting criteria for West Yorkshire

A major fire in West Yorkshire typically refers to a fire at an industrial site, requiring a response lasting up to 18 hours, 30 firemen and a command unit. Such a fire would trigger a 6 pump response from West Yorkshire Fire and Rescue. However a similar fire in London would lead to an 8 pump response because nationally fire services respond differently to major fires and chemical incidents, depending on locally available resources. Hazardous Material (HAZMAT) officers in West Yorkshire would be involved in all suspected chemical incidents except petroleum spillages on roads.

Preliminary assessment of suggested alerting criteria

A survey was carried out among all 14 HAZMAT Officers in West Yorkshire Fire and Rescue in order to identify chemical incidents which occurred over a period of one year from July 2003 to June 2004. A survey was used because the West Yorkshire Fire and Rescue Chemical Incidents database contained incomplete information: the information recorded was mainly for performance management of their services. The response rate was 100% and a total of 33 incidents were reported by the HAZMAT officers. The suggested criteria would have identified 22 incidents of public health importance, suggesting that there would have been on average 2 incidents notified to public health each month for the 3 districts in West Yorkshire. This information is useful in alleviating concerns that developing criteria for alerting public health of chemical incidents may lead to a substantial increase in workload. The validity of the criteria is summarised in Table 1 and is based on the author's assessment of chemical incidents which are of public health importance.

Table 1: Validity of the suggested alerting criteria

		Public Health Incidents		
		+	-	Total
Criteria	+	13	9	22
	-	1	10	11
	Total	**14**	**19**	**33**

Sensitivity 93%; Specificity 53%; Positive Predictive value 59%;
Negative predictive Value 91%

Early alerting pathway

A steering group involving representatives from West Yorkshire Fire and Rescue, the Environment Agency, Local Authorities, West Yorkshire Ambulance Service and the Health Protection Agency has been developed. The steering group has agreed on an early alerting system which will be the same pathway used for early alerting of CBRN incidents. Fire officers dealing with major fires and chemical incidents of public health importance will ring the West Yorkshire Metropolitan Ambulance Service (WYMAS) who will make arrangements to contact the CCDC on call. WYMAS also plans to train and recruit hazardous material officers who will be called HAZMED officers and will be responsible for receiving such calls from the fire services. Training for the HAZMED officers is being developed by the London Chemical Hazards and Poisons Division, WYMAS and the Leeds Health Protection Agency.

Next steps

The suggested criteria will be piloted and evaluated to assess prospectively their validity and the usefulness of public health involvement. The plan is to use the steering group to monitor the implementation of the pilot and shape future work. As a result of concerns raised by public health specialists about the need for training on management of chemical incidents, an educational event may also be organised to train on call public health staff.

Source of information

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Acknowledgements:

West Yorkshire Fire and Rescue: David Thewlis and David Turner.

Exercise reports

Exercise Atlantic Blue

Virginia Murray,
Chemical Hazards and Poisons Division (London)

From the 4 – 8 of April 2005 a major tri–partite exercise was held in the US, Canada and the UK. The exercise was referred to as TOPOFF 3 in the US, Triple Play in Canada and Atlantic Blue in the UK.[1] The United States, Canada, and the UK have worked together throughout a two-year planning process to achieve shared objectives in four key areas:

- Incident management: To test the full range of existing procedures for domestic incident management of a terrorist event and improve, through practice, top officials' capabilities in affected countries to respond in partnership.
- Intelligence/investigation: To test the handling and flow of operational and time-critical intelligence.
- Public information: To practice strategic coordination of media relations and public information issues in response to linked terrorist incidents.
- Evaluation: To identify lessons learned and promote best practice.

The US was the only country to run a live play exercise, which incorporated strategic level play, similar to that played in Canada and the UK, as well as play at an operational level.[2] Exercise TOPOFF3 involved more than 10,000 participants representing more than 200 federal, state, local, tribal, private sector and international agencies and organisations, as well as volunteer groups.

The Canadian Exercise Triple Play[3] was run as a command post exercise with players from the emergency services, local and regional governments, and the health services.

In the UK Exercise Atlantic Blue was designed to test simultaneous responses to internationally linked terrorist incidents, focusing on how the UK communicates across international borders at a strategic level.[4] The Metropolitan Police Service has been the host police force for the UK, working closely with the Home Office and other government departments and London agencies on planning and delivery. Planning has taken over two years since it was first agreed between the UK and the US. The exercise was a command post exercise. This means a real incident control room is set up to co-ordinate responses, but the exercise does not involve live action on the ground.

Photograph 1: Notice on door of Health Advice Committee at the Strategic Command Centre ©CHaPD

Around 2500 people in the UK were involved in the planning and delivery of Exercise Atlantic Blue. These include representatives from the Home Office and other Government Departments, the Metropolitan Police Service and a wide variety of London agencies including emergency services, utilities and local government.

Health Protection Agency (HPA) personnel participated in the play and other members of the agency provided invaluable background support. For example, the Chemical Hazards and Poisons Division (London) supported the Health Advice cell at the Strategic Command Centre.

Photograph 2: The Health Advice Committee at work. ©CHaPD.

The HPA recognises that emergencies, outbreaks of disease, and chemical incidents have the potential to cause disruption for communities on a large scale and present operational problems to the NHS. Disease outbreaks and chemical incidents can develop very rapidly – so preparation and emergency planning are essential components in minimising the impact on the public. Responding effectively requires organisations to work together to achieve a return to normality as quickly as possible.[5]

Training exercises are a vital part of counterterrorism, as they ensure preparedness for response to any kind of terrorist attack and confirm that counterterrorism arrangements are tried and tested. As with all exercises, the lessons learned from Atlantic Blue will be incorporated into future contingency planning. It is important to emphasize that this exercise was planned and designed to enhance international emergency preparedness and in no way reflects a specific threat to any of the participating nations.

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Exercise Code Silver: RAF Lakenheath, Suffolk

Rachel Paddock: Chemical Hazards and Poisons Division (London)

On 22nd March 2005 the US Air Force 48th Fighter Wing, based at RAF Lakenheath, ran exercise CODE SILVER. The exercise was attended by multi-agency participants, the main aims of the exercise were to:

- Assess the combination of specific responsibilities, and general response and protection procedures, of on-base and local Emergency Medical Services organisations.
- Develop the relationships between RAF Lakenheath, RAF Mildenhall and local emergency response organisations.
- Expose personnel to a variety of chemical-biological situations in an exercise mode.

CODE SILVER was a table top exercise which differed from the conventional emergency service table top exercises. The participants discussed the scenario as one group around the table, as opposed to forming Gold and Silver commands and expert groups such as the Joint Health Advisory Cell (JHAC). The exercise players included: US Air Force, RAF, Ministry of Defence Police, Suffolk Police, PCT and HPA.

The scenario involved the detonation of a bomb on the RAF base following an earlier threat. It later became apparent that this was a "dirty bomb" containing both nuclear and chemical components which were revealed as Lewisite and Cesium 137 (boxes 1 and 2). In the afternoon session the group discussed a biological scenario.

As the information about the incident was provided, the participants discussed the relevant issues including:

- Evacuation procedure, shut down of the base and surrounding roads.
- Implementation of cordons around the incident site.
- How and when liaison with local police constabulary and national security forces would take place.
- Command Structure with regards to the responsibilities internal and external base organisations would take on.
- Liaison with external organisations including ambulance, fire, local hospitals and Primary Care Trust.
- Personal Protective Equipment to be worn by responders
- Detection of chemical and radioactive agents.
- Mass decontamination.
- Communication between internal and external organisations.
- Media Involvement.

Learning Points

The table wide discussion, aided by an exercise facilitator, proved useful for sharing thoughts and knowledge about different aspects of the scenario.

This exercise highlighted the high level of strategic planning the US Air Force stationed at this RAF base have in place. It also established areas in which communication channels need to be strengthened between the base and external organisations, for example links to the local PCT.

Discussion by experienced US Airforce personnel, with regards to the detection, identification and monitoring equipment available, and the way in which it would be utilised in this type of situation, was a very beneficial learning experience.

Box 1: Lewisite

Lewisite is a vesicant, which is more commonly referred to as a blister agent. Toxicity produced by this agent includes: blisters, eye injury, airway damage, vomiting and diarrhoea. Blisters may form several hours after initial contact with the agent[1].

Lewisite contains arsenic, this means that utilisation of an antidote is viable. British anti-lewisite (BAL) is a chelating agent for arsenicals and other heavy metals. Administration of BAL may reduce the systemic toxicity of lewisite[1].

Box 2: Dirty Bombs

A 'dirty bomb' uses a conventional explosion to disperse radioactive material over a targeted area. One source of radioactive material is Cesium 137. Cesium 137 is a radioactive gamma emitter used in medical imaging and radiotherapy. The human health effects are mainly attributed to radioactivity[2], which is dose dependant and therefore will only affect those close to the site of the explosion. Immediate health effects from radiation exposure, at the low levels expected from a 'dirty bomb', are likely to be minimal[3].

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Exercise Gemini

Rachel Paddock: Chemical Hazards and Poisons Division (London)

Deborah Haynes: Senior Emergency Planning Officer, Wiltshire County Council/Wiltshire Primary Care Trusts

Dr Mark Evans: Consultant in Communicable Disease Control, Health Protection Agency

On Friday 1st April 2005 Wiltshire Local Resilience Forum ran Exercise Gemini, a table-top scenario.

The aims and objectives of the day were:

Aim

To evaluate the effectiveness of the Wiltshire and Swindon Strategic Co-ordinating Group's (Gold) management of a Major Incident.

Objectives

- To conduct a table top exercise using multi-media inputs to evaluate command decisions at a strategic level.
- To examine the Strategic Co-ordinating Group's decision making ability, under rigid time restrictions.
- To evaluate all agencies individual and joint Major Incident Plans.
- To provide an opportunity for the Emergency Management Teams of stakeholder agencies to observe, in an advisory capacity, the Strategic Co-ordinating Group's decision process.

Exercise Summary

The exercise was organised so that the Strategic Co-ordinating Group (Gold) sat at a central table, surrounded by expert tables with relevant advisers and experts from various agencies to aid the decision making process. The expert tables included Emergency Services, Health, Local Council, Media and Utilities.

The initial scenario was the reporting of structural damage to a dam, West Wiltshire, with serious flooding consequences for the valley situated beneath. As the participants began to discuss the immediate issues of concern raised by the flood warning, another exercise inject was provided. This was the derailment of a goods train carrying 60,000 litres of sulphuric acid and 4 tanks of ethyl choloroacetate in the North Wiltshire/Swindon area. To manage both parts of the scenario in parallel, a secondary Strategic Co-ordinating group was set up to handle the dam situation. The remaining exercise participants considered the train derailment. The exercise was split into 5 stages and injects were issued as the scenario developed.

At the Health table, a decision was made to split the group, to form a public health and an operational group. Combined the two groups would make up the Joint Health Advisory Cell (JHAC) giving health advice to the strategic co-ordinating group (photograph 1). The main issues discussed at the expert table included:

- The potential risk of the chemicals involved in the incident (boxes 1 and 2)
- Evacuation versus shelter of the public, in the area surrounding the incident
- Decontamination
- Personal Protective Equipment for emergency services
- Risk of water contamination
- Media strategy
- The return of evacuated public to their homes

The Health table also responded to specific questions posed by the Strategic Co-ordinating group with regards to the topics listed above.

Box 1
Sulphuric Acid
- Sulphuric acid is a colourless oily liquid which is used in the manufacture of dye stuffs, fertilisers, food additives, electroplating, industrial explosives and battery acid1.
- It is extremely corrosive to skin, respiratory tract, eyes, mucous membranes, gastrointestinal tract or any tissue with which it comes into contact. Exposure to sulphuric acid on skin, by inhalation or by ingestion may be fatal1.

Box 2
Ethyl Chloroacetate
- Ethyl chloroacetate is a colourless liquid with a pungent odour. It is mainly used as an industrial solvent2.
- This substance is a severe irritant and may be fatal by inhalation, ingestion or skin contact2.

Photograph 1: Strategic Co-ordinating Group. © Wiltshire County Council, April 2005.

Lessons learned

- In the hot debrief there was a general consensus that the exercise had been a very successful learning experience.
- The careful planning of the exercise ensured that each stage was thoroughly discussed and feedback was received from the Strategic Co-ordinating Group. This was extremely useful as it enabled all participants to monitor and understand the decision process carried out by the Strategic Co-ordinating Group.
- This exercise highlighted that it is extremely important to utilise all available resources. In the debrief it was expressed that not all of the expert tables were used to their full potential to provide advice to the Strategic Co-ordinating group.
- Concern was voiced that it is important to ensure that the Strategic Co-ordinating group (Gold) remain strategic and allow Silver command to manage operational aspects of the exercise. A more realistic scenario would have had silver commands set up as well.
- Health advisors/experts learnt more about how the fire service accessed their own scientific advice.
- The Strategic Co-ordinating Group required extra personnel for co-ordination of all communication messages and recording the decisions made and the reasons why they were taken.
- The health lead in the strategic co-ordinating group, a Primary Care Trust (PCT) Chief executive, quickly had to call in more staff.

References

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Land and environmental contamination

Contaminated land: Special Sites under Part IIA of the Environment Protection Act 1990

Mike Harget, Technical Manager – Contaminated Land Remediation, Environment Agency

1. Background

Part IIA of the Environment Protection Act 1990, which came into force in England in 2000 and Wales in 2001, introduces a new regulatory regime for the identification and remediation of contaminated land. This regime provides, for the first time, a statutory definition of "contaminated land" which is based on risks of significant harm to human health and the environment, or pollution of controlled waters. It adopts the principles of risk assessment and risk management to ensure that contaminated land is identified and managed effectively.

The main objective of the Part IIA regime is to provide an improved system for the identification and remediation of land, where contamination is causing unacceptable risks to human health or the wider environment. This should be assessed according to the current use and circumstances of the land, in order to meet the Government's "suitable for use" approach.

2. How is it regulated?

The principal regulators for Part IIA are the local authorities. The Environment Agency has an important complementary role with specific responsibilities as set out in the table below.

3. What is Contaminated Land?

Under Part IIA, contaminated land is defined as land which appears to the local authority to be in such a condition, by reason of substances in, on or under the land, that:

a) significant harm is being caused or there is a significant possibility of such harm being caused; or
b) pollution of controlled waters is being, or is likely to be caused.

Land is only defined as contaminated land if there is a "significant pollutant linkage". This requires evidence of the presence of a contaminant, a receptor that could be harmed by the contaminant, and a pathway linking the two. In addition, the type of harm that the receptor could suffer must meet the descriptions of "significant" given in the statutory guidance. This guidance describes the types of receptor that can be considered under Part IIA, such as humans, property and some ecosystems. A site where a contaminant is causing, or is likely to cause, pollution of surface water or groundwater, also constitutes contaminated land.

Local authorities have the sole responsibility for the identification and determination of contaminated land. This responsibility cannot be delegated to any other person or body.

4. What is a Special Site?

If a local authority decides that a site is contaminated land, both it and the Agency will consider whether it falls within one of the descriptions for Special Sites in the regulations. If it does, the site will be designated as a special site and the Environment Agency will take over its regulation. The categories of special site do not imply that the land is more likely to constitute contaminated land merely, that the Environment Agency is best placed to be the enforcing authority.

Key responsibilities for Local Authorities	Key responsibilities for the Environment Agency
• Prepare and publish an inspection strategy	• Provide information to local authorities
• Inspect their areas to identify contaminated land	• Ensure remediation of Special Sites
• Consult the Agency on pollution of controlled waters	• Maintain a public register of regulatory action
• Ensure remediation of land identified as Contaminated Land	• Prepare a national report on the state of contaminated land
• Transfer Special Sites to the Environment Agency	• Provide advice to local authorities on identifying and dealing with pollution of controlled waters.
• Maintain a public register of regulatory action	

The categories of special sites are:-

- Water Pollution cases
  - Where contaminated land affects controlled waters used, or intended to be used, for the supply of drinking water.
  - Where contaminated land affects controlled waters, so that those waters do not meet, or are not likely to meet relevant surface water criteria.
  - Where contaminated land affects groundwater to the extent that certain specified contaminants are found within groundwater contained within specified geological strata.

- Industrial cases
  - Waste acid tar lagoons
  - Oil refining
  - Explosives
  - Sites regulated under Part I of the 1990 Environment Protection Act "Integrated Pollution Control" sites.
  - Nucelar sites (non – radioactive contamination)

- Defence cases
  - Current military, naval and airforce bases and other properties, including those of visiting forces
  - The Atomic Weapons Establishment
  - Certain lands at Greenwich Hospital
  - Land formerly used for the manufacture, production or disposal of chemical and biological weapons.

For further more detailed information you should refer to the relevant Regulations.

5. How many Special Sites are there in England and Wales?

Up to 1st March 2005, there are 22 special sites. These are listed in the table below.

	Site Name	Location	Local Authority responsible	Agency Area Office
1	Ailsworth Road Landfill	Helpston	Peterborough City	Anglian Region, Northern Area
2	Ben Johnsons Pit	Helpston	Peterborough City	Anglian Region, Northern Area
3	Bransholme Landfill (1)	Hull	Hull	NE Region, Ridings Area
4	Former Mirvale Tarworks	Mirfield	Kirklees	NE Region, Ridings Area
5	Woldgate former landfill	Bridlington	E Riding of Yorks	NE Region, Ridings Area
6	Cranleigh Brick and Tile Works	Cranleigh	Waverley BC	Thames Region, SE Area
7	Dump E, Portreath	Portreath	Kerrier	SW Region, Cornwall Area
8	Dump D, Portreath	Portreath	Kerrier	SW Region, Cornwall Area
9	Dump C, Portreath	Portreath	Kerrier	SW Region, Cornwall Area
10	Dump B, Portreath	Portreath	Kerrier	SW Region, Cornwall Area
11	Dump A, Portreath	Portreath	Kerrier	SW Region, Cornwall Area
12	St.Leonards Court	Sandridge	St. Albans DC	Thames Region, NE Area
13	Scholars Court	Neston	Ellesmere Port	Welsh Region, Northern Area
14	Hampole Quarry	Hampole	Doncaster MBC	NE Region, Ridings Area
15	Bayer Crop Science Ltd	Cambridge	S. Cambridgeshire	Anglian Region, Central Area
16	Ivatt Close, Bawtry	Bawtry	Doncaster MBC	Midlands Region, Lower Trent
17	Former Albright & Wilson Wks	Whitehaven	Copeland BC	Northwest Region, Northern Area
18	Area A12Q1 AWE,	Aldermaston	W. Berkshire Council	Thames Region, West Area
	Aldermaston	Hull	Hull	NE Region, Ridings Area
19	Bransholme Landfill Site (2)	Grimsby	NE Lincs Council	Anglian Region, Northern Area
20	Shell Petrol Filling Station	Bridgend	Bridgend CBC	Welsh Region, SW Area
21	Tondu House Farm	Bootle	Sefton BC	Northwest Region, South Area
22	Litherland Road			

An investigation of a contaminated allotment site

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Dr Ada Bennett, Specialist Registrar in Public Health, Gloucestershire Health Protection Team

Summary

Contamination at an allotment site previously infilled with industrial wastes was uncovered when a new plot holder discovered buried cans and drums on his plot. He contacted the local council officials who undertook a site visit and obtained some soil samples.

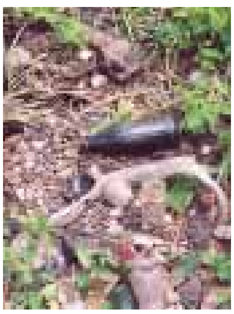
The site with an average plot size of $200m^2$ had 50 allotments, only 12 of which were in use. Initial enquiries revealed that it had been a saw mill and boat building yard in 1902. There were anecdotal reports of its use as a “tip”. A considerable amount of glass fragments, broken pottery and clinker were noted in the soil during the site visit, suggestive of a history of waste disposal at the site, which could be a potential source of contamination.

Soil samples were obtained from ten hand dug pits. The concentrations of arsenic, nickel, lead and benzo-a-pyrene at the site were 43.2 mg/kg, 75.4 mg/kg, 1595 mg/kg respectively (95% upper confidence levels). These are 2.2 times, 1.5 times, and 3.5 times the respective Defra published soil guideline values for the metals, and 6 times a derived screening concentration for benzo-a-pyrene. This rendered the site unsuitable for continued use as allotments. No testing for dioxins and furans was undertaken.

As a precautionary measure, the council closed the allotment site, offered alternative plots to allotment holders, recommended destruction of the crops grown on the site and requested public health advice from the local Health Protection team.

Action Taken

The results of the soil sampling undertaken were discussed with the Chemical Hazards and Poisons Division (CHaPD), London, of the Health Protection Agency.



Photographs 1 and 2: Allotment site visit © CHaPD

Further information was requested from the Council to undertake a risk assessment of the health implications of the incident. Information requested included types of crops cultivated on the site, who ate them, age range of allotment owners and the numbers of children taken to the site. Advice was also sought from the Environment Agency, the Department of the Environment, Food and Rural Affairs and the Food Standards Agency.

The Consultant in Communicable Disease Control (CCDC) convened a multi-agency meeting involving the ChaPD, London, the Local Authority, the Director of Public Health of the Primary Care Trust and the local Health Protection team. The purpose of the meeting was to assess risk to the health of the allotment holders and their families, provide public health advice and offer an opinion on the Council’s decision to close the site.

The key issues discussed at the meeting were the difficulties of undertaking a full health risk assessment in the absence of further information about plot holders, biological sampling to assess blood lead levels of current holders and the development of a questionnaire to assess other possible sources of lead exposure. Other issues discussed were risk communication with allotment holders and a discussion of the proposed future use of the site by the Council.

The CCDC, the Local Authority Officer and the GHaPD (London) representatives undertook another site visit. The main health risks identified were likely to result from eating vegetable produce grown in the soil, with lesser risks associated with physical contamination whilst working the soil. The crops cultivated on the site were potatoes, green runner beans, peas, carrots, swede, parsnips, salad vegetables, onions, lettuce and cabbage. No samples of produce were available for analysis. Allotment holders were mainly older men. It was unclear how often children accompanied their parents or grandparents to allotment sites.

All eleven plot holders were asked to complete a questionnaire to undertake exposure risk assessment. They were also offered the possibility of providing blood samples for testing to assess their blood lead levels as this was considered a useful marker of exposure. Only one out of the eleven plot holders agreed to a blood test for lead. This result was within normal limits.

This incident illustrates the challenges of communicating risks to the public and the need to develop more biological markers for assessing health risks following exposure to contaminated land.

Sources of information

defra R&D Publication Series CLR7 to CLR10; The Contaminated Land Exposure Assessment Model (CLEA (2002)) and associated toxicological reports and soil guideline values (2002)

IARC (1987) International Agency for Research on Cancer. Overall Evaluations of Carcinogenicity; an Updating of IARC Monographs Volumes 1 to 42, IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Supplement 7, IARC, Lyon.

Responding to chronic environmental problems in Cheshire & Merseyside – Systems and Procedures

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Background

The Cheshire and Merseyside Health Protection Unit covers a population of 2.4 million in 15 Primary Care Trusts and 13 local authority Environmental Health Departments. The Consultant team comprises the Director, six 'standard' CCDC posts and two other Consultant posts with special interest in environmental public health, one of which covers CCDC work as well.

There is a large concentration of industry in the two counties: there are 34 top tier COMAH sites, some of which are still sited very near to residential properties, and there were 45 IPPC applications in 2004. The local authorities are currently prioritizing over 20,000 potentially contaminated land sites across the zone.

The Problem

The need for the development of a standard procedure, in the local Health Protection Unit, for responding to chronic environmental hazards of various types quickly became clear as the work load mounted. Such procedures should encourage transparent and robust responses and scientific integrity, enable learning from experiences, provide support to public health professionals in the management of complex issues, and allow the assessment of communications and stakeholder involvement.

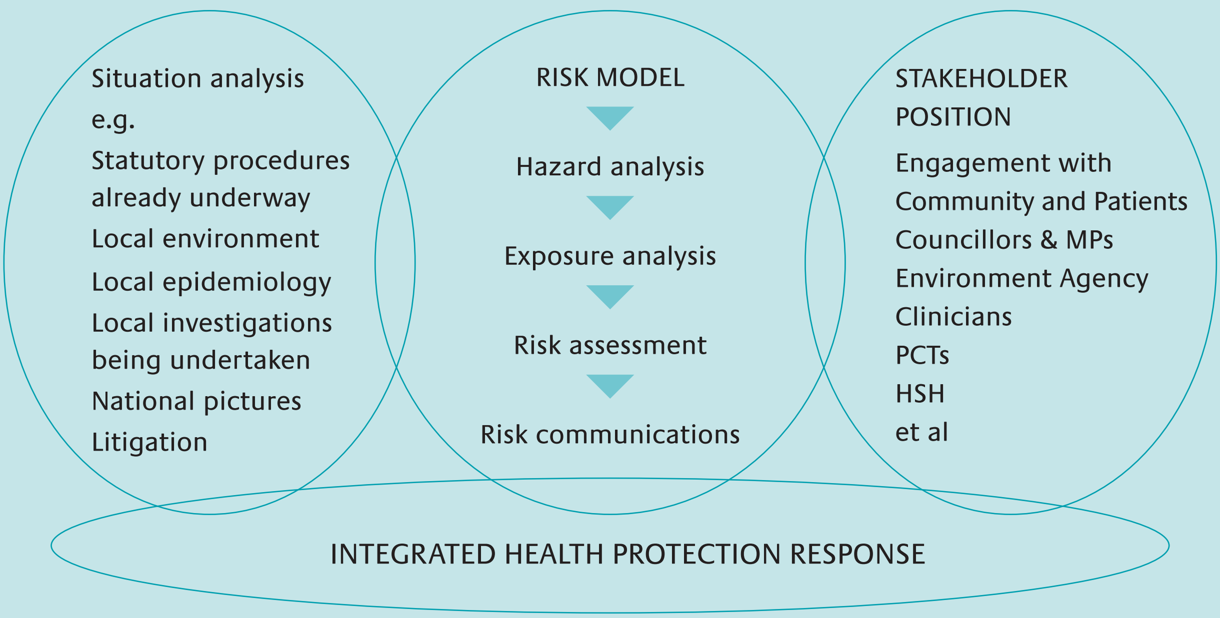
The procedures were developed in order to:

- Facilitate initial assessment of chronic environmental problems.
- Help scope workload and decisions on a suitable scale for any investigations.
- Help protect HPU and PCT staff from complaints, litigation and unrealistic expectations.
- Record carefully all requests to the HPU.
- Assist with multi-agency understanding and working arrangements.
- Identify when and how a formal Health Protection Advisory Group should be constituted and managed.

The Response

The health response needs to integrate three strands: the risk assessment process, an analysis of the situation and stakeholders' positions (box 1). For example: the situation analysis should take account of whether formal statutory processes are underway e.g. Part IIa land contamination; IPPC], while stakeholder engagement should elicit the extent of any prior involvement, resulting communications and how decisions are already being taken. If such integration is not done it is possible that the health protection response will not only be partial, but will run the risk of missing important aspects of the overall situation, ending up biased and misinformed.

Box 1: Integration of assessment and response



The procedures identify four levels of responses (box 2):

1. Level 1: Telephone advice or information given or posted / emailed – basic information sheet completed.
2. Level 2: Assessment and short report written and sent to enquirer – basic information sheet completed.
3. Level 3: A short meeting required to agree action – basic information sheet plus Environmental Human Health Situation Analysis and Stakeholder / Engagement Process completed.
4. Level 4: Health Protection Advisory Group is needed – basic information sheet plus Environmental Human Health Situation Analysis and Stakeholder / Engagement Process completed.

A level 4 response is indicated when there is a significant exposure to environmental hazards that could cause human health problems or are believed to have already done so, and a formal, coordinated multi-agency response is needed.

Conditions that could make a level 4 response sensible include the following:

1. A demonstrable harm to human health through a large elevation of observed versus expected cases of a single, clearly defined, disease or syndrome.
2. Red risk on the traffic light model of risk, along with an established source - pathway - receptor link.
3. Major consequences of actions to protect health. For example high cost of remediation, relocation or major upheaval of residents.
4. Likely legal action where evidence from Health Protection Unit may be used.
5. Demands for action by local or national politicians.
6. Any situation where PCT or LA would prefer this level of response.
7. High profile issue or an issue without good evidence base or guidelines.

A less formal meeting (i.e. level 3 response) would be more appropriate when none of the level 4 conditions are established, where the investigation is just at the information gathering stage, where no source - pathway - receptor link is present (or unlikely), or where only a few agencies are involved. Levels 2 and 3 may precede level 4 where escalation is required.

Level 4: Health and Advisory Group

The terms of reference for the Health Advisory Group are currently –

1. To advise other statutory agencies on prevention of risk to health from local environmental hazard(s).
2. To take further expert advice as necessary.
3. To identify resources to investigate exposed groups and to plan necessary healthcare interventions.
4. To provide medical advice to any relevant agency.
5. To ensure appropriate human health monitoring and the collection of biological samples for the purpose of estimating exposure and possible health effects.
6. To advise on any look-back exercises for previously exposed individuals.
7. To oversee epidemiological studies and arrange surveillance of the population.
8. Ensure that local health professionals are given adequate information.
9. Provide public statements about medical care, exposure avoidance, and the provision of information or reassurance on the probable effects of exposure.
10. To provide reports.

The group membership is wide, and includes local HPA staff as well as national experts, PCT and local authority representation, expert advisers from appropriate bodies such as the Environment Agency, Cancer Registry or Small Area Health Statistics Unit (box 3).

Box 2: Examples of the four levels of response:

Level 1 - Lead in Drinking Water
Lead in a household's tap water found to be above guideline values during routine testing.

Level 1 - Leak from Solar Panels
Leak of 1,2 Propylene Glycol from circulatory system of solar panels; householder reporting symptoms of vomiting.

Level 2 - Military Vapour Trails
Concern from local residents over vapour trails from military aircraft.

Level 2 - Mobile Phone Base Stations
MP's concerns over plans to build mobile phone base stations in residential areas.

Level 3 - Diesel Spill
Diesel spill during early phase of housing construction not detected until housing complete; remediation of gardens undertaken but concern remained over potential health affects due to residual diesel under housing.

Level 3 - Remediation of Old Gas Works Site
Complaints of health effects in residents close to the site with questions about the level of remediation required [possibly moving to L4].

Level 4 - Contaminated Golf Course
Site used as landfill for >100 years, capped and redeveloped as a municipal golf course; breakdown of cap detected, with high levels of arsenic found in soil samples and water samples from stream running through golf course.

Level 4 - Process failure at Water Treatment Works
Problems with a company facility and odour containment; local community complaining of unpleasant odours and health effects including nausea and diarrhoea.

Box 3: Possible Composition of Level 4 Health Protection Advisory Group

- Local CCDC/Consultant in Health Protection (Convenor & Facilitator).
- Consultant in Health Protection with interest in environmental public health (oversees technical assessment process).
- Director of Public Health (Chair and host).
- Toxicologist and other expert HPA staff.
- Administrative Assistant, to organise and record meetings.
- Analyst, to produce required information e.g. mapping.
- Senior Environmental Health Officer.
- Communications manager (PCT, and possibly HPA).
- Support, (research assistants, trainees etc).
- Colleagues from other centres, e.g. Environment Agency, Cancer Registry, SAHSU.

Experience

To date we have recorded 38 chronic environmental problems. Most of these (n=16, 43%) have generated a level three response. Only 10 (13%) level 1 and five (26%) level 2 responses have been noted, possibly due to the difficulty in capturing the lower level events. However, seven (18%) level 4 health advisory groups have met and each has contributed to our understanding of these procedures, confirming our general feeling that the approach is robust, practical and reproducible.

Outstanding Issues

We have described the local situation so far. There is a need for further development:

1) GOOD PRACTICE
HPA and partner agencies [e.g. Local Authority, Environment Agency] need to develop good practices across the country, through such methods as published models and memoranda of understanding.

2) CAPACITY & PRIORITIES
Capacity will be stretched if sudden involvement is needed; the time consuming nature of the processes mean that only a few can be handled at any one time.

3) LOCAL ISSUES
Local comments need to be heard and incorporated as part of the whole process, of which a Health Advisory Group is only one element. Skills and time are needed for eliciting community viewpoints in a robust way to inform the health advisory group.

4) LEARNING
Lessons may be learned from many sources, e.g. audit and debriefing, legal challenges, further enquiries and audit.

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Impact of the contaminated land regime A questionnaire study to assess the needs for health advice from the HPA in the NW region

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Rachel Mwangi (Salford University)

Introduction

The Contaminated Land regime implemented by Part IIA of the Environmental Protection Act 1990 places duties upon local authorities to determine whether sites under their jurisdiction are deemed to be 'Contaminated Land'. The decision as to whether sites are indeed 'contaminated land' is conducted through a risk assessment process, which requires the presence of

- a **source** (i.e. the chemical contaminants in the soil),
- a **pathway** (a route by which exposure from the soil can occur e.g. inhalation of contaminant from dust blown off the site) and
- a **receptor** (e.g. people living on or near the site, or a receiving water course).

The risk assessment must show a linkage between the source and the receptor via relevant exposure pathways and that this results in a 'significant possibility of significant harm' to a receptor for the site to be considered as contaminated land. Effects upon human health are one of the types of harm (others include pollution of groundwater, impacts on sensitive environmental receptors such as wildlife habitats, physical damage to building structures). *[The details of the intricacies of the Contaminated Land Regime have been described elsewhere in previous editions of the Chemical Hazards and Poisons Reports].*

Assessment of human health risks

Assessment of human health risks can be facilitated by using the Environment Agency's Contaminated Land Exposure Assessment Model (CLEA) and by reference to Soil Guideline Values (SGVs) which are set for a limited number of contaminants commonly occurring in polluted environments.

The CLEA model, using probabilistic modelling techniques, can estimate the levels of exposure in humans close to or on the sites from a number of specified exposure pathways. There are 10 exposure pathways in total in the model, the most significant of which are the direct (accidental and deliberate) ingestion of soil, and consumption of vegetables grown on the polluted land. These separate exposures can be summed and the total human intake of contaminants from polluted soil can be compared against toxicological criteria of acceptable human intakes of that particular contaminant, taking account of the fact that human exposure to the same contaminant will usually already be arising from small sources in food, drinking water, air, etc. Should the predicted exposure exceed the total allowable intake calculated from soil, the site can be considered to be 'contaminated land' and action will be needed to break the source-pathway-receptor linkage to prevent a harmful level of exposure occurring.

Where SGVs have been established, these soil concentrations represent (for different end use scenarios e.g. a house sited on the land constantly occupied by adults and children or for a factory on the site occupied intermittently by adults only) levels of contaminants in soil (expressed in mg contaminant per kg soil - mg/kg), at or below which no harm is likely to ensue to the most sensitive human (if exposure from all the relevant pathways in the CLEA model were to exist for the particular end use of the land).

SGVs are therefore health protective in a 'reasonable worst case' scenario and indicate that if the soil concentration is below the SGV there is no need for concern. However, if an SGV is exceeded this does not necessarily mean that harm may arise – it is however a signal to consider whether all the assumptions in deriving the SGV are relevant to the site in question – e.g. do all the exposure pathways operate? Are the model's soil characteristics appropriate to the actual site? From this consideration, site-specific soil values (SSVs) can be calculated which are more relevant to the site. These may be derived using exposure models other than CLEA (the EA website identifies other suitable models). SSVs will generally tend to be higher numerically that SGVs.

SSVs can also be calculated for those contaminants which do not have SGVs allocated – and there are hundreds of such substances. Expert toxicological advice is needed to determine whether the exposures calculated by the models used represent a risk to human health.

Once a site is considered to be 'contaminated land' remedial action needs to be considered. Actions can include removal of the source (so-called 'dig and dump'), eliminating an exposure pathway (e.g. covering a site with a layer of clean soil and/or a tarmac), or removing the receptor (physically excluding people from the site, e.g. by rehousing). The costs and benefits of these remedial actions need to be assessed and balanced before deciding which to pursue.

In addition, concerns can be generated among residents living on or near to sites under investigation – even if ultimately they are shown not to be 'contaminated land' and so of no health impact. Dealing with these concerns will require the assistance of local health professionals, public health and health protection specialists to explain the potential health impacts, ameliorate any stress or anxiety created by the assessment process, and possibly investigate whether health may have been affected over the longer term.

Need for expert advice

From the foregoing it is clear that specialist health advice will be needed by Local Authorities to assist them both in their technical duties to identify 'contaminated land' and in their social duties dealing with the inevitable public interest and concern which will ensue. Traditionally, Primary Care Trusts (PCTs) have the responsibility for the health of their populations. The normal recourse would be for Environmental Health Departments in Local Authorities to seek assistance from the local Director of Public Health (DPH). In turn DsPH would then refer to specialists in the HPA, locally through Consultants in Communicable Disease Control (CCDC) in Health Protection Units and nationally from expertise available in the Chemical Hazards and Poisons Division (CHaPD).

Presently progress of Local Authorities (LA) in assessing sites under Part IIA has been slow. At the end of 2004, only 78 sites in the UK had been declared as 'contaminated land' while the eventual number of sites so designated will possibly run into thousands. However, work in this area is now sharply accelerating. It is perceived that health risk assessment will be the main driver for conducting this assessment and so it is expected that future LA needs for health advice in connection with contaminated land risk assessment will fall upon the local HPUs (via PCTs/DPHs). This will soon place serious resource and capacity demands upon the HPA. Added to this workload only 9 health-based SGVs have been published. This has created a specialist knowledge gap in human health risk assessment/ interpretation which the HPA may be expected fill.

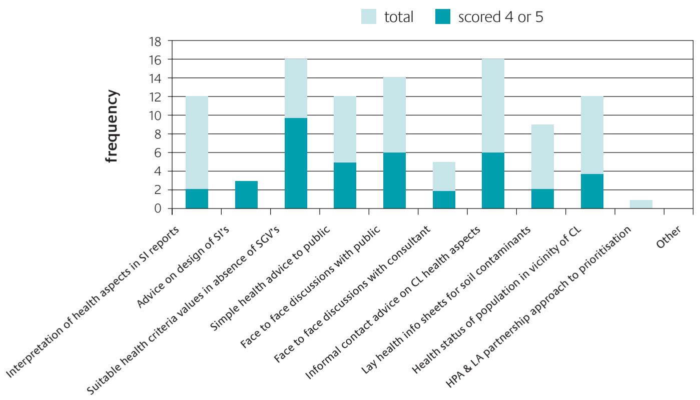

Table1. Sites per LA in Part IIA process
Average (range) from 27 replies

Objectives and methods

Given this perceived demand upon the HPA, a small group of interested specialists from within HPA agreed that quantification of the future demand upon HPA capacity and capability was needed. A questionnaire survey of Local Authorities Environmental Health Officers with responsibilities for Contaminated Land in the NW region was proposed. The objectives of the exercise were:

- To ascertain the extent of HPA health advice needed by Local Authorities to assess sites as 'Contaminated Land' under Part IIA, both currently and over the next 5 years.
- To appraise the needs for, and sources of, health advice from the HPA by LA Environmental Health Officers.

Discussions were held with Environmental Health Contaminated Land Officer Groups (CLOGs) in Cheshire, Lancashire, Merseyside and Greater Manchester to ascertain the present and future work plan for contaminated land.

From these discussions it became apparent that there was a great discrepancy in the progress made by local authorities in identifying contaminated land sites in their territories, but a common five stage framework to the process was apparent.

These five key stages were

- Identification of all **potentially contaminated sites** on basis of previous historical land use.
- **Prioritising** a selection of the above sites for more detailed evaluation using a customised scoring system to identify those of most concern.
- Subjecting the sites of most concern to a **desk study** of previous evaluations, complaints etc.
- Taking a decision which sites then need addition data collection e.g. **intrusive site investigation** for risk assessment purposes.
- Concluding the risk assessment by deciding whether a site can be **determined** as 'Contaminated Land'.

It is at these latter two stages that the highest input from the HPA would be required.

The above framework was used as the basis of a questionnaire agreed with a panel of EHOs and which attempted to provide a quantitative picture of the number of sites going through the various parts of the assessment process, both currently and cumulatively over the next 5 years. The questionnaire also examined the sources of health advice for Local Authorities and enquired about the likely priorities of types of support which would be wanted from the HPA. A copy of the questionnaire used is available from George Kowalczyk at George.Kowalczyk@hpa.org.uk.

The questionnaire survey was conducted over the summer of 2004 with final information being received in September 2004.

Results

A total of 27 questionnaires were returned (69%) over the period July –September 2004.

Table 1 summarises the data obtained on the estimated number of sites progressing through the five stage assessment process described above. The average number of sites being considered for evaluation currently averages 750 per LA (some LAs had not begun the process and one LA considered that it had 22,000 potential sites in its area). This number may ultimately rise to a total of about 2,000 per LA once all evaluations have been started. This is then expected to yield, over the next 5 years, approximately 20 sites per LA in the process of detailed investigation and in the process raise, local public awareness, expectations and possibly health concerns. About half of these sites (9 per LA) would then be expected to be determined as "contaminated land" and would need to be considered for remedial action which again may cause concerns for the local population –such as the disruption created by excavating areas of contaminated soil for example. Significant input from the HPA will be needed to support the LA in both the assessment process and mitigating the public health perception consequences.

From these data, each of the three NW HPUs, over the next 5 years, can expect to be asked to provide significant health input (i.e. data interpretation input, public health advice, presence at meetings) for some 50-100 sites in their geographic regions. Overall this amounts to something between 200-400 individual sites across the NW Region.

How will the HPA cope with these demands?

The survey also revealed that Local Authorities use varied sources of health advice; this is mainly from the local from HPU and PCT, but it is interesting to note that advice from consultancies has also been sought (Figure 1).

The main types of advice sought from the HPA by LAs was assessed on a 5 point scale. Most sought after (i.e. those items with most scores ranked as 4 or 5) were:

- ‘health criteria values’ for contaminants,
- the provision of simple health messages to the public,
- availability for informal contact and
- presence at public meeting

(Figure 2 provides additional details).

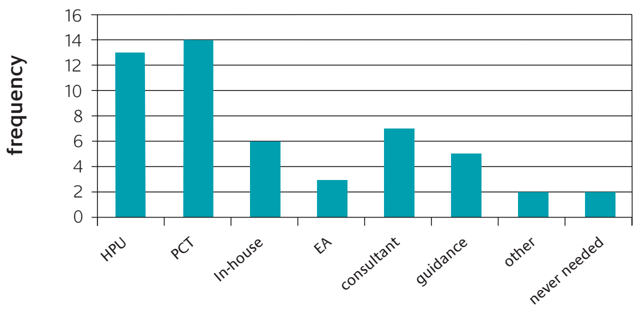

Figure 1 Sources of health advice for LAs

Discussion and conclusions

During the HPA’s existence and the lifetime of the new Contaminated Land regime, the HPA’s involvement in the process has been piecemeal and very often an afterthought. In the NW, HPUs have often been made aware of contaminated land investigation by local authorities once public health concerns or media interest have been activated. It is essential that HPA involvement is engaged at an early stage to help LA’s to avoid public anxiety and antagonism that can arise if issues are not handled sensitively.

Currently across the NW, the 3 HPUs are actively involved in over 20 contaminated land investigations each of which has a high public and media profile. This work is stretching local resources to the limit in respect of time devoted to reading and assessing technical literature, attending meetings and preparing information for the public. There has been tremendous assistance from ChaPD (London) without which it would have been impossible to cope with this level of demand.

	Currently	Over next 5 years
Potential sites	750 (0-21,000)	2000 (420-15,000)
Prioritised	90 (0-600)	1,000 (10-10,000)
Desk study	30 (0-414)	160 (10-650)
Site investigation	1 (0-30)	20 (5-75)
Determined	0 (0-1)	9 (1-50)

Figure 2. Type of advice needed by LAs
(Ranked on 1-5 scale; 5 =most sought)

This research has quantified the extent of the future burden upon the HPA locally and reveals that current level of demand is the just the tip of a much bigger iceberg. The Agency needs to face up now to increasing and possibly overwhelming demand. Liaison between HPUs and LA Environmental Health Officers is essential to plan and scope future workload to define the limits of deliverable HPA support to the Part IIA process.

An action plan has been developed in the NW to meet this predicted demand:

- A small joint-agency team in Greater Manchester is working to develop an MoU and a toolkit to facilitate interaction between HPUs and LAs to enable the LAs to be more specific and focused in their requests for advice from the HPU.

- Existing public health information leaflets on contaminated land issues (e.g. on the health effects of specific substances written in non-technical language) are being collated from across the country. A master set of documents will be provided to HPUs to assist in risk communication.

- Toxicological experts at the HPA’s newly formed Centre for Radiation, Chemical and Environmental Hazards (CRCEH) have been asked to provide authoritative advice on key issues that have frequently arisen in the assessment of contaminated land sites and which in some cases have been dealt with in differing ways by the Local Authority (e.g. how bioavailability and biological accessibility factors for contaminant uptake should be considered, how mixtures of polycyclic aromatic hydrocarbons should be assessed).

It is hoped that these activities will assist local HPUs in meeting the capacity and capability demands which will inevitably arise in the coming months.

Acknowledgements
Rachel Mwangi (MSc student, Salford University) for questionnaire design work response follow up and data analysis. Dr John Reid, Chris Booth, Dr John Astbury, Dr Richard Jarvis, Dr Alex Stewart, and Dr Jane Richardson of LARs NW for their assistance in discussions with NW Environmental Health Officers. Helen Casstles (John Moores University, Liverpool) and Professor Virginia Murray (CHaPD London) for their support and inputs at key stages of the project. Environmental Health Officers in the NW who assisted in the distribution of questionnaires to their colleagues and in particular to Robert Tyler (Thameside Metropolitan Borough Council) and Katherine Worthington (Salford City Council) for work in designing the questionnaire.

CHaPD developments

Government, water, soil and waste

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November 2004 saw the Department of Health (DH) transfer to the HPA Chemical Hazards and Poisons Division (CHaPD) its role of advising United Kingdom (UK) Government Departments and Agencies on human health effects of chemicals in water, soil and waste. This advice is intended to ensure that the development of Government policy takes due account of the protection and promotion of public health. Some of the principal interactions are with DH (on fluoridation of drinking-water), the Drinking Water Inspectorate (DWI) (on the quality of drinking-water), the Environment Agency (EA) and the Department for the Environment, Food and Rural Affairs (DEFRA) (on water sources, contaminated land, and waste), the Cabinet Office (on Soil Guideline Values) and the World Health Organization (WHO) (on Guidelines for Drinking Water Quality). Good working relationships with a range of other regulatory agencies such as the Food Standards Agency (FSA) and the Health and Safety Executive (HSE) are also important.

On fluoridation of drinking water, CHaPD is involved in discussions with DH and the Medical Research Council on formulation of a research programme. On more general issues of drinking-water quality, we advise DWI, for instance, on statutory authorisation of the temporary supply of water that does not meet the regulatory requirements for “wholesomeness” (but which may nevertheless be safe to drink). We are represented as an adviser on the DWI committee concerned with statutory approval of products and processes used in public water supplies. We would also advise DWI on any proposals to modify the current European Union (EU) or UK regulations. We contribute to the rolling revision of the WHO Guidelines for Drinking-water Quality, which are an important influence in setting the EU and UK standards.

The protection of water sources is an important safeguard for drinking-water quality. We are members of an EA-led committee which advises on the classification of chemicals according to criteria specified in an EU Directive which aims to protect groundwater from pollution. The criteria include carcinogenicity, mutagenicity and teratogenicity. We are also involved in a DEFRA-led steering group considering EU proposals for emission controls and environmental quality standards for 33 priority substances (or groups of substances) within the Water Framework Directive.

The safety of the various methods of waste disposal, such as incineration and landfill, continues to raise public concern. CHaPD is represented on the boards of several EA research projects (on incineration, scrapyards, and detailed assessment of emissions from landfill sites) and liaises with DH on epidemiological studies of landfill and health undertaken by the Government-funded Small Area Health Statistics Unit. We will also work with DEFRA on its review of environmental and health effects of waste management, following the publication of the first stage (on municipal solid waste and similar wastes) in 2004.

In order to provide a coherent and consistent approach for assessing risks to human health from contaminated land, EA with DEFRA publishes the continuing series of reports “Contaminants in soil: collation of toxicological data and intake values for humans” and “Soil Guideline Values” for substances thought most likely to be found as pollutants. We work with DEFRA, EA, FSA, HSE and the Scottish Environment Protection Agency in the preparation of these reports, which are intended to assist local authorities and EA in decisions on determination and remediation of contaminated land. The Cabinet Office’s Business Regulation Team has set up a Task Force to look at issues around the production, content and use of the Soil Guideline Values and related material. The Task Force includes representatives from DEFRA, the Office of the Deputy Prime Minister, EA, CHaPD, FSA, local authorities, industry, consultants and other stakeholders.

CHaPD provides an assessor on the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) and its sister committees concerned with mutagenicity (COM) and carcinogenicity (COC). These independent advisory committees provide expert advice to Government Departments and Agencies on all aspects relating to the potential toxicity, mutagenicity and carcinogenicity of chemicals. Where appropriate, we prepare papers for these Committees when specific guidance on human health effects of chemicals in water, soil and waste is needed. We also attend the Committee on the Medical Effects of Air Pollutants (COMEAP) as an observer; this independent advisory committee provides expert advice to UK Government Health Departments on the effects on health of both outdoor and indoor air pollutants. COMEAP’s views are relevant to evaluation of the effects of inhalation of airborne chemicals from waste facilities and contaminated land.

Useful links (alphabetical order)

British Fluoridation Society http://www.bfsweb.org/
Cabinet Office, Soil Guideline Values Task Force
http://www.cabinetoffice.gov.uk/regulation/business/program.asp
Department for Environment Food and Rural Affairs, Contaminated land
http://www.defra.gov.uk/environment/land/contaminated/index.htm
Review of environmental and health effects of waste management
http://www.defra.gov.uk/environment/waste/research/health/index.htm
Water Framework Directive
http://www.defra.gov.uk/environment/water/wfd/index.htm
Department of Health, Committee on the Medical Effects of Air Pollutants
Committees on Toxicity Mutagenicity Carcinogenicity of Chemicals in Food, Consumer Products and the Environment
http://www.advisorybodies.doh.gov.uk/
Drinking Water Inspectorate (England and Wales)http://www.dwi.gov.uk/
Environment Agency, Contaminated land
http://www.environment-agency.gov.uk/subjects/landquality/113813/672771/
Groundwater Directive
http://www.environment-agency.gov.uk/science/922316/934631/
Science and research
http://www.environment-agency.gov.uk/science/
European Union documents
http://europa.eu.int/documents/index_eulaw_en.htm
Food Standards Agency, Committees on Toxicity Mutagenicity Carcinogenicity of Chemicals in Food, Consumer Products and the Environment
http://www.food.gov.uk/science/ouradvisors/
Health and Safety Executive. http://www.hse.gov.uk/
Small Area Health Statistics Unit. http://www.sahsu.org/
World Health Organization, Drinking Water Quality
http://www.who.int/water_sanitation_health/dwq/en/

Skin as a route of exposure to environmental chemicals – in vitro models for skin permeation, distribution and metabolism

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Introduction

Skin is being recognised as an important route of exposure to environmental, as well as occupational, chemicals, including those involved in accidental or deliberate releases. Skin presents a considerable surface area (almost 2 m^2), so there is a great potential for absorption of chemicals in contact with skin. The scope of toxic effects resulting from dermal exposure to chemicals ranges from irritation and sensitisation to systemic toxicity and skin cancer. The ability of a chemical to penetrate skin depends mainly on its molecular size and lipophilicity, though factors such as the concentration, the composition of the application vehicle, and anatomical site are also important. Viable skin contains xenobiotic metabolising enzymes which may modulate the absorption and toxicity of chemicals. It is important therefore to study the dermal absorption, distribution and metabolism of chemicals in order to assess the risk of toxicity occurring following exposure.

Experimental approaches

Human volunteer studies are expensive and have ethical challenges. *In vivo* and *in vitro* studies using laboratory animals such as rats and mice have been used, though the permeability of rat and mouse skin is known to be much higher than that of human skin, and the current trend is towards a reduction in the use of animals in research. The use of human skin in *in vitro* systems presents fewer ethical problems than human volunteer studies; surgical redundant skin from abdomino- and mammoplasty has been used successfully. There are now OECD guidelines (OECD 2004) for the use of in vitro skin permeation studies.

Diffusion cells for the study of skin permeation and metabolism

The CHaPD unit at Newcastle has considerable experience in the use of diffusion cells for measuring chemical permeation through human skin in vitro. The Scott Dick flow through diffusion cell (Figure 1) consists of an upper, donor chamber and a lower receiver chamber. A section of human skin, dermatomed to remove most of the dermis, is placed between the two chambers. Liquid medium ("receptor fluid"), e.g. buffered saline or tissue culture medium, is pumped beneath the skin and the receiver chamber is maintained at 35ºC (this maintains the skin surface at about 32ºC). The receptor fluid leaving the diffusion cell flows to a fraction collector, allowing the system to be automated.

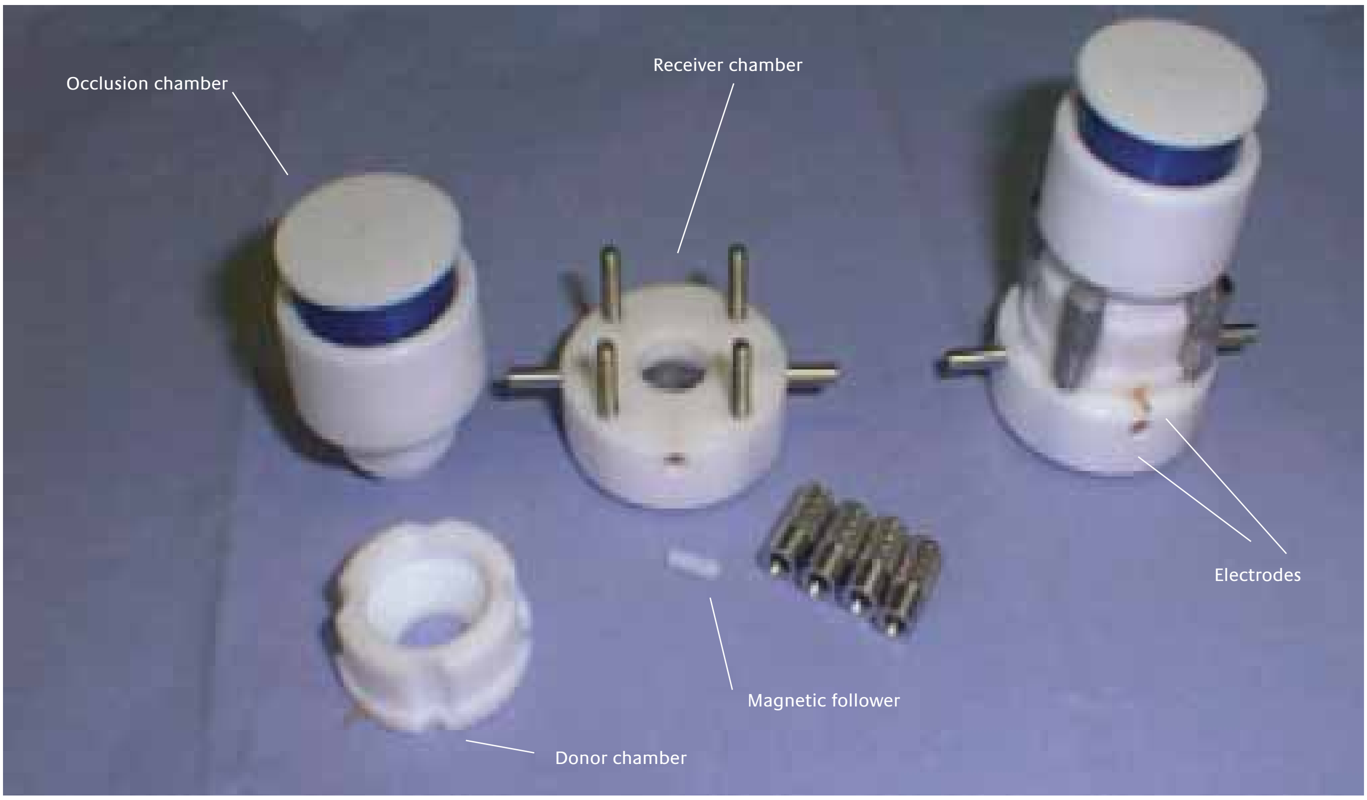

Figure 1. PTFE Scott Dick flow through diffusion cells, developed at Newcastle University.

The chemical of interest (usually in radiolabelled form to facilitate analysis) is applied to the skin surface (to a constant exposure area) in a liquid vehicle, and the amount of chemical in the receptor fluid is analysed and monitored over time. This is equivalent to the amount of chemical that is absorbed systemically, and the rate of absorption (in units of amount of substance per unit surface area per unit time) can be calculated from the cumulative absorption-time curve. At the end of the exposure period, the flow through cell is dismantled and the donor and receiver chambers washed to recover any test chemical present. The surface of the exposed skin is washed several times with a suitable emollient to measure the amount of material unabsorbed. The stratum corneum, a lipid rich matrix which comprises the uppermost layer of the epidermis and is the principal barrier to chemical absorption, is sampled using tape stripping. The tape stripped skin is digested in alkaline solution; this represents material present in the skin following exposure, which may subsequently be systemically absorbed. The OECD guidelines state that the total amount of test chemical recovered in the manner described above must equate to 90-110% to the applied amount for the study to be acceptable. The Newcastle Unit is equipped with a liquid scintillation counter to enable rapid analysis of samples from diffusion cell studies. Measurement of dermal metabolism requires the quantification of specific chemicals, and the Newcastle Unit is also well served with equipment for this purpose, including new LCMS and GCMS systems.

Integrity testing

The OECD guidelines recommend that an integrity test be carried out to ensure that the samples of skin used are not damaged before use. Permeation of tritated water has been used as a standard method for some years, though this may compromise the results of studies where radiolabelled test compounds are used. The Newcastle Unit is establishing the use of diffusion cells fashioned from PTFE, with gold coated contact electrodes fitted in the donor and receiver chambers. The integrity of the skin can be assessed by measuring electrical resistance when an alternating current is applied across the skin. This is a cheaper and less invasive method of skin integrity measurement which is now being developed to study the influence of irritants on skin integrity with colleagues in the Skin Toxicology Unit at Newcastle University. However, there is still some debate about the limit of acceptability for water permeation. Many laboratories use a permeability coefficient (absorption rate divided by concentration) for water of 1×10^{-3} cm/h, although 2.5×10^{-3} cm/h and 4×10^{-3} cm/h have also been used.

Current and future studies

The *in vitro* skin permeation system being established in the Newcastle Unit will be used in a project funded from the HPA studentship fund, to study the absorption and metabolism of aromatic and polyaromatic hydrocarbons, in collaboration with the University of Newcastle Institute for Research on Environment and Sustainability (IRES). A collaborative study with IRES and the Central Science Laboratory (York) and funded by DEFRA, will research the influence of pesticide formulation mixing on dermal absorption of active ingredients. In the longer term, the unit will undertake a larger study of dermal absorption of the most common chemicals involved in acute and chronic incidents, where data on dermal absorption are lacking.

Source of information

OECD (2004) Guideline for Testing of Chemicals. Guideline 428: Skin Absorption: *In Vitro* Method. (Original Guideline, adopted 13th April 2004).

Conference reports

Urgent Meeting on Tsunami Research
Institution of Civil Engineers, London, 18 March 2005

Co-sponsoring Organisations: Arizona State University, EPSRC, UCL Environment Institute, ACOPS, Risk Group, ICE, ACNDR

Janet Clifford, CHAPD (London)
Locum Environmental Epidemiology Scientist

Following the Asian disaster of December 2004 and the devastating effects of the Tsunami waves, the Lighthill Institute of Mathematical Sciences [LIMS] held a meeting to consider the mathematical and engineering science of the phenomena and suggest methods for reducing the damage in future.

An interesting and extremely informative day was provided by reports from experts in various fields and by short contributions on wave modelling studies. We learnt that tsunami can be caused by both underwater earthquakes in shallow water and by underwater landslides. Earthquakes can be identified seismically but not landslides.

Prof. D Howell Peregrine (University of Bristol) talked about tsunami hydrodynamics. There are problems for early warning of tsunamis. Firstly deep ocean waves cannot be identified from satellite images, only those approaching the shoreline. The topography of the seabed can cause diffraction and the shoreline can cause reflection. So more mapping of the seabed and shoreline is needed. HMS Scott has carried out a Bathymetry Survey of the seabed in the region.

Prof. Harindra Joseph Fernandez from the US Science Team said Sri Lanka was an example of this. The east coast received direct waves, but the west coast was also damaged because it received a combination of reflected, refracted and diffracted waves. Models underestimate for this complex mixture of waves. It is therefore not possible to calculate an ideal safe distance from the shore for rebuilding. He considered the education of communities and the preservation of the shoreline to be the two most important messages. Removal of sand mounts, coral and mangroves led to greater inundation.

David Long from the British Geological Survey found contamination of the ground water by salt, fuel, sewage waste and debris such as concrete and asbestos.

Gordon Masterton (Vice President, Institution of Civil Engineers) thought the robustness of buildings should be considered and that guidance for building in risk areas should be updated. Reinforced concrete frames survived whereas complete villages of lightweight buildings were lost. Many religious buildings survived due to better quality materials and construction. Homelessness is a great problem and trainers are urgently needed for reconstruction work to proceed quickly.

Professor Jan-Peter Muller (Department of Geomatic Engineering, UCL) has made a study of remote sensing and web-based geographical information system (GIS) aspects. This has revealed that the technology is ready in space to deliver more real-time information, but that there is no co-ordination, no web system, and a lack of bathymetric topographical information to make use of it. It could provide a method of giving real-time triggering to the Global Earth Observation System of Systems (GEOSS) for disaster management.

In the discussion recommendations were made that buildings should have reinforced concrete frames with lightweight infill that is easy to replace. Natural sea defences and sand mounts should be maintained. Living areas should be on higher floors. Governments should impose standards. Planning guidelines, integrated response schemes, and a system of forecast, warning, and education should be put in place. Every country should have a national platform for disaster reduction and there should be a global data co-ordination network with low cost data provision for countries to process themselves. Warnings must be reliable for the public to respond.

Amongst other outcomes, a research proposal will be made to EPSRC. Ideas suggested were for studies to extend bathymetric knowledge and to investigate the stability and mobility of sediment that builds up on the Continental Shelf.

Probabilistic Modeling of Exposures for Risk Assessment: A two day training course run by The Health and Safety Laboratory (HSL), Buxton; 16th & 17th March 2005

Myfanwy Cook, Locum Environmental Epidemiologist, Chemical Hazards and Poisons Division (London), Health Protection Agency

Probabilistic modeling techniques, including Monte Carlo simulations, are becoming increasingly popular tools in the assessment of the health risks associated with exposure to chemicals in the environment. It is therefore more important than ever that risk assessors and managers in the environmental and health fields should have an appreciation for the methods involved and the advantages and disadvantages of the technique. This two-day course at the Health and Safety Laboratory provided an introduction to the topic and a chance for those with some modeling experience to develop their skills.

The course structure included morning presentations on the theory and practical application of probabilistic modeling, followed by more 'hands on' afternoon sessions. These gave attendees the chance to use some commercially available probabilistic modeling software packages, and to get a good feel for some of the technical issues involved. Free trial copies of the software were provided at the end of the course to allow attendees to try out in their own time the techniques that they had learned.

Day one began with a detailed introduction to the topic, in two presentations given by Dr Anna Rowbotham (Senior Toxicologist, HSL). These covered the essentials of probabilistic modeling; the background and history of the techniques; key components of a probabilistic model; the basics of Monte Carlo and Latin Hypercube analysis and sensitivity analysis. These talks were followed by sessions from Dr Derek Morgan (Head of Epidemiology and Statistics, HSL) and Dr Nick Warren (Senior Statistician, HSL) on good modeling practice and methods of characterizing uncertainty.

The morning continued with a chance to implement some of these principles in an interactive computer session. This demonstrated the use of Matlab® with a simple Monte Carlo analysis.

Day two focused more on the applications of probabilistic models, with case studies presented by guest speakers. Two presentations, from Mr Kim Travis (Syngenta) and Dr Carol Harris (Exponent International Ltd), gave different perspectives on the use of probabilistic modeling in the risk assessment of pesticides. An excellent presentation from Dr Mel Holmes detailed the Central Science Laboratory's work on the use of probabilistic techniques in assessing exposure to chemical migrants from packaging materials.

After another hands-on computer session, this time using @risk software, the audience (by now suffering from mild statistical shell-shock) was invited to contemplate some more advanced methods such as Markov Chain Monte Carlo Analysis, and their application in complex systemic exposure assessments and physiological-based pharmacokinetic models.

This was the first training session in probabilistic modeling held at the HSL, and it is intended that the event will be repeated in the future. This would provide a good opportunity for risk assessors inexperienced in probabilistic exposure assessment to develop an increasingly important set of skills.

Further Reading and Resources:

For those seeking a further introduction to Monte Carlo Analysis and probabilistic modeling in the environmental field, the following references may be of interest:

- Risk Analysis, A quantitative guide (Second Edition) by David Vose, published by John Wiley & Sons Ltd, Chichester, UK. 2003. ISBN 0 471 99765 X.

- Guiding Principles for Monte Carlo Analysis. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, EPA/630/R-97/001, 1997 (available from http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29596)

Free trial versions of two easy-to-use Monte Carlo packages, Crystalball™ and @risk, can be downloaded from the internet:

- Crystalball™: http://www.decisioneering.com/. This site also includes some example simulations providing examples of modeling applications in the environmental sector.

- @Risk: http://www.palisade-europe.com/html/risk.html

The Healing Environment in our Communities and Healthcare Settings: Research Excellence into Practice. Royal College of Physicians London, 21 February 2005

Dr Howard Eastcott, South East Region, Health Protection Agency

This conference was organised in collaboration with The Prince's Foundation for the Built Environment, The Centre for Medical Humanities, University College London and the International Centre for Health and Society, UCL.

This was a timely and important conference presenting the evidence from a wide range of scientific and professional disciplines to a multi-disciplinary, multi-agency audience on the manifold and profound ways that the built environment impacts on health. Within the programme, many issues concerning the health protection field were presented with a clear message for a better integrated approach to the subject of town planning; one that brings to bear the wealth of understanding that we now possess about the effects that un-regulated and poorly considered designs of the past have contributed to ill health across the whole of society, but most profoundly on the poor.

Topics covered in the excellent series of presentations ranged from history, aesthetics, architecture, sociology, social psychology, human geography, planning, industrial development, the caring professions and health care managers to personal perspectives of the speakers as patients and citizens.

Following the welcome and opening remarks from Professor Carol Black CBE, President of the Royal College of Physicians, the first presentation was given by Professor Sir Michael Marmot, Director of the International Centre for Health and Society, UCL entitled 'The local social environment and health'. This was a tour de force presentation of the key evidence underpinning the relationship between having a satisfactory social environment and being enabled to lead a healthy and sustainable life. This was followed by another thought provoking, beautifully illustrated presentation by Michael Mehaffey, Director of Education, The Prince's Foundation for the Built Environment covering the topic of 'The local built environment and health'. These presentations were followed by workshops that enabled participants to gain a feel for the wide range of experience and expertise that lies within local communities.

The keynote speech was given by HRH The Prince of Wales. http://www.princeofwales.gov.uk/speeches/health_21022005.html. His speech covered an even broader perspective but with reference to the importance aesthetic and functional qualities needed at a local level for peoples' well-being as well as the impact that industrialisation has had in terms of pollution of land, sea and air and global climate change.

After lunch Susan Francis, Architectural Adviser, NHS Confederation gave a lengthy and comprehensive outline entitled 'Optimising design: making quality places for modern healthcare.' A key element of this was the importance of providing staff with an aesthetically and functionally good workplace if the organisation was sincere in its desire to get the best from its workforce.

This was followed by a presentation from a health service user's perspective on the impact of the health service environment on the sickness/getting well experience by the artist, Michele Angelo Petrone entitled, 'A user's perspective on the healing environment: in search of the right questions'. The day ended with a further multidisciplinary workshop and plenary session.

Whatever the Prince's current views on the architecture of the Royal College of Physicians building, the contrast between the spacious building with windows onto green fields, trees and the early daffodils in Regents Park and the depressing illustrations of the eyesores of former planning failures made me realize my extreme good fortune to be there and to have enjoyed such a brilliantly varied and stimulating day.

Conference Report on UK-China Food Safety Seminar – Chongqing, PR China 15th – 17th March 2005

Richard Elson-Senior – Scientist,
Environmental and Enteric Disease Department, CDSC, HPA

Colin Houston – Unit Head,
Enforcement Division, Food Standards Agency

Robie Kamanyire – Senior Toxicology Scientist,
Chemical Hazards and Poisons Division (London), HPA

Summary

Members of the Health Protection Agency, the Food Standards Agency and the World Health Organisation were invited to participate in a food safety seminar at Chongging, Peoples Republic of China (PR China). The main objectives were to:

- Initiate collaborative activities between the UK and China on food safety in South West China
- Map out common areas of interest in food safety including outbreak and incident response
- Facilitate the understanding of food safety and standards systems between China and the UK

A number of presentations were made by the UK delegates and the outcomes of the workshops are summarised in this report along with recommendations for further work.

Background and context

China and the UK issued a joint statement in May 2004 setting out plans for developing cooperation in a number of areas including science and technology. Prompted by this statement, the British Council and the Chinese Ministry of Science and Technology developed the UK-China Partners in Science initiative. This seminar was amongst the first Partners in Science activities in Southwest China and was arranged by the British Consulate General Chongqing and the Chongqing Food and Drug Bureau. Food safety and consumer protection enjoyed considerable media attention both locally and nationally during the workshop. This was demonstrated by editorial articles in the China Daily, national events held to mark national consumers day on the 16th March 2005 and an article on the Food Safety Seminar itself in the Chongqing Times newspaper.

Aims and objectives of seminar

The aims and objectives of the seminar were to:

- Initiate collaborative activities between the UK and China
- Raise awareness of the UK food standards system among Chinese counterparts in the field of food research, standards setting, standards implementation and food processing.
- To raise awareness of the UK advanced knowledge in rapid testing and investigation of outbreaks and incidents due to food contamination events
- Help the UK side better understand the Chinese food safety research priorities, food standards system and the food industry in South West China.

Activities

The seminar took the form of presentations from FSA, HPA and WHO representatives, interactive workshops and field visits to government departments, academic and private laboratories and research institutes and a food processing plant. Translated documents were provided by the HPA and the FSA regarding the principles of surveillance and response, Hazard Analysis Critical Control Point (HACCP) and food safety and food hygiene.

Areas identified for possible further co-operation and collaboration.

- Chemical contamination of food and agricultural land, including pesticide contamination
- Increase access to, and publication of, translated UK information on food safety issues.
- Increase access to EU/UK standards for foodstuffs particularly HACCP and quality control for export of food to UK.
- Developing surveillance systems with limited resources.
- Working with the Food and Drug Administration and others involved in food safety, identify ways to promote cross working between departments and ministries drawing upon the examples of the HPA and FSA models.
- Response to acute food related illness (communicable and non-communicable).

Conclusions

This seminar provided an excellent opportunity for UK representatives to get a feel for current food safety concerns in the South West region of China. Co-ordination and communication between the HPA, the FSA and the Consulate General Chongqing was established to provide a foundation for further work with the organisations involved in the seminar.

Food safety is an extremely wide discipline and to gain full benefit from future work, the subject could be broken down into specific themes, particularly those that have been identified as local priorities. These themes could be linked into overarching principles such as surveillance, response and outbreak investigation and management.

The main short term need identified was an authoritative source of easily accessible information, particularly concerning the hygiene standards for food stuffs expected in the UK and other European member states. The possibility of developing the Consulate General UK-China Partners website to contain a food safety portal was discussed with Consulate staff.

The event also highlighted a potential approach for future joint international work between the HPA and the FSA.

Education and training

Go in, stay in, log in – Developing an online module for incident management training for general practitioners

Dr Ruth Ruggles, CCDC, SW London HPU (ruth.ruggles@swlondon.nhs.uk)

Dr Tim Ringrose, Director of Professional Relations, Doctors.net.uk (www.Doctors.net.uk)

Key points

- Good control measures early in an incident are important in prote#ting healthcare staff and public health, so it is important that frontline healthcare professionals take appropriate action in a chemical or infectious disease incident.
- In our experience, General Practitioners are often uninvolved in PCT emergency planning and preparedness, and have low levels of knowledge about advice and support available from public health and the Health Protection Agency.
- General practitioners have many competing demands on their time. Online training modules are a means of providing education to large numbers of General Practitioners. They have the additional benefit of increasing awareness of the advice and support available from public health and the Health Protection Agency.

Introduction

Good control measures *early* in an incident are important in protecting healthcare staff and public health. But, a Doctors.net.uk survey in 2003 showed that only six percent of 200 GPs surveyed felt that they knew what to do in the event of a major incident.[1] Experience of those providing training at the Health Protection Agency (HPA) was that relatively small numbers of general practitioners (GPs) were attending training days in CBRN or incident management. GPs were often uninvolved in PCT emergency planning and preparedness. Our experience was that GPs had low levels of knowledge about advice and support available from public health and health protection, and how to contact and use such expertise.

A large incident or overt deliberate release is most likely to be detected and managed by the emergency services. But not all incidents present like this. A new illness (like SARS) or a covert deliberate chemical or biological release may present as unusual, ill-defined illness over days, weeks or months. GPs may be involved in any phase of an incident, from recognition and early response through to recovery.

It is important for frontline healthcare professionals, including GPs, to be able to recognise the symptoms and signs of a possible CBRN event, chemical incident, or emerging disease, and to take appropriate action. Simple preparation and training measures in primary care can reduce the risks from a chemical or infectious disease incident to patients, healthcare staff and the general public.

Figure 1: Scenario used to illustrate key points.

E-learning, like that provided by Doctors.net.uk, is popular with general practitioners and offers an opportunity to provide education to large numbers of general practitioners in a short time.[2] In 2003, a Specialist Registrar at the CHaPD (London) worked with Doctors.net.uk to develop and pilot an online training module in incident management for GPs.

Aims & objectives

The aims and objectives of the module were to:

1. Increase awareness of potential risks from chemical and infectious disease incidents.
2. Increase knowledge of the possible presenting features and initial management in general practice of chemical and infectious disease incidents.
3. Increase knowledge of the steps to take to prepare your practice and staff for a chemical or infectious disease incident.
4. Increase knowledge of the sources of expert information and support in managing chemical and infectious disease incidents.

Method

The development of the e-learning module was a partnership between CHaPD (London), the Emergency Response Division of the HPA, and Doctors.net.uk. The module was developed by a Specialist Registrar in Public Health (and former GP principal) attached to CHaPD.

Doctors.net.uk provide a proforma for writing online training materials, and the IT expertise. Most of the modules follow the same general format (box 1) Knowledge is tested using multiple-choice questions, before and after completing the module (pre-test and post-test). The education in the modules is built around clinical scenarios.

The content of our module was based on existing training materials from the HPA, and guidelines on emergency preparedness guidance and protocols. These were tailored for general practice, using clinical scenarios to illustrate key points from the specialist guidance (Figure1).

1. Introduction, including statement of learning objectives
2. Pre-test Multiple Choice Questions (MCQ)
3. Two Case Studies: A mix of text, graphics and a set of multiple-choice questions. As each question is answered, text is displayed reflecting on best evidence and current guidelines.
4. Post-test MCQ (a repeat of the pre-test)
5. Evaluation form

Box 1: Standard format for modules

Outcomes

The incident management module is accredited by the United Kingdom Conference of Educational Advisers (UKCEA) for two CPD points, and has now been completed by about 4000 General Practitioners (Figure 3). The module has been positively reviewed; with almost all the participants reporting that the module increased knowledge of incident management and of sources of expert advice and support (Figure 2).

Feedback from the participants enabled us both to make adjustments to this and other HPA training materials aimed at GPs. Further modules and a series of short online presentations are now being added to the programme.

Online modules offer additional benefits, such as the ability to link to additional training and service resources. For example, it was clear from early feedback that many GPs did not know how to contact the their local Health Protection Units. Contact details and material about the HPA (and local HPUs) were then linked to this module.

Summary

General practitioners have many demands on their time, and perceive major incidents such as CBRN, chemical incidents and pandemic flu as low probability events, albeit with high impact. From the health protection perspective, it is important that GPs are adequately prepared and trained, as early recognition and appropriate immediate control measures are important determinants of incident outcomes.

Online training modules are useful and popular resources for reaching large numbers of doctors, and should be considered as part of a larger training programme. Many aspects of public health and health protection relevant to general practitioners can be taught using this format. In addition, e-learning offers scope to provide other types of training such as interactive videos and expert lectures.

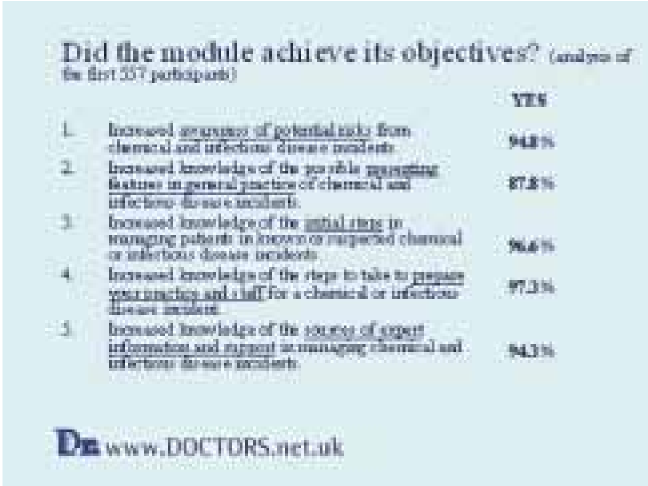

Figure 2: Evaluation of the incident management module (first 557

Online modules also have benefits for the authors and specialist agencies. The proforma was easy to use, and it was enjoyable and challenging to translate ‘dry’ expert guidance into clinical scenarios and an interactive multiple-choice format. It is important to seek advice from both experts and potential participants to ensure that the module is relevant and valid. Feedback from participants has contributed to the development of other teaching materials.

Through this online module we were able to increase awareness of the Health Protection Agency, and provide contact details for local Health Protection Units to General Practitioners.

References

1. National survey of General Practitioners in the UK. Doctors.net.uk November 2003
2. Reference to DNUK paper on e-learning

Figure 3: HPA modules counted by postal vote.

A new internet based course on major incident management

Dr Nima Asgaria, SpR in Public Health, London Region, on secondment to Chemical Hazards and Poisons Division, London

From October of 2004, the University of Manchester in conjunction with the HPA have started a self taught internet based course on major incident management. The course is part of the electronic Masters of Public Health degree, run by the University of Manchester although it can be taken as a stand alone course.

In its current format, it lasts for one semester (end of Jan. 2005), although in the future, it will be expanded and run over two semesters. Currently, the course is divided into 10 modules. Initial modules deal with the general concept “All Hazard Management” and functions of bronze, silver and gold commands in an emergency. This is followed by a module on management of a transport incident and then modules on acute, chronic and deliberate chemical incidents. Other modules cover both natural and deliberate biological incidents and management of nuclear incidents.

The modules can either be studied online or the whole course can be downloaded and studied offline. There are many references for each topic and the majority are accessible via hyperlinks from the actual page. There is the opportunity for weekly teleconferences with the course organiser in the evenings and discussion boards to discuss topics with fellow students.

Every module follows the same format and is interactive, forcing the reader to use his brain rather than simply read facts. There are self appraised tests in all modules which try to teach the concepts behind the facts. The modules are well presented and navigation between different pages and modules are such that even the most computer illiterate person is at ease.

Assessment is based on two written essays submitted at the middle and end of the semester. To encourage interaction between fellow students, extra marks are given to those who regularly participate in the discussion boards.

I was in the first ever cohort that studied this course. My fellow students were drawn from all aspects of health sector, acute and primary care trusts, Department of Health employees, Utility companies and the HPA.

The course covers a vast syllabus in a relatively short time frame. There is a great emphasis on self directed reading from the reference material provided and some of the modules may look daunting. This is particularly so for students studying two separate courses as part of their masters in public health (MPH) degree while having a full time occupation. However, it must be emphasised that all modules are well written, very interesting to follow and well explained.

The only shortcoming that I found in the course was lack of material on pandemic influenza in the biological modules, especially as avian influenza is currently occurring in S.E.Asia. It is hoped that as the course evolves, this topic may be included in one of the modules.

In short, this is a course that explains the concepts behind management of major incidents, the importance of multi agency approach for managing such incidents and examples of various real or potential incidents and how they were managed. I would recommend this course to anybody who is involved in emergency planning or who wants to understand the methodology of emergency management in UK.

For those who are interested, an outline of the course can be found at the following website: http://www.mphe.man.ac.uk/Prospectus/Downloads/CourseUnits2004.pdf (page 16)

Silent Weapons
Report on half-day conference held on Monday 31st January 2005 at Adams Park, High Wycombe

Allan Bailey, Health Emergency Planning Adviser, South East Region

"Silent Weapons" is the title of a national programme of training events organised by the HPA aimed at updating front line health service staff on preparations for potential CBRN threats. This was the second Silent Weapons event held in the Thames Valley. The first was held in January 2004 over two days. Feedback following that event was positive. However, as a significant number of health care professionals were unable to attend, it was agreed to try this shorter half day event while still covering the key topics, Chemicals, Biological Radiological and Nuclear, presented by the same speakers:

- Chemical — Prof Virginia Murray,
- Biological — Dr Barbara Bannister
- Radiological & Nuclear — Lesley Prosser

Dr Jonathan McWilliam, Public Health Director Oxford City PCT and Chair of the Thames Valley Emergency Planning Group provided an overview of the health response to the key CBRN threats from the Thames Valley perspective.

Over 70 delegates attended the conference from a wide cross section of primary and secondary care services.

The main aim of the conference was to provide staff from Accident and Emergency Departments, Ambulance, Primary Care and Public Health with useful information on what to expect in the event of a CBRN incident however caused. The CBRN experts were asked to provide a comprehensive overview of their subject and to identify the tools to obtain more detailed information as required with the aim of demystifying the subject, to help key frontline staff understand risks and how to protect against contamination.

Chemicals

Dr Murray outlined the main chemicals likely to be found at the scene of a chemical incident with their actions and treatments. She covered the many issues surrounding the subject from the perspective of health staff, for instance, 'white powder'. Dr Murray stressed the roles of the different agencies available for advice and recommended seeking help from the Chemical Hazards and Poisons Division as early as possible.

Biosecurity; coping with infectious disease emergencies

Dr Bannister covered the main agents likely to be used in a deliberate release as well as other diseases where there was risk of epidemic. Much progress has been made in planning for biosecurity at a national level but more work is required at a local level to plan for the assessment and handling of casualties and preparing the public. She stressed that education and training were the keys to protecting healthcare teams.

Radiological & Nuclear

Lesley Prosser covered the main issues with radiological and nuclear risks with the health effects associated with radiation. The role of NRPB in relation to emergency planning, emergency response, and monitoring and coordination were covered in detail.

Feedback from the event was very positive. Although the event was intensive and gave little time for the interactive approach of the two day event, it was agreed that it provided a valuable comprehensive overview of the important issues relating to CBRN and was very worthwhile. There are plans to repeat the event again later this year.

CBRN training by the Emergency Response Division, Health Protection Agency

Anna Prygodzicz, Training Manager,
Centre for Emergency Preparedness and Response,
Health Protection Agency,
Porton Down

The Training Division of the HPA's Centre for Emergency Preparedness and Response was set up in 2002, to deliver amongst other things, Chemical, Biological, Radiological and Nuclear (CBRN) training to NHS staff.

Review of 2003-2004 training

Eight different areas within the NHS were identified as the first targets for the training programme. Each needing very different types of training, these included:

- general practitioners,
- A & E staff,
- medical microbiologists,
- biomedical scientists,
- health physicists,
- Strategic Health Authority and Primary Care Trust staff,
- medical incident officers and
- emergency planning officers.

After organising a series of conferences for general practitioners it became obvious that the most proficient way of training this group would be to develop on-line training modules. To that end a chemical and biological Continuous Professional Development (CPD) module was written. This was hosted via the Doctors.net system: a paper on this is published in this issue of the CHaPD report.

The most suitable training programme identified for A & E staff was an already up-and-running programme entitled 'Silent Weapons'; a two-day course developed by Lister Hospital to raise awareness of the rapid diagnosis, investigation and treatment of CBRN casualties, as well as giving insight into the staff of the role of the emergency services, a much neglected area.

Another effective training programme identified was the Emergo Application – a 2 day real-time exercise, run by Coventry University's Department of Disaster Management. This course is not only for A & E staff, but for members of other departments within hospitals, including porters and domestic staff, as it tests the hospital's emergency plans and their capabilities of dealing with major incidents.

For Health Physicists – a two stage training package was developed and delivered by NRPB, to increase awareness of the likely radiological consequences of a CBRN incident and to provide NHS hospital physicists with appropriate training to equip them to respond effectively, if required.

Two different courses were developed for medical microbiologists and bio-medical scientists. The first was a regional one day course that raised awareness of the diagnosis and investigation of biological threats, whilst the second was a five day course run at Porton Down the aim of which was to familiarise bio-medical scientists with agents which could be used as bio-weapons.
Overall this year, the HPA managed to train over 4,500 NHS staff!

2004-2006 training

The training division of the Health Protection Agency's Centre for Emergency Preparedness and Response works with partner organisations to deliver specialist courses for healthcare providers and managers. These courses, funded by the Department of Health, enable delegates to respond effectively to major incidents of all kinds, including the deliberate release of chemical, biological, radiological or nuclear materials: The training programme now includes

- Emergency planning officers course
- Emergo-Application training for A&Es
- Strategic Decision Making and Leadership
- Silent Weapons
- Clinical Management of CBRN Injuries
- Recognition, Investigation and Management of Major Infectious Disease Incidents, including Deliberate Release of Biological Agents
- Differential Laboratory Diagnosis of Potential Biological Deliberate Release Agents
- Radiological Incident Management Training

Following the success of the on-line modules for general practitioners, a radiation module has been written and should be accessible by the end of November. We are also in the process of filming a series of 10 minute presentations (each one will be backed up by sub-titles for the hard of hearing) covering the whole CBRN scenario, which will add to the already popular modules. Each presentation will be able to be viewed independently.

For further information on any of the above, or to request a 2004 – 2005 training brochure please write to emergencyresponse.training@hpa.org.uk. Or look at the course on the HPA web site at http://www.hpa.org.uk/emergency/courses/cbrn.htm

CHaPD Conference December 2005

"Chemical Hazards, Poisons and Sustainable Communities"

VIIIth International Conference, Cardiff, Wales, UK
The Macdonald Holland House Hotel, Cardiff, Wales, UK,
December 5-7, 2005.

Chemicals are an essential part of modern life but they can cause harm. Indeed the public is increasingly anxious about the long term effects of exposure to chemicals as well as the acute threat from chemical terrorism. In the drive for sustainable communities, the undoubted benefits to society of chemicals in manufacturing, industry, agriculture, food presentation, housing products, etc. have to be tempered by the potential for harm.

This conference will focus on national and international developments in identifying the key threats to the health of the public, covering 'Alert and Response' systems, environmental public health tracking of hazards, exposures and health effects, engaging with the public, assessing risk and giving advice. The conference will highlight current knowledge and gaps and will make challenging proposals for research and for developing interventions and strategies for sustainable communities, including what the public health workforce should look like in the 21st century.

The conference will be of interest to policy makers, environmental health and public health professionals and toxicologists as well as professionals in allied agencies and organisations.

For further information on the conference and poster communication submission, please contact:

Conference Administrator
Health Protection Agency, Chemical Hazards and Poisons Division
Colchester Avenue, Penylan, Cardiff CF23 9XR

Tel: 029 2041 6388
Email: chemicalconference@hpa.org.uk
Website: www.hpachemicalconference.org.uk

For further information on the Macdonald Holland House Hotel, Cardiff, please contact:

Macdonald Holland House
24-26 Newport Road,
Cardiff, CF24 0DD

Tel: 0870 1220020 Fax: 02920 488894
Email: sales.holland@macdonald-hotels.co.uk
Website: http://www.hollandhousehotel.co.uk/contact.htm

Training Days for 2005

The Chemical Hazards and Poisons Division considers training in chemical incident response and environmental contamination for public health protection a priority. The 2005 programme is being developed to offer basic and more detailed training, along with the flexibility to support Local and Regional Services initiatives as requested.

Environmental and Public Health Training – Advanced Update to include Integrated Pollution Prevention and Control (IPPC)
28th June 2005, London
(for the HPA Environmental Network, Consultants in Health Protection with a special interest in environmental contamination and Local Authority environmental health practitioners)
The general aim of this training day is to raise awareness of some recent developments in environmental science. The specific educational objectives include familiarising participants with current issues relating to environmental sciences including modelling, monitoring, risk assessment and relevant research topics. Using the IPPC regime as an example, the course will describe many if the key risk assessment tools and sampling methodologies used by industry and regulators. Case studies will include the Environmental Agency's H1 assessment tool and the use of air dispersion modelling in IPPC and Local Authority air quality review and assessment reports.
A maximum of 40 places are available.

Introduction to Environmental Epidemiology – a week long course
19-23 September 2005, London
Organised jointly by the Chemical Hazards and Poisons Division, the London School of Hygiene and Tropical Medicine and King's College
(For Consultants in Health Protection, CsCDC, CsPHM and Specialist Registrars in Public Health and others who need this competency in environmental epidemiology in their daily work).
For further information see website http://www.lshtm.ac.uk/prospectus/short/seep.html or contact Karen Hogan on 020 7771 5383.

Contaminated Land training Day
27th September 2005, London
(For Consultants in Health Protection, CsCDC, CsPHM and Specialist Registrars in Public Health Medicine and Local Authority Environmental Health Officers)
Land incidents are of considerable concern and present extremely interesting and important issues for public health protection. Occasionally land contamination may arise from acute events (such as spills, leaks etc) but most public concern now concentrates on chronic long-term contamination issues (waste disposal including landfills, an abandoned factory site, or other brownfield sites). These 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 should provide delegates with the tools and information required to provide an appropriate and timely response to chemical incidents that result in land contamination.
A maximum of 40 places are available.

How to Respond to Chemical Incidents
25th October 2005, London
(for all on the on-call rota including Directors of Public Health and their staff at Primary Care, other generic public health practitioners, Accident and Emergency professionals, paramedics, fire and police professionals and environmental health practitioners)
The general aims of these basic training days are to provide an understanding of the role public health in the management of chemical incidents, to be made aware of the appropriate and timely response to incidents and to understand the interaction with other agencies involved in incident management. These training days also have specific educational objectives which include to be aware of the process for health response to chemical incidents, the type of information available from CHAPD (L) to help the health response, the resources available for understanding the principles of public health response and the training needs of all staff required to respond to chemical incidents.
A maximum of 40 places are available for each course.

Acute Chemical Incident Response for Emergency Departments
24th November 2005, London
(for Emergency Physicians and Nurses but will also be of interest to hospital managers and clinicians from other specialities [General Physicians, Anaesthetists and Intensivists] who may be involved in a hospital's response to a chemical incident.)
Topics to be covered include recognising a chemical incident, containing the incident, principles and practice of decontamination, antidotes and supportive treatments, the role of the Health Protection Agency, planning and preparation and medico-legal and forensic issues. Presentations on each topic will include small group sessions with case scenarios facilitated by members of the teaching team.
A maximum of 40 places are available.

Those attending CHAPD (L) courses will receive a Certificate of Attendance and CPD/CME accreditation points.

The cost of the training days are £25 for those working within the Health Protection Agency and £100 for those working in organisations outside the Health Protection Agency. Places will be confirmed as reserved upon receipt of the fees. These charges are to cover lunch, training packs and administration costs.

For booking information on these courses and further details, please contact Karen Hogan, our training administrator on 0207 771 5384.

CHAPD (L) staff are happy participate in local training programmes. Please call Virginia Murray or Karen Hogan to discuss on 0207 771 5383.

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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.