Chemical Hazards and Poisons Report

From the Chemical Hazards and Poisons Division

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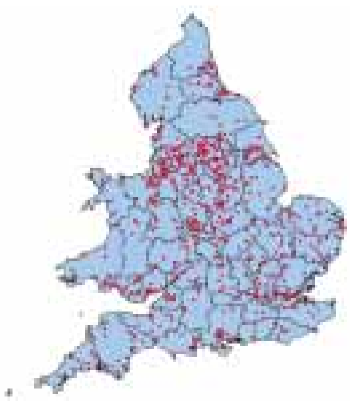


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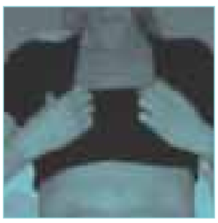


Editorial

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

In this third Chemical Hazards and Poisons Report we address a series of incidents relating to childhood exposure including potential chemical risks occurring in schools including asbestos and a paper addressing population susceptibility to environmental exposure including the potential susceptibility of children.

A series of unusual incidents are reported including three relating to potential and confirmed ingestion of toxins and chemicals and an incident where colleagues form the Newcastle Unit of the Chemical Hazards and Poisons Division undertook biological monitoring of exposure to organochlorine pesticides in an African population.

Emergency response remains a priority and early alerting of chemical incidents to public health is a difficult issue. In a project undertaken in London a programme is trying to develop a pilot scheme which if helpful could be used more widely.

An interesting series of exercise reports is included. The difficulty of providing resources to islands is considered in Livex 2004 whilst experience from Paris and a recent radiation exercise provide examples of how other European countries are responding to problems from CBRN and terrorism issues.

Important developments in Integrated Pollution Prevention and Control and the creation of the Environmental Health and Risk Assessment team, Chemical Hazards and Poisons Division, Health Protection Agency are presented. The North West Region has had a series of incidents relating to mercury and in collaboration with the Environment Agency proposals for a mercury amnesty are being considered.

As always education and training remain high on the agenda of the Chemical Hazards and Poisons Division. Two reports of recent week long courses, one run in the North West and the other at the London School of Hygiene and Tropical Medicine, provide interesting examples of how this may be taken forward. The back page of this Chemical Hazards and Poisons Report gives 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 April 2005. The deadline for submissions is March 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[Virginia.Murray@hpa.org.uk] or call on 0207 771 5383.

I am very grateful to Professor Stephen Palmer, Professor Gary Coleman and Dr Elaine Farmery for their support in preparing this issue.

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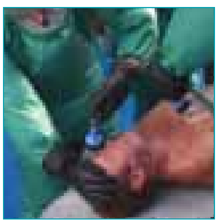

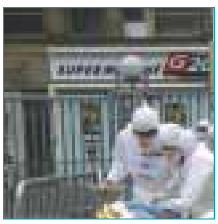


Children

Investigating an unknown illness in a comprehensive school

Dr Nima Asgari-Jirhandeh Specialist Registrar in Public Health Medicine, Chemical Hazards and Poisons Division, London (CHaPDL),
Dr Chris Williams Specialist Registrar in Public Health Medicine, East and North Hertfordshire Health Protection Unit (ENHHPU)
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Introduction

On the morning of Thursday 9th September 2004, the Consultant in Communicable Disease Control (CCDC) for East and North Hertfordshire Health Protection Unit (HPU) was informed about a possible chemical incident at a secondary school in Stevenage. Emergency services used the current advice on managing incidents of unknown nature, and full evacuation of school, decontamination and medical assessment of over 50 students and staff was performed. To date, no causative agent has been found. Chemical Hazards and Poisons Division (London) had been supporting the local HPU in determining the cause. This report describes the details of the incident and focuses on the management strategy used by all agencies involved.

Time line (see table 1)

The incident started at approximately 10.00 hours in a pottery class where 2 students in year 7 (11 years old) complained of being unwell while watching a video on health and safety. By lunch time eight children were unwell and the local HPU was informed of the situation. Ambulance control also informed the local police and fire service. By early afternoon, police initiated their major incident plan and the local A&E department was on standby. A total of 53 pupil, staff, parents and ambulance crew were seen in the A&E, either as a precaution or for assessment and treatment. By 19.00 hours, water and environmental samples were taken. Gold command had also met and stood down the major incident. The school remained closed the following day, opened to staff on Monday 13th September and to students on 14th September.

Clinical Presentation

The pupils reported a variety of symptoms. These included, dyspnoea, nausea, headache, fatigue, sore eyes and pins and needles in extremities. Apart from one pupil with an incidental finding of a pneumothorax, no physical signs were found on examination by the A&E staff. Whilst unable to eliminate the possibility that symptoms might have been due to chemical exposure, A&E staff confirmed that symptoms were compatible with those of anxiety.

Discussion

As table 1 shows this was an incident that very quickly escalated and became a multi agency major incident. There were a number of reasons for this change. Current emergency services policy specifically indicates that if there are three or more people who suffer with similar symptoms with an unknown cause and are linked in time and place to each other, the staff should assume there could be a potential CBRN exposure and should take appropriate steps to minimise the risk to themselves and to verify the likelihood of CBRN release. Speculation suggests that the proximity of the date of incident to both September 11 atrocities and the Belsan school massacre had put the emergency services on a heightened level of alert. However, excluding a CBRN threat does not mean that there has not been a HAZMAT incident.

As part of the investigation, once the CBRN threat was negated, the police assumed command of the school and dealt with the site as a crime scene. Consequently, a number of environmental samples as well as some blood and urine samples were taken and sent to forensic laboratories. None of these samples identified a potential cause. Discussions with the A&E staff indicated that none of those seen were seriously ill and the majority were discharged soon after admission to the department.

There are a number of similar incidents reported in the medical literature where large numbers of students and staff complain of similar symptoms without an aetiology ever being found. Many of these incidents are labelled as mass psychogenic illness[1,2]. However, the fact that no aetiological agent has been found does not exclude the possibility of a chemical exposure. Often, the complexity of chemicals involved and not knowing when and what to sample hampers identification of the chemicals.

Lessons Learned:

A number of points can be drawn from this incident and the way that it was dealt with:

- It is important to consider schools as a high risk area when emergency planning procedures are being devised. Children have a lower threshold level to adverse health effects from chemical exposure and an incident in a school, be it deliberate or accidental, has much higher emotional ramifications and media impact. This may affect the emergency services and divert resources away from the acute management of the event.
- The way that such incidents are treated has changed immensely since 9/11. Whereas before the diagnosis of mass psychogenic illness would have been made sooner, now other more frightening possibilities have to be ruled out. The process of ruling out deliberate release of CBRN agents can enhance the effects of mass psychogenic illness.
- Interagency working is of particular importance when the decision is made to evacuate a school. The sooner the local Consultant in Communicable Disease and the HPU staff have been told about the incident the more time they have to gather relevant support from national centres, warn the wider health economy of the threat and try to influence decisions at Strategic (Gold), Tactical (Silver) or Operational (Bronze) levels.
- The current guideline of assuming a CBRN incident if three or more people have similar symptomatology with unknown aetiology may

Table 1: time line of events

Thursday 09.09.04		
	10:00-11:00	2 students become ill in pottery class while watching a video. One complains of shortness of breath. They go to sick bay and an ambulance is called for.
	11:00-12:00	2 more students complain of being unwell and are sent to sick bay. One child is sent home, is subsequently seen by GP and is referred to A&E, where an incidental diagnosis of pneumothorax is made.
	12:00-13:00	Increase in number of pupils feeling unwell. All pupils are from the same class
	13:00-14:00	8 children are unwell, 2 are sent home. Local HPU is contacted and informed of the situation. Local HPU informs the local A&E department, the Strategic Health Authority and contacts CHaPDL to seek advice. Police and fire service are informed by ambulance control. Police undertake a threat assessment in consultation with the anti-terrorist branch. Classrooms evacuated although pupils were not allowed to go home
	14:00-15:00	There are 2 fire crews and 2 ambulances at the scene
	15:00-16:00	Police call a major incident. 19 pupils are now unwell, decontamination of students is initiated in school showers. Children's clothing is bagged and they are given appropriate overalls prior to transfer to the A&E
	16:00-17:00	Self presenters including the patient with pneumothorax arrive at the A&E without being decontaminated, they were decontaminated outside of the hospital A&E entrance. Decontaminated children from school were ferried to the A&E. A&E department is closed to all other emergencies
	17:00-18:00	Fire crew entered the school building wearing breathing apparatus. CBRN team enter the site and check for potential chemical, biological radiological or nuclear material using handheld scanners. Environmental health and local water board take water samples
	18:00-19:00	Gold command at the police station stands down the multi agency major incident. The site is still a crime scene. A&E is opened to other patients. A total of 53 staff, pupils, parents and emergency crew are assessed. All are discharged without treatment.
	After 19:00	Police scene of crime officers enter the building after it has been reported safe from the CBRN and take forensic environmental samples.
Friday 10.09.04		
	8:00-12:00	4 patients re-attended the A&E and were subsequently discharged without treatment. A multi agency meeting occurred at the police station, involving Police, emergency services, environmental health and HPU, CHaPD (London) to assess the findings. Police undertook a questionnaire survey of the affected pupils. Site visit by HPU, CHaPD (London), and environmental health officers was undertaken.
	12:00-18:00	School remained closed all day. Two further meetings at 12.00 and 16.00 hours involving all agencies and the A&E department was held at the police station
Monday 13.09.04		School remained closed to pupils although staff were allowed to go back
Tuesday 14.09.04		School reopened. Final meeting between local agencies involved. The incident was shut, no lasting adverse effect was noted and no causative agent was found.

need to be refined. The advice although very sensitive is not very specific and leads to a rapid escalation of response. This is particularly the case in areas of the country where such incidents are rare and the emergency services may have fewer resources to exclude a CBRN incident in a timely fashion.

- Receiving hospitals, once told that there is a chemical incident in progress, should be aware of the possibility of 'walking wounded' who have bypassed decontamination at site and should be prepared to set up and decontaminate such patients in the hospital grounds before the patients contaminate the A&E department.

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Summary of CHaPD (London) chemical incidents at Educational Establishments with unknown aetiology

Dr Nima Asgari-Jirhandeh-Specialist Registrar in Public Health Medicine, Chemical Hazards and Poisons Division (London), Health Protection Agency.

Introduction

Incidents at schools have the potential to affect a large number of people and rapidly raise anxiety levels. This can lead to high resource allocation by all the services involved in managing an incident in educational establishments.

Chemical Hazards and Poisons Division (London) (CHaPD (London), receives information about incidents at educational establishments from a number of sources, these include the National Poisons Information Service, London (NPIS), Primary Care Trusts (PCT), local Health Protection Units (HPU) and local authorities. All such incidents are categorised and entered into a database with paper copies of the incident form also archived to allow a more detailed retrospective search and referencing.

Aim

- To summarise all reported incidents at educational establishments between January 1998 and September 2004.
- To describe in detail those incidents where the causative agent was not known or classified as other.
- To draw any lessons learned from these incidents

Method

The CHaPD (London) database was used to identify all incidents that have occurred at educational establishments. A second more focused search of these incidents was undertaken where the nature of incident was 'not known' or was classified as 'other'. Paper records of all such incidents were then identified and reviewed with a particular emphasis on the management of these incidents.

Results

Of the 9,074 incidents in the database, only 234 (2.56%) occurred at an educational establishment. Table1 and Figure 1 provide a break down of these incidents by type as recorded in the database:
As table 2 shows, there were between 30-40 incidents involving schools per annum, however, the number of incidents where the causative agent is not known is roughly 4 a year.

There were a total of 13 incidents categorised as 'unknown' and a further 11 incidents categorised as 'other'. Visual searching of the database identified a further three incidents where an unknown chemical was released in an educational establishment.

Of the 27 incidents, archived paper records for 25 were retrieved. Of the 2 records not retrievable, one related to health concerns from occupants of a school where there appeared to be a smell and the other was on advice regarding an unknown chemical causing illness in a school since the school was refitted three months ago.

Table 1: Breakdown of the reported incidents

Type of event	Number
Air	52
Explosion	5
Fire	7
Food & drink	15
Information	6
Land	10
Leak / Spill	70
Malicious	31
Not filled	6
Other	11
Water	8
Unknown	13
Total	**234**

Unknown Incidents

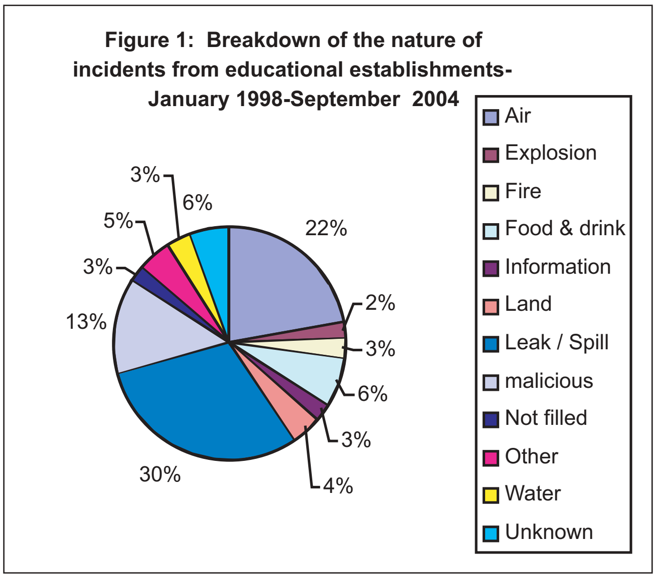
Of the 25 cases where archived records were retrieved, eight, were incidents where the cause was truly unknown, In all the incidents, CHaPD was contacted to give advice on either management or to help with identification of causative agents. However, of the eight incidents three were situations where one could not rule out the possibility of 'mass psychogenic effect'. Most recently, this occurred in a school in Stevenage and a full report on this is available in this Chemical Hazards and Poisons Report.

Another incident reported to CHaPD in February 2002 and concerned fainting attacks affecting eight children from the same class in a consequential way. Other causes including carbon monoxide poisoning were excluded and all children were discharged once they attended the A&E. No other students or staff were affected.

Finally, one of the largest incidents of mass psychogenic effect in schools occurred in a high school in Central Europe where close to 100 pupils complained of vague symptoms. This incident was investigated by an international team and no cause was found. Diagnosis of mass psychogenic effect was made as a diagnosis of exclusion.

Accidental inhalation of gaseous agents

There were eight incidents in this group. These related to accidental release and inhalation of variety of gases and fumes including butane, hydrogen sulphide, carbon monoxide, sulphur dioxide, chlorine and phenylethylene fumes. These incidents affected both students as well as staff and in most cases CHaPD advice was



requested by the A&E staff. Four (50%) of these incidents occurred in schools' chemistry lab.

Accidental contact with chemicals

This occurred in four incidents. In one case, university students were in contact with thalium and needed reassurance from CHaPD. Three other incidents include reactive rashes in children as a result of exposure to a toy taken into a school, mild burns on the arms of children after spraying each other with a freezer spray, and mild burns on the arms of children after contact with glycophosphate in a school ground.

Incidents involving swimming pools

Two incidents were related to school swimming pools, in one case bromine instead of chlorine was used as a disinfectant. The mistake was identified and corrected, however, by the time of discovery, up to 20 staff and students were regularly swimming in the pool and were suffering from symptoms of a 'chronic mysterious illness'. The second incident involved only one student feeling ill after entering the pool. No further detail is available on this incident.

Sewage smell in schools

Two schools reported of sewage smell. One related to seeking advice on any adverse health effects from the opening of a new sewage treatment works nearby. The second incident involved sudden increase of sewage smell in a school. Appropriate remedial work was done and the smell subsided.

Ingestion of chemicals

Finally in one incident, four pupils in a chemistry lesson ingested copper sulphate and required medical attention. CHaPD (L) was contacted to provide appropriate support to the health care staff.

Discussion

As can be deduced from the above breakdown, most of the incidents categorised as unknown or other can be sourced to a particular agent. However, the fact that three out of eight incidents where no cause could be found are assumed to be 'mass psychogenic illness' is worrying. Overall this equates to roughly 1% of all school-based incidents as reported to CHaPD (L). There is a well established body of evidence that points to this phenomenon and it is not limited to schools[1,2,3,4].

Studies done by the US National Institute for Occupational Safety and Health have shown that job stress may contribute to acute disturbances such as mass psychogenic illness among groups of workers. The sudden appearance of symptoms, usually in response to some "trigger factor" may result in the spread of the apparent "illness" with non-specific symptoms like headaches, dizziness, and nausea. Investigations often fail to detect specific physical or chemical causative agents[5].

What is important to note is not the frequency of these incidents, but the way that they are dealt with. Previously, health and emergency services had more freedom in dealing with these situations and diagnose mass psychogenic events earlier in the process of incident. However, since September 11th 2001, there has been a paradigm shift in the way that we respond to emergencies. If incidents of unknown nature occur in educational establishments, the potential threat should be taken seriously and using a combination of common sense and current guidance on Step 1,2,3[6]. This may mean that more resources will be spent on dealing with such incidents, and the number of such incidents may rise in the near future.

One way of ensuring that such incidents are dealt with adequately is to involve the health sector as soon as possible. This would mean that any risk assessment done by the emergency services could take into account advice from health, making it more robust.

References

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[5] Schmitt N, Colligan MJ, Fitzgerald M. Unexplained physical symptoms in eight organizations: individual and organizational analyses. Journal of Occupational Psychology 1980;53:305-17
[6] Health Protection Agency and National Radiological Protection Board. Management of Outbreaks and Incidents of Unusual Illnesses- a guide for ambulance staff. Available at : http://www.hpa.org.uk/infections/topics_az/deliberate_release/Unknown/Unusual_Illness_Ambulance.pdf.

Table 2: Breakdown of incidents by year (where paper records were available)

Year	Number of incidents reported	Number of unknown incidents/ other incidents
1998	38	0
1999	32	4
2000	42	7
2001	36	2
2002	39	6
2003	32	3
2004 (9 months)	15	3
Total	**234**	**25**

The chemical hazard of asbestos for educational premises

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Background

Asbestos was used extensively as a building material in the UK from the 1950s through to the late 1990s. Although some of this material has been gradually removed over the years, there are many thousands of tonnes of asbestos still present in buildings. It is estimated that over half a million non-domestic premises currently contain some form of asbestos containing materials (ACMs).

Case Study

As a result of an audit of risks in a school building, asbestos containing ceiling tiles were identified in the kitchen used for preparing meals for pupils. There was a single broken asbestos tile in a cupboard in the kitchen. The tiles were painted and in some cases the paint had been peeling off and dropping to the floor.

Analysis of the broken tile in the cupboard and of a ceiling tile detected a mixture of brown (amosite) and white (chrysotile) asbestos in each.

The kitchen was closed pending removal and clean up of the asbestos containing materials by a specialist asbestos contractor. Potential receptors included kitchen and maintenance staff. Pupils did not have access to the kitchen other than collecting their meals through a hatch, but an air vent ran from the kitchen to the playground outside.

Parents were informed by letter of the reasons behind the closure and renovation of the kitchen. To date no specific monitoring or surveillance activities have been deemed necessary.

Control of Asbestos at Work Regulations 2002-implications for educational premises

A new duty to manage the risks from asbestos in buildings has been added to the Control of Asbestos at Work Regulations 2002. This addition came into force in May 2004. Asbestos and asbestos containing materials (ACMs) may be found in schools/colleges built or refurbished before blue (crocidolite) and brown (amosite) asbestos were banned in 1985. Some asbestos containing materials such as asbestos cement, most frequently containing white (chrysotile) asbestos, were used up until 1999.

The most likely way for ACMs in schools and colleges to be disturbed or damaged is through maintenance and in particular through demolition and construction activities. Anyone carrying out such work needs to be aware that the building contains or may contain asbestos, where it is located and its condition.

Guidance for Educational Premises

- The Health and Safety Executive has a range of guidance material to help duty holders comply with their duties under the new Regulations and is available at www.hse.gov.uk/asbestos/information.htm
- The Department of Education and Skills has also produced guidance on managing asbestos in schools and is available at www.teachernet.gov.uk/atoz
- The Health Protection Agency, Chemical Hazards and Poisons Division and the National Poisons Information Service are available to provide clinical toxicological advice to local Health Protection Units, NHS, Local Authorities and Emergency Services.
- Consider alerting colleagues in your Primary Care Trust and discussing this with the local education authority to make sure they are aware of the support HPA can offer.

Population susceptibility to environmental exposure

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Introduction

Society as a whole is extremely dependent upon chemicals, being used daily in food production and preservation, water sanitation, housing, housekeeping and household equipment, transportation and health. This dependence is supported by a vigorous industrial chemical synthesising base, with distribution by a transport infrastructure of railway and road haulage, maritime and air cargo. The magnitude of chemical utilisation is underlined by the fact that over 11 million chemicals exist within the "Universe of Chemicals", 70,000 of which are in regular usage, with 49 million tonnes transported around the UK on an annual basis.

Linking of potential exposure to public health, however, is complex and for the great majority of chemicals, it is simply not known whether environmental exposure induces population ill health. Accordingly, there is a paucity of epidemiological, toxicological and molecular data linking environment and health, making risk assessment difficult.

Risk Assessment

Classical risk assessment is based upon 4 stages, as illustrated in the figure 1.

It may be seen that in order to make a risk assessment regarding the public health impact of exposure to environmental chemicals, extrapolation of data is required, largely from animal based models and occupationally based data. Therefore, there are limitations to this approach, revolving around inter-species and intra-species

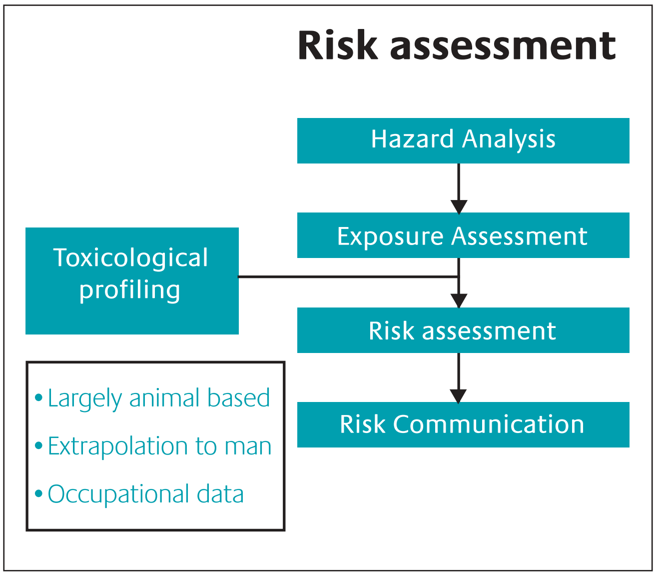

Figure 1: Classical risk assessment paradigm

These limitations make it difficult to accurately determine the public health impact of environmental exposure. Therefore, this paper will focus upon a particularly sensitive sub sector of the population, namely children, together with environmental genomics, a research tool that has the potential to highlight genetic susceptibility and subsequent novel biomarkers, thereby allowing a more tailored and focused public health response.

Children

It is now appreciated that the developing child is especially susceptible to the toxicity of environmental chemicals compared to the adult. There are several reasons for this:

- Children's exposure to environmental chemicals is disproportionately greater than that of adults. Intake of water and food is several times greater, on a weight per weight basis, than an adult, and air intake in an infant is twice that in an adult, so exposure of children to environmental toxicant present in these media will be greater than to adults. Furthermore, hand-to-mouth behaviour and play close to the ground magnify exposure to environmental chemicals.
- The kinetics of absorption may also differ between adults and children; for example, a greater proportion of lead is absorbed from the gastrointestinal tract of children compared to adults.
- Metabolic pathways involved in the detoxification of chemicals are less well developed in children than in adults, and their ability to transform, detoxify and excrete many such chemicals, as well as therapeutic drugs, differs greatly from that of adults.
- The importance of skin barrier function and dermal metabolism in environmental chemical exposure in children is still unclear, though there are several reports of percutaneous toxicity to new born and older infants from topical agents. This appears to result from the greater surface area to body weight ratio in infants, as well as to immature drug metabolism systems and, in premature infants, substantially decreased barrier function due to a much thinner stratum corneum (transepidermal water loss is tenfold greater in a 24-week premature infant compared with a full term neonate).
- Children also undergo rapid growth and development and it has been postulated that the rapid cell division occurring during early development leaves children at increased risk to chemical exposures.
- The developing nervous system is particularly vulnerable to chemical insult compared to that of an adult, resulting from differing levels of metabolising enzymes, rates of excretion and the lack of a blood brain barrier.
- Children have more years of future life ahead than most adults, they have more time to develop chronic diseases resulting from early exposures. For example, it is believed that the development of allergy to airborne environmental antigens, a major cause of asthma, may result from a T-cell selection process operative during infancy, which is triggered via encounters between the immature immune system and incoming airborne allergens from the environment.

Environmental Genomics

The term genomics is used to encompass everything from genome sequencing, annotation of function to genes, and genome architecture to studying patterns of gene expression (transcriptomics), protein expression (proteomics) and metabolite flux (metabolomics; see Figure 2). For the purpose of this document the collective term "omics" will be used to address the transcriptome, proteome and genome.

Application of "omics" technology to (eco)toxicology

"Omic" technologies have the potential to reduce uncertainties in the risk assessment process described above and facilitate a more rapid evaluation of a chemical's toxic potential and subsequent response of populations to environmental change. This learning will come from the incredible amount of molecular level information obtained from these technologies. This information will be used to elucidate new biological signalling pathways, new biomolecules and to understand mechanism of action.

Clearly, however, there will be ethical, legal and regulatory implications for these new technologies. Some of them are already being felt in our court systems and the problems will increase as more customised gene expression patterns or individualised "fingerprints" are forthcoming. Areas discussed included the privacy of genetic information, protection of patient confidentiality, implications for regulatory agencies, applications in tort litigation, and discriminatory uses of genetic information by employers and insurers. The importance of the regulatory and legal challenges faced in the environmental application of these technologies also needs careful consideration.

Environmental Perspective

The Human Genome Project is the pinnacle of a new era of knowledge in medicine and biology. Inevitably, the science of environmental (ecological) risk assessment will need to develop in order to be able to take this new knowledge into account in a pragmatic way.

Exposure to environmental toxins also represents a stimulus that can induce changes in gene expression, which may be typical of that type of toxin, although gene expression is not exclusively controlled by environmental stimuli. These changes can be monitored using genomic approaches, specifically transcriptomics, which effectively provides vast numbers of potential biomarkers. Environmental genomics offers improved understanding of mechanism of action, greater predictivity and the ability to apply bio-informatics to safety assessment, identification of sensitive sub-populations, improved inter-species extrapolation, identification and validation of novel targets and biomarkers. A number of UK and international research programmes are addressing these issues, including the MRC and Wellcome Trust "Biobank" programme.

Example of Toxicogenomic Profiling of Bioreactive Particles within Diesel Exhaust (data courtesy of Professor Roy Richards, Cardiff School of Biosciences, Cardiff University)

Epidemiological studies conducted first in the USA and later in the UK, suggested that a relationship exists between increasing cardio respiratory hospital admission, morbidity and mortality rates and increase in the small particulate matter, PM10s, originating from fumes such as diesel exhausts.

PM10s are particulates with an aerodynamic diameter of less than 10 µm, being a complex mixtures of natural materials, metals, carbonaceous components, soluble ionic species and organic micro-pollutants. In urban environments, diesel exhaust particles (DEP) form a large constituent (20-80%) of the airborne PM10s arising from vehicular activities. The exact biological mechanism by which these molecules elicit their toxicological effect is unclear. Furthermore, the impact these particles exert on the wider environment is poorly understood.

Previous research has concentrated on the size and surface chemistry of the PM10s, as an important factor underlying the health problems associated with exposure to these particles. Therefore, it has been necessary to perform classical toxicological exposures to study the physiological or the cellular damage caused by PM10s on the lung surface. Although this provided classical histopathology associated with lung damage,the results suggested that a better understanding of how DEP may increase lung permeability/information could come from studying more subtle biological endpoints. To this end, a toxicogenomic approach has been employed to profile the genes involved in the toxicological response

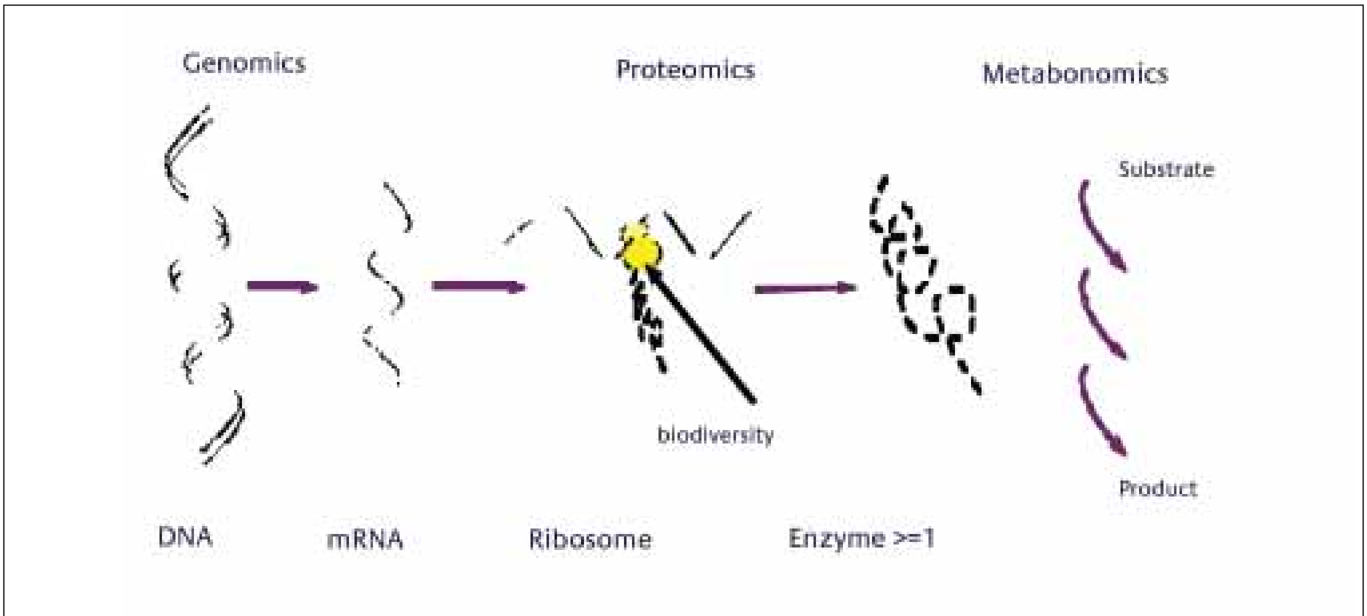

Figure 2 The molecular basis of life

The rational has been to look for genetic markers or candidate genes to monitor the toxic response. For this a commercial macroarray, representing genes involved in stress, cell signalling, xenobiotic metabolism, DNA repair/cell cycle, inflammation etc was employed. Identical membranes were hybridised to radiolabel targets generated from the genes transcribed within control and PM10 exposed animals. Of particular interest was the water soluble component of PM and specifically its bioavailable transition metals. It was hypothesised that these are the problem agents and by being bioavailable are crossing the lung barrier and at first pass targeting the heart. The macroarray technique was instrumental in identifying 15 genes of current interest (between 8 and 5000 fold change) that alter in the heart 4 hours after the pollutant is given to the lung. This might explain why people exposed to air pollution suffer from cardiac morbidity and mortality. More importantly, this technique is revealing how the heart communicates with the lung and how relevant drugs may compromise lung defences and modulate the affects on the heart.

Although the implications to environmentally relevant organisms can be extrapolated since the pathways involved are common, direct confirmation of the long term consequences of PM10 release into the environment on specific ecosystems requires further investigation. The tools provided by this toxicogenomic approach should enable these experiments to be performed in short order.

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Unusual chemical incidents

Scombrotoxin poisoning

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Dr Julia Harris, Consultant in Emergency Medicine. Southampton General Hospital.

Case Report

A 30-year-old woman presented to the Emergency Department at the Chelsea and Westminster Hospital complaining of feeling unwell. She had consumed a tuna sandwich at a sandwich bar and approximately ten minutes afterwards began to feel hot. Erythema, nausea, dizziness and a headache developed subsequently. By the time she reached the department (one hour later) there was florid erythema from head to toe.

There was nothing of note in her past medical history except she suffered from allergic rhinitis. Miss B. had no other known allergies, was not on regular medication, smoked 2 cigarettes per week, consumed 7 units alcohol per week and was single.

On examination all systems were normal except erythema that extended from her head to all 4 limbs and which was confluent in most areas (except hands, anterior abdominal wall) (see figure 1).

Observations:-

Temperature 36.4,
Pulse 92,
Blood pressure131/80,
Respiratory rate 24,
Oxygen saturations of 100% on room air.

Following treatment with antihistamines (chlorpheniramine and ranitidine) and further supportive treatment with intravenous fluids her symptoms resolved quickly (figure 2). She was successfully discharged that evening following a period of observation. The Public Health team on call were informed who in turn contacted the local Environmental Health Department.

Discussion

Scombrotoxin poisoning is a form of ichthyosarcotoxism[1] and can occur with any of the members of the scombridae family and a few non-scombroid relatives. Tunas, mahi mahi, mackerel, sardines, bluefish, amberjack, dolphin and abalone have all been implicated.

Scombrotoxin is thought to consist, at least partly, of histamine from the degradation of histidine in spoiled fish. Certain bacteria produce the enzyme histidine decarboxylase, which in warm temperatures converts the free histidine in fish flesh to heat stable toxins. This process can occur at any stage, from catching the fish, to processing, storage and preparing it for consumption. Bacteria that have been commonly implicated include proteus, clostridia, escheridia coli, shigella and salmonella.[2]

Fish that cause scombrotoxin poisoning usually contain more than 20 - 50mg histamine per 100g of fish.[3,4] Although histamine is the main toxin involved, there may be other factors involved as scombrotoxin is more toxic than histamine alone taken orally. Various hypotheses have been suggested, but so far none has been conclusively proven to be correct. One, favoured by a review of histamine fish poisoning, is that another substance, urocanic acid, is formed from histidine degradation, and this also causes mast cell degranulation, accounting for the increased toxicity from spoiled fish.[3]

There seem to be individuals who are more susceptible, and it has been postulated that this is related to endogenous histamine levels[5] (although there has been one study measuring PGD-M, a substance found in the urine of individuals after mast cell activation, which did not find elevated levels in these scombrotoxin poisoned patients[6]). The symptoms are often more severe in the elderly and individuals taking isoniazid.[7]

Large fish, such as Tuna, are often caught on long lines with multiple hooks, which trail up to 60 miles behind a boat for 12-20 hours. If a fish is caught early on, it is dragged along in relatively shallow, warm water until the line is reeled in. This provides a near perfect condition for bacteria to form histamine. Ideally, the fish should be cooled / frozen immediately after death.[8]

As the toxins are heat stable, once formed, they can cause disease even if the fish has subsequently been frozen or cooked. The levels of histamine in spoiled fish are very variable, making it difficult to regulate in those countries with guidelines for the maximum levels of histamine permitted in fish.

It has been reported that the affected fish may taste uncharacteristically sharp, metallic or peppery.[9] Some patients also complain of a tingling or burning sensation in their mouths immediately after eating fish containing scombrotoxin.

Symptoms usually develop over approximately 1 hour after ingestion, but onset can range from minutes to several hours. Normally, patients present with symptoms and signs closely resembling a histamine reaction:

1. Flushing or a diffuse erythematous rash which is pruritic
2. Nausea, vomiting and abdominal pain
3. Palpitations and tachycardia
4. Headaches
5. Breathlessness and wheeze (in more severe cases)
6. Hypotension and cardiovascular collapse (in more severe cases)

Antihistamines should be given, and supportive treatment provided.

Scombroid poisoning is a worldwide problem. The incidence has probably been underestimated due to a mixture of misdiagnosis and the more mild cases not presenting to their local health care professionals.

Figure 1 before treatment © Chelsea and Westminster Hospital

Figure 2 after treatment © Chelsea and Westminster Hospital

There are three important reasons why scombrotoxin poisoning needs to be differentiated from a simple allergic reaction:

- Environmental issues. The distributors of the affected produce need to recall stocks and cease selling the offending fish. The stage at which degradation occurred must be identified and methods put in place to prevent recurrence of the problem. The incident is also notifiable to the CDC in the UK.
- There is the potential for a large number of people to be involved. For example, some 40 children in a school lunch programme who consumed imported tinned tuna were affected in an outbreak in 1970.[7]
- The subject who has been affected does not need to avoid products that contain or might contain fish from the scombridae family for the rest of their lives, due to an allergy.

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Scombroid or Ciguatera Poisoning? Investigation of an incident of fish related food poisoning among crew of a ship from Columbia at Avonmouth Port

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Presenting circumstance of fish poisoning Incident

On 6th October 2004 Bristol City Council contacted Avon Health Protection Team to ask the Port Medical Officer (CCDC) to see twelve crew members of a Columbian ship at Avonmouth Port who had fish poisoning. The crew thought the symptoms were related to a white snapper fish they had caught from the Caribbean island of St Eustatius on 25 September 2004. Three crew members had been seen by a GP on Saturday 2nd October for the same reason and were prescribed Cetrizine Hydrochloride (10mg).

Twelve crew members who had eaten the fish were seen by the CCDC on 6 October 2004. It appeared that everyone who had eaten the fish was ill with diarrhoea and vomiting. Following discussion with CHaPD a factsheet and questionnaire were written for the crew members.

The questionnaires revealed eighteen symptoms amongst those ill, including vomiting, diarrhoea, painful joints, aching muscles, headache, tiredness, tingling, metallic taste, itchy skin and constipation. The most common symptoms were diarrhoea, painful joints, aching muscles and a tingling tongue.

Scombroid or Ciguatera Poisoning?

The presenting symptoms and possible diagnosis of scombroid poisoning were discussed with the London Chemical Hazards and Poisons Division (CHaPD). The advice from CHaPD was that the symptoms should resolve within 8 to 12 hours if untreated. However, the crew's symptoms had persisted for ten days. This did not fit with the symptoms of scombroid poisoning and snapper was not identified in the information about scombrotoxin[1]. A Google web search for 'white snapper and food poisoning' identified ciguatera poisoning as a possibility. Ciguatera poisoning was discussed with CHaPD and their information sheet confirmed that the symptoms, origin of the fish and type of fish were consistent with ciguatera poisoning.

Ciguatera Toxin Poisoning

Ciguatera toxin disease has long been known as a seafood linked human disease[2] and is a well-recognized problem in the tropics. Ciguatera toxin, also known as ciguatoxin is a newly described class of poly ether toxins that act on the sodium channels of cells causing changes in their electrical potential and permeability. More than 20 different ciguatoxins have now been characterized (figure 1)

The toxin is produced by a range of algae dinoflagellates including *Gambierdiscus toxicus*. The algae are eaten by herbivorous fishes that absorb the toxin without significant observable effect[3]. The toxins remain in all parts of the fish but are concentrated in the viscera. The concentrations increase the higher up the food chain so that the fish with the highest quantity of toxins are those that are large predators like sharks and barracuda. The act of digestion appears to potentiate the toxicity. The toxin is odourless and tasteless, and contaminated fish taste normal. The ciguatera toxins are heat stable and not destroyed by cooking, freezing or by acid.

Ciguatoxins are amongst the most potent toxins known and start to exert their effects at their level of detection at around 0.1 parts per billion. There are three main forms of Ciguatera toxin each of which is found in a separate part of the tropics: Pacific Ocean, Red Sea, Indian Ocean and Caribbean Seas from 35 °N to 35°S.

The epidemiology of ciguatera toxin related disease is given on the CDC website. http://www.cdc.gov/nceh/ciguatera/default.htm. Worldwide at least 25,000 cases occur each year. It is the most frequently reported seafood related disease in Australia, USA, the Caribbean, and Papua New Guinea.

This incidence is likely to increase with global warming which is thought to predispose to the death of coral reefs providing nutrient for the dinoflagellates that produce the toxin[4].

The growing popularity of tropical holidays increases the likelihood that clinicians may see this disease. This is borne out by rising numbers of case reports in the literature of the disease in travellers returning to non-endemic countries from the tropics[5,6]. Thus cases of ciguatera fish poisoning are no longer confined to endemic areas. The increasing consumption of fish as part of a healthy heart diet together with an increase in international exports of large exotic fishes has extended the range of reported human poisonings to more temperate areas of the world. This makes awareness of this entity important.

Transmission of symptoms to a baby via breast milk has been reported as has transmission to a sexual partner via semen during sexual intercourse. It has also been reported as associated with increased rates of spontaneous abortion following degradation of the coral reefs near Muroroa, Tahiti.

Conclusion

A large outbreak in a closed community is relatively easy to spot. There are many case reports of isolated cases that have undergone extensive neurological tests before the history of a fish meal in the tropics/subtropics was sought and the diagnosis deduced. Toxin assays are being developed but are not sufficiently reliable for general use.

Populations in tropical/subtropical regions are those most likely to be affected because of the frequency of exposure to toxic fishes but ciguatera poisoning has to be considered in the differential diagnosis of acute gastroenteritis affecting travellers to a tropical area.

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What is Ciguatera Poisoning?[7]

Key Points

- **Origin:** Ciguatera poisoning results from ingestion of fish that are endemic to tropical reefs and contain a toxin known as ciguatoxin. Fish most commonly implicated include the groupers, barracudas, snappers, jacks, mackerel, and triggerfish.
- **Response:** There is wide variation in individuals' response to ciguatera.
- **Onset:** usually 1-6 hours, but may be up to 30 hours.
- **Duration:** Gastrointestinal effects usually resolve in 1-3 days, neurological and cardiac effects can last for weeks or months or even years in severe cases. Recurrent attacks of illness may occur for years after the initial poisoning following ingestion of alcohol or non-toxic fish. These recurrences have been noted as similar to those of Myalgic Encephalopathy (ME[2]). Anecdotal reports of recurrence of neurological symptoms (weakness, muscle aches) have followed the eating of pork and chicken reared on fish meal.
- **Symptoms:** gastrointestinal, cardiovascular, and neurological signs and symptoms. Initially, watery diarrhoea, vomiting and abdominal cramps, then neurological symptoms including parathaesia, headache, dysesthaesia (distortion of sense) - especially touch and hot-cold temperature reversal. Many other effects have been reported including weakness (usually of lower extremities), myalgia, pruritus, arthralgia, malaise, hypersalivation, blurred vision, dysphagia, tremor, ataxia, headache, toothache, metallic taste, chills, sweating, dysuria, dizziness and erythema. Hypotension, bradycardia (rarely tachycardia) and reversible T-wave changes may occur. In severe cases there may be respiratory depression, muscle paralysis, shock and convulsions. Fatalities are rare[8]. The toxin being lipid soluble is transferred to milk and can cause symptoms in breast fed infants.
- **Diagnosis:** based entirely on symptoms and recent dietary history.
- **Treatment:** there is no specific antidote

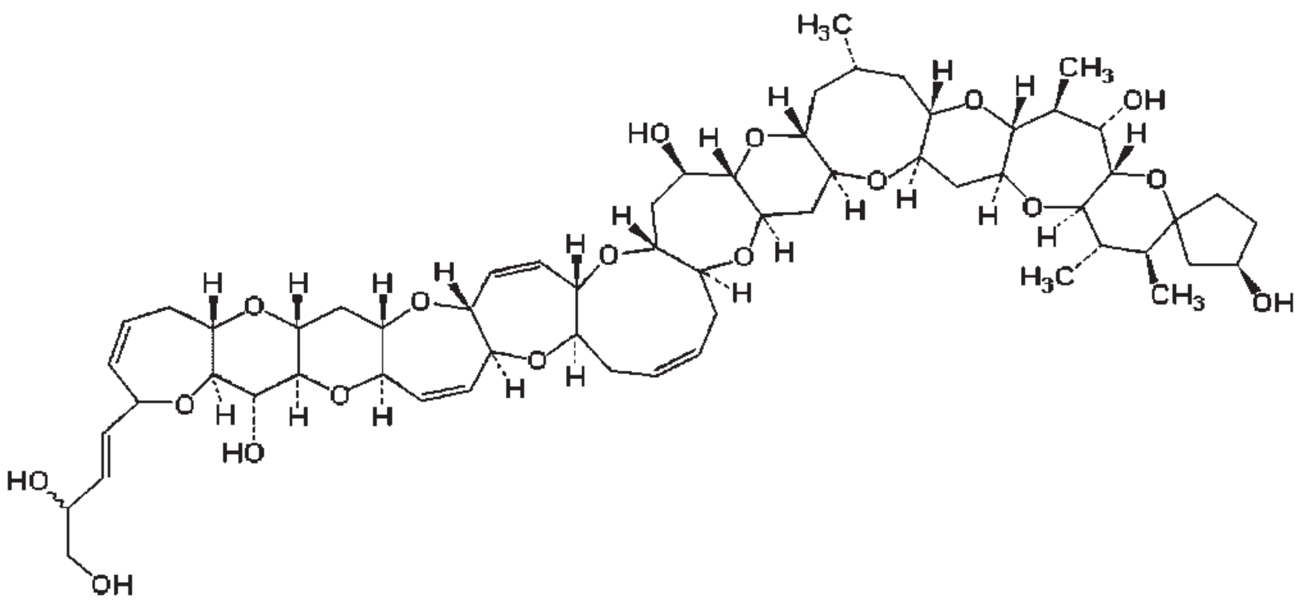

Figure 1 CTX-1 (from the US FDA website)

Water Contamination in North East London

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Dr Sudy Anaraki, Consultant in Communicable Disease Control, North East London Health Protection Unit

Introduction

Here we describe an incident that occurred in September which involved the contamination of the water supply of a 21 storey block of residential flats in North East London (table 1). This block of flats is home to several hundred residents ranging in age from 6 months to 80 years of age. A total of 76 households were involved in the incident, the majority of these residents were Bangladeshi with many who do not speak English.

Table 1: Incident summary and time line

Tuesday 21.09.04	12.30	Thames Water received a phone call from a resident at around 12.30 reporting what appeared to be a petrochemical taste in the water. Following investigation it transpired that all floors above the 4th were affected. This was explained by the fact that the water supply for floors 1 - 4 water is supplied directly from the mains, whereas the water for floors 5 – 21 is supplied from a tank at the top of the block. Samples were taken from two affected flats and were sent for analysis.
	14.00	A representative from the Local Authority council housing department went to the site and along with Thames Water advised all residents on floors 5 and above not to drink the water. Provision of bottled water for all these residents was arranged by Thames Water.
	18.50	Thames Water informed the North East London Environmental Health Officer and the North East London Health Protection Unit (NEL HPU) about the incident.
Wednesday 23.09.04	12.50	Analysis of the water samples collected the previous day showed levels of 40-50µg/L of a kerosene like hydrocarbon substance (box 1 for details of analysis, box 2 for results (page 18) and interpretation and box 3 for kerosene facts).
	14.15	A site visit was carried out by one of the Consultants in Communicable Disease Control (CCDC) from NEL HPU. The tank storage room was inspected and although there were no signs of break in or tampering, there was a petrochemical smell in the room. There were suggestions that the room may have been used by a pirate radio operator for transmission, however the housing department considered it unlikely that the keys to the water tank room were easily available. During the visit the CCDC also spoke to the residents, but no one complained of any symptoms.
	12.55	Accident and Emergency departments, walk-in centres and local GPs were all notified about the situation, by NEL HPU, and were provided with relevant information detailing symptoms and appropriate treatment. Social services and the community nursing service were contacted to try and ascertain whether there were any residents who would need extra help or medical care, for example disabled and elderly.
	16.00	An incident meeting was attended by representatives from: NEL HPU, Tower Hamlets Primary Care Trust, North East London's Health Emergency Planning Adviser, Chemical Hazards and Poisons Division (London) (CHaPD(L)), Thames Water and Tower Hamlets Borough Council.
Thursday 23.09.04		The whole water system was flushed and chlorinated by Thames Water. This was completed by 19.00 hours.
	12.00	A second incident meeting was held and it was agreed that, until results from subsequent testing indicated that the problem was resolved, water could be used for taking showers, bathing, brushing teeth, flushing the toilet, washing clothes and washing the dishes. However residents were advised not to use the water for drinking and cooking and it was recommended that those with severe skin conditions, such as severe eczema, contacted their GP before using the water for bathing or washing.
	19.00	The water supply was reinstated and simultaneously an information leaflet was distributed, advising the residents on the precautions to take as discussed at the meeting. At the meeting it was also decided that more samples would be taken on Friday from the tanks and two properties. If analysis showed hydrocarbon levels were less than 10µg per litre, water would be declared fit to drink.
Wednesday 29.09.04		A third incident meeting revealed that samples taken on Friday 24/09/04 and Monday 27/09/04 showed no traces of hydrocarbons. The supply of bottled water was ceased and water was declared fit for all purposes. The Borough expressed a concern that non-authorised persons might have managed to obtain keys to the water tank room. It was therefore considered that this incident could be repeated and might be a problem for a similar tower block. The police were informed of these concerns but we are not aware if any action is being considered.
Monday 04.10.04		Further samples tested clear therefore the incident was closed

Learning Points

- Although Thames Water was notified of the incident during the day on Tuesday, North East London Health protection Unit (NEL HPU) was not informed until later. It may be beneficial to consolidate links with Thames Water so that notification occurs earlier, even if in the early stages it is purely to advise of the situation before completion of the initial investigation.
- As NEL HPU was alerted late on Tuesday, it was not feasible to hold an incident meeting at this time. It might have been beneficial to hold this first incident meeting sooner to ensure that all relevant organisations were aware of the situation as soon as possible.
- There was good representation from all agencies involved at the incident meetings. This enabled good inter-agency communication, which in turn ensured the incident was dealt with efficiently.
- Accident and Emergency departments, GPs and walk in centres reported no cases, where residents had presented with symptoms, that could possibly have been related to this incident. This suggests that the incident was handled appropriately, therefore causing no risk to wider public health.
- This incident also illustrates, that it is of vital importance, that stringent measures are taken to ensure that water supply tanks are kept secure and access to them is limited.
- Other Health Protection Agency organisations in London were informed to warn them of the potential hazards. The sharing of incidents is constructive as it increases knowledge and preparedness across all organisations.

BOX 1: Kerosene[6]

- Kerosene is a colourless thin flammable liquid, it is a hydrocarbon mix that is obtained through the fractional distillation of crude oil. In the past it was widely used in lamps but now it is mainly used as a fuel in jet engines. Its use as a cooking fuel is, in the most part, restricted to developing countries.

Toxicology[7]

- Kerosene can cause irritation to both the respiratory system and the gastrointestinal tract.
- Toxicity is principally due to pulmonary complications if some is inhaled whilst being ingested.
- Following inhalation headaches, dizziness, drowsiness, problems with co-ordination and euphoria may be experienced.
- Following ingestion, often no symptoms occur but there may be nausea, vomiting and occasionally diarrhoea.
- In severe cases pulmonary oedema, drowsiness, convulsions or coma and cardiac arrhythmias.

Sample taken at site of incident.

↓

Sample is prepared for analysis, this involves aspiration to produce a 200ml sample.

↓

In the case of suspected hydrocarbon contamination, the first step is to extract the hydrocarbon contaminants from the rest of the water. This is achieved using a method called liquid-liquid extraction, this involves the addition of a solvent (pentane) and shaking which causes the hydrocarbon contaminants to partition from the water into the solvent. The solvent layer can then be easily removed and is ready for analysis.

↓

The sample is analysed using Gas Chromatography Mass Spectrometry (GCMS), this allows the identification and measurement of the chemical components in mixtures. Gas Chromatography (GC) separates a mixture into its chemical constituents, Mass Spectrometry (MS) is a detection method, which identifies and quantifies the components of a mixed sample by determination of the molecular mass of fragmentation ions and their abundance.

↓

These results will enable the analyst to interpret and quantify the hydrocarbon contaminants present in the water sample. The results will only be quoted if the stringent quality checks throughout the procedure are satisfactorily completed.

Box 1: Analysis Method of water samples is carried out by Thames Water at their laboratory in Reading.

Box 2: Analytical results and Interpretation

The analysis showed that the samples tested contained 40-50µg of the hydrocarbon contaminant. The contaminants present in the water sample were alkanes consisting of between 9 and 16 carbon atoms. An alkane is the simplest form of hydrocarbon meaning it contains only carbon and hydrogen. Although it is impossible to determine the absolute identity of this contaminant, alkanes in this size range are indicative of a fuel oil such as Kerosene.

Organisation	Hydrocarbon	Guideline Value
Drinking Water Inspectorate (United Kingdom)[5]	Dissolved or emulsified hydrocarbons (after extraction with petroleum ether); mineral oils	10µg/L (0.01mg/L)

The UK uses only one hydrocarbon guideline. Other countries take the approach of using specific hydrocarbons as indicator substances, examples are given below.

Environmental Protection Agency (USA)[1]	Benzene	5µg/L (0.005mg/L)
	Toluene	1000µg/L (1mg/L)
	Xylenes (total)	10,000µg/L (10mg/L)
Healthy Environments and Consumer Safety (Canada)[2]	Benzene	5µg/L (0.005mg/L)
	Toluene	≤ 24µg/L (≤ 0.024mg/L)
	Xylenes (total)	≤ 300µg/L (≤ 0.3mg/L)
Co-operative Research Centre for Water Quality and Treatment (Australia)[3]	Benzene	1µg/L (0.001mg/L)
	Toluene	800µg/L (0.8mg/L)
	Xylene	600µg/L (0.6mg/L)
World Health Organisation[4]	Benzene	10µg/L (0.01mg/L)
	Toluene	700µg/L (0.7mg/L)
	Xylene	500µg/L (0.5mg/L)

The table outlines some of the guideline values for drinking water quality with regards to hydrocarbons.

It can be determined from the table, that the level of hydrocarbons in the water exceeded the United Kingdom prescribed concentration, for this reason water supply to the flats was ceased. According to the toxicology report produced by Thames Water, 800µg/L is considered the level below which there are no health hazards, however contamination as low as 10µg/L is sufficient for there to be a noticeable taste and odour effects to the water.

As Thames Water also monitors water quality they regularly test for the presence of benzene and other specific hydrocarbons in water, on this occasion none of the aromatic hydrocarbons routinely assayed for were present.

Acknowledgements

North East London Health Protection Unit
Kim Lowe and Edel Costello Thames Water

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Biological monitoring of exposure to organochlorine pesticides in an African population

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The situation

An abandoned pesticide storage depot located on an escarpment above a small African village was the source of soil contamination. Compounds stored in the depot included environmentally persistent organochlorine (OCs) pesticides: lindane, heptachlor, Dieldrin, and DDT. During civil war the depot was damaged by air raids. Sometime later local inhabitants emptied more than 81,000 litres of pesticides into the ground in order to re-use the storage drums. Contaminated soil was excavated by local people for pest control and resale in local market; this activity allegedly resulted in at least one death.

Health concerns were raised for the villagers living in the vicinity of the contaminated soil; the government was asked to investigate. A meeting was convened of representatives from a number of ministries, including health, foreign affairs and water, and representatives from WHO, UNHCR and UNICEF. The purpose of the meeting was to discuss the pesticide contaminated area and to request the assistance of UN agencies in dealing with the perceived threat to public health.

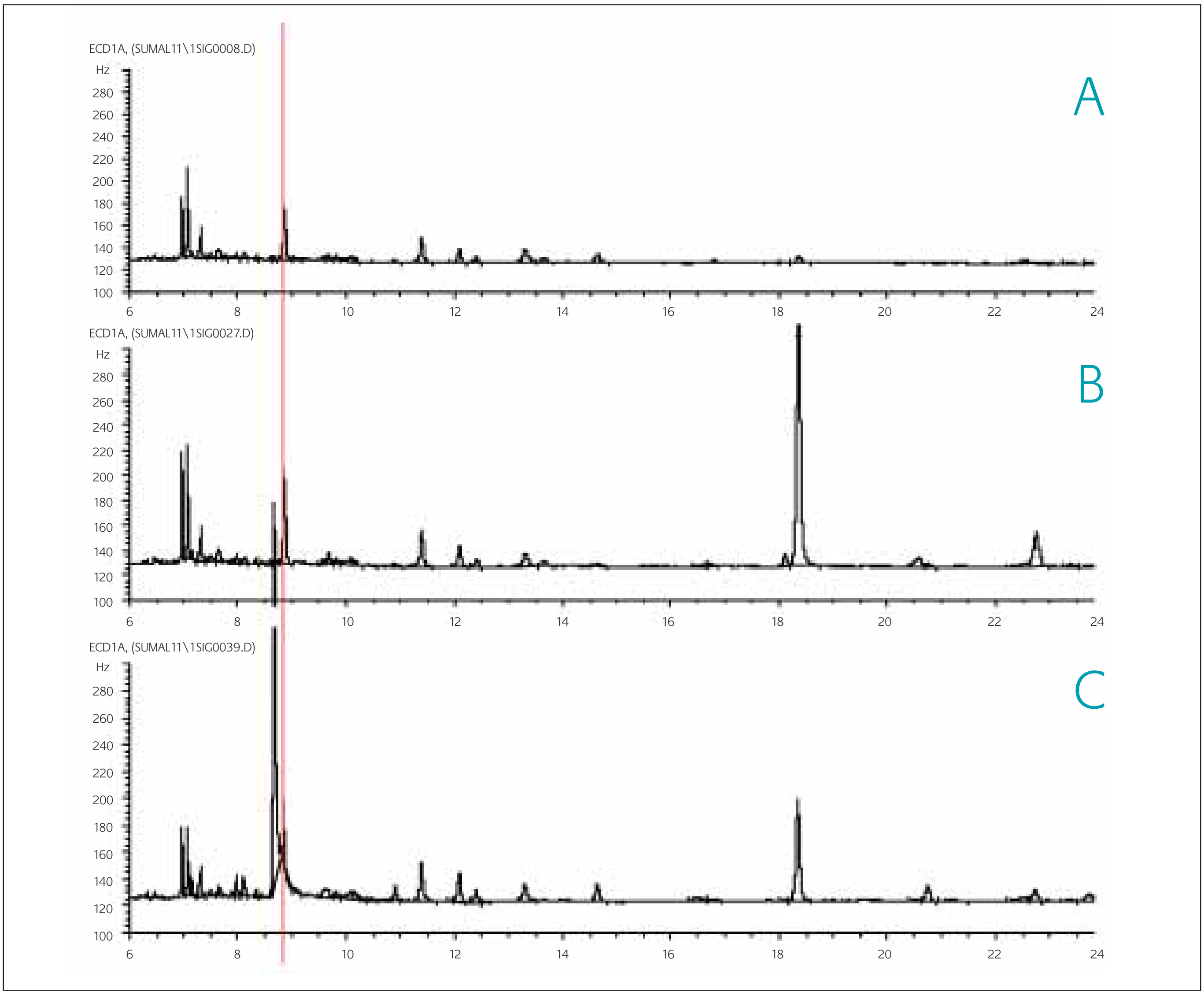


Figure 1: Gas-chromatograms of plasma extracted OC pesticides.
A and B show peaks detected in the group living on the contaminated land. C is from the control group. IS indicates where the internal standard elutes. All analyte peaks are identified in relation to the IS.

During this meeting the Health Protection Agency was identified as an agency that could carryout human exposure assessment and suggest appropriate public health interventions.

Objectives of the Project

- To confirm exposure to OCs using plasma biomarkers
- To quantify exposure and offer guidance on health risks
- To recommend health protection measures.

Methods

A recognised method was adapted to include the OC pesticides of interest in this project. The method was validated using commercial standards.

In order to determine if the population living on or near the depot were exposed to elevated levels of OC pesticides it was necessary to determine levels in a reference population. A reference population — the controls— was sourced from a near-by village. Additional blood samples were taken from personnel in the investigating laboratory in Newcastle upon Tyne in the UK. These UK samples were used in the construction of calibration lines.

OCs were extracted from plasma into iso-octane using solid phase extraction (figure 3) and analysed by gas chromatography with electron capture detection (figure 4). All concentration levels were calculated from linear regression analysis of the peak area ratio of the OC to an internal standard against the standard concentration and reported as µg OC/L plasma. Calibration lines were produced using control plasma from UK volunteers (figure 1). Detection limits ranged from 0.01 to 0.25 µg/L plasma.

Some environmental monitoring of soil, and water was also carried out to confirm contamination of the environment.

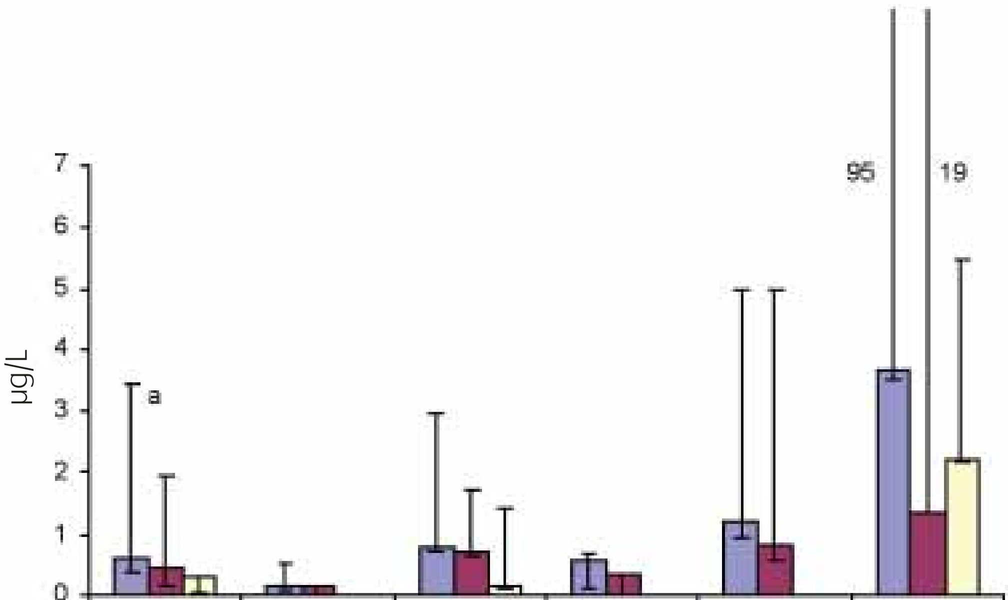
Results

OCs were detected in 100% (n=60) of the group living on contaminated land and 95% (n=56) of the group not living on contaminated land. There was no difference in the median concentrations between the two groups. Concentration ranges of OCs in plasma for both groups were: b-Lindane (0.25-3.44 µg/L), g-lindane (0.11-0.52 µg/L), Heptachlor (0.06-2.95 µg/L), Dieldrin (0.32-0.66 µg/L), DDT (0.26-13.5 µg/L) and ppDDE (0.10-95.0 µg/L).

Dieldrin and ppDDT were not detected above the detection limits in the Newcastle samples. Lindane, Heptaclor and ppDDE were detected at 0.285 median (range 0.25 -0.30), 0.159 (range 0.05-1.40) and 2.21 (range 0.05-5.46) µg/L, respectively (figure 2). The values were however, not statistically different from the African groups.

Comparison of the environmental levels with the biological monitoring values was not an issue raised during the conception of this project. The sites of environmental monitoring are not appropriate for the comparison of these two sets of data.

Figure 2: Median Plasma levels of organochlorine pesticides in African and UK samples



	b lindane	g lindane	heptachlor	Dieldrin	ppDDT	ppDDE
African Controls (n=56)	0.62	0.17	0.77	0.54	1.18	3.66
African Exposed (n=60)	0.44	0.15	0.71	0.32	0.84	1.34
UK Samples (n=6)	0.285	0	0.159	0	0	2.21

Discussion and Conclusions

The results were unexpected and of interest to the HPA as well as the African population under study. No statistically significant differences were detected between the two African groups, with the exception of ppDDE which was higher in the control group not living on contaminated land. The study shows that there is no immediate health risk from the pesticide contaminated land. There is however a need to monitor the situation and the government should assess the exposure over a period of time.

Furthermore, there was little difference in the levels detected in the African samples as compared to the UK controls. The UK control group

Figure 4: Gas Chromatograph © Chemical hazards and poisons division (Newcastle)

Figure 3: Solid phase extraction © Chemical hazards and poisons division (Newcastle)

was very small (n=6) and reference values for European populations are few and/or not comparable due to technical dissimilarities. As a consequence of this study the Health Protection Agency is at present developing a research programme aimed at monitoring reference levels of chemicals of concern to public health including environmentally persistent pesticides.

Harmonisation of large scale biomonitoring — or indeed small scale biomonitoring — studies would facilitate use of comparable techniques and reporting of results. There is an urgent need for coordinated activity in the field of Biomonitoring with study designs incorporating environmental monitoring as appropriate.

Emergency response

Early Alerting: The Future for Chemical Incident Reporting

Rachel Paddock, Chemical Hazards and Poisons (London). This work was carried out as part of a project placement in partial fulfilment of a MSc Forensic Science, Department of Forensic Science and Drug Monitoring, King's College London. Virginia Murray, Chemical Hazards and Poisons Division (London), Health Protection Agency

Introduction

The production and use of chemicals is vital in almost all sectors of the economy, this means that in some way everybody will come into daily contact with chemicals. The majority of chemicals people are exposed to are at such levels that they are not harmful. However some do present risks to human health or the environment[1].

There are now estimated to be an excess of 24 million chemical substances known to man, with 4000 new substances being added to the Chemical Abstracts Service (CAS) database each day. Some of these chemicals are produced in excess of 1 tonne per annum. The increased numbers and production rate of chemicals has led to growing concern about the threat posed to the population[2].

Ineffective reporting of incidents could potentially put the public at risk from the adverse health effects a chemical incident may cause. CHaPD(L) has been working with the London Ambulance Service (LAS) and the London HEPAs in order to develop a Chemical Incident Early Alerting System for London. This will allow the early alerting of the NHS, HEPAs and CHaPD(L) to ensure that chemical incidents are dealt with appropriately so that the public are not put at risk.

Case Study: A fire in London

- A fire occurred in a warehouse at 9am on 16th January 2004 (figures 1a and 1b).
- The fire, police and ambulance service were in attendance and there was reported to be no risk from the fire, so no evacuation occurred.
- A large plume was produced by the fire which was persistent for several hours.
- The fire also caused the asbestos concrete sheeting roof to explode; the content of asbestos was found to exceed 30%.
- Seven people were taken to hospital, three of whom were members of the emergency services[3].

The Health Protection Agency were not made aware of this incident until some hours later, so therefore no public health advice could be provided to highlight the risks at the scene, such as the deposition of high asbestos content roof fragments into the surrounding area. This also meant that the public and emergency services were exposed to the dense smoke plume for some time before an appropriate cordon was set up.

Figures 1a and 1b: The fire in London.
Pictures courtesy of the London Fire Brigade.

Development of the Early Alerting System

One of the initial steps was to identify the systems that are currently in place with regards to the management and reporting of chemical incidents, in an attempt to highlight the problem areas that need to be targeted by the new chemical incident early alerting system.

An understanding of the roles and responsibilities of the emergency services with regard to chemical incidents, was developed through interviews with key personnel. Statistics were obtained from the London Fire Brigade (LFB), London Ambulance Service (LAS) and the CHaPD(L) database[4,5,6] (figure 2). Analysis of these statistics (figure 2) identified that the number of incidents reported to CHaPD (L) is not representative of the total number of chemical incidents that occur in London since some relate to chronic events such as land contamination.

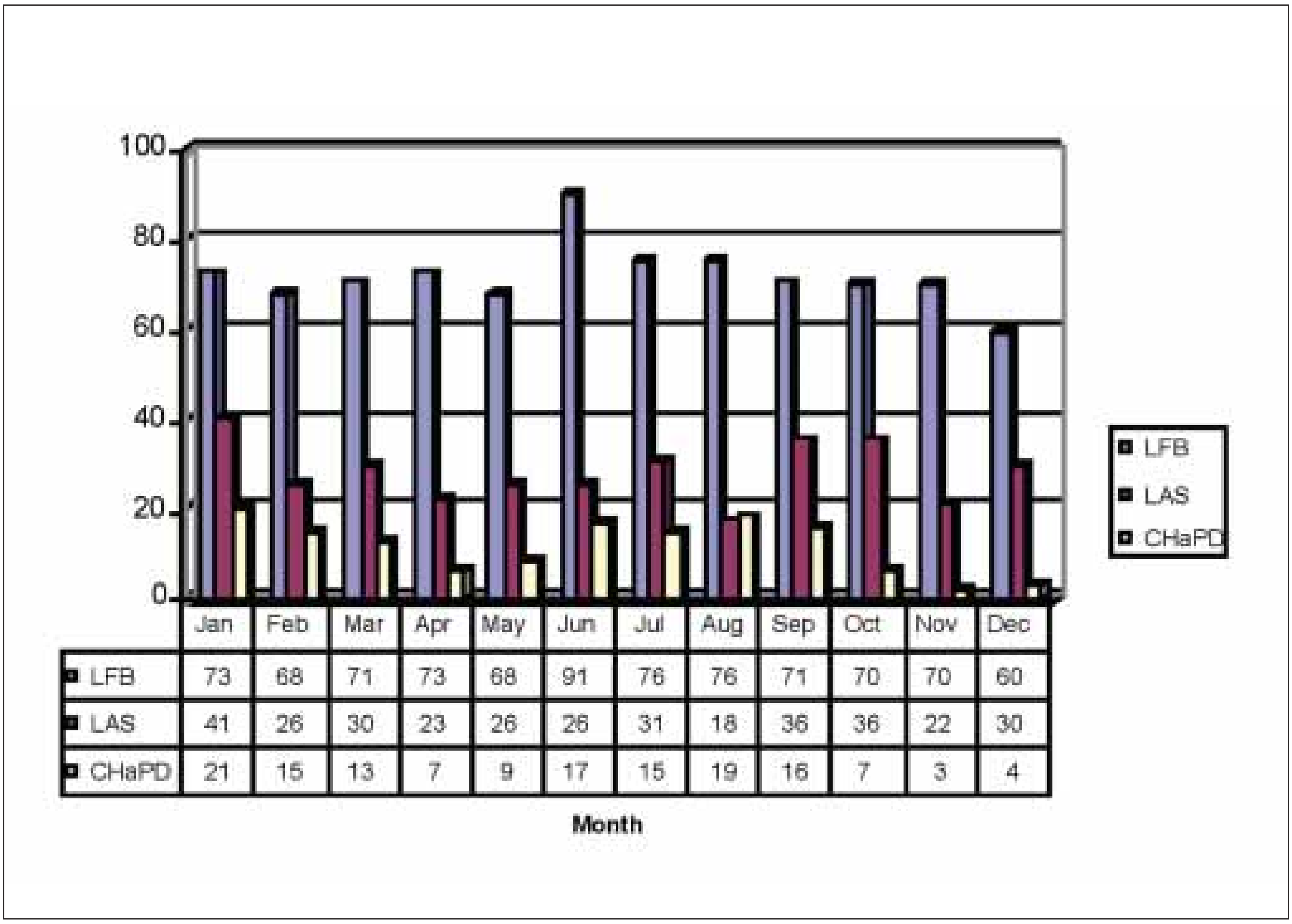


Figure 2: A comparison of incident reporting
Chart illustrates the difference between the numbers of chemical incidents reported to LFB, LAS and CHaPD (L) in 2003.

On the basis of these results a pilot chemical incident early alerting system was developed as a result of collaboration between LAS, CHaPD(L) and London HEPAs (figure 3). The trigger factors implemented are a reflection of the information that was obtained as a result of the preliminary research. Using this system, information is cascaded from those attending the scene, to those who are trained to give advice on the acute and chronic effects that could potentially arise due to the occurrence of a chemical incident.

The Future

- The early alert system went live on 23rd July 2004, the pilot will run for a nine month period concluding in March 2005.
- The system is being constantly monitored by CHaPD(L), this involves weekly comparison of statistics obtained from the LAS against incidents reported through the early alerting system. Meetings with representatives from all organisations involved in the scheme are held at three monthly intervals. The aim of this continuous assessment is to ensure that the system works at maximum efficiency by investigating any incidents that are not reported and updating the system as necessary.
- CHaPD(L) is also liaising with the Multi Agency Initial Assessment Team (MAIAT) which has been set up in London. This communication and cooperation allows both CHaPD (L) and MAIAT to develop and improve their respective alerting systems.
- Advice on the wider health issues caused by an incident is crucial to ensure that a chemical incident does not have repercussions on the health of the local population. It is envisaged that an effective chemical incident early alerting system will improve the reporting of chemical incidents, so therefore ensuring that this important advice is made available as early as possible.

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Acknowledgements

London Fire Brigade: Mick Eagle, Keith Diamond and Terry Jones
London Ambulance Service: Russ Mansford and Lorraine Mole
London Health Emergency Planning Advisers

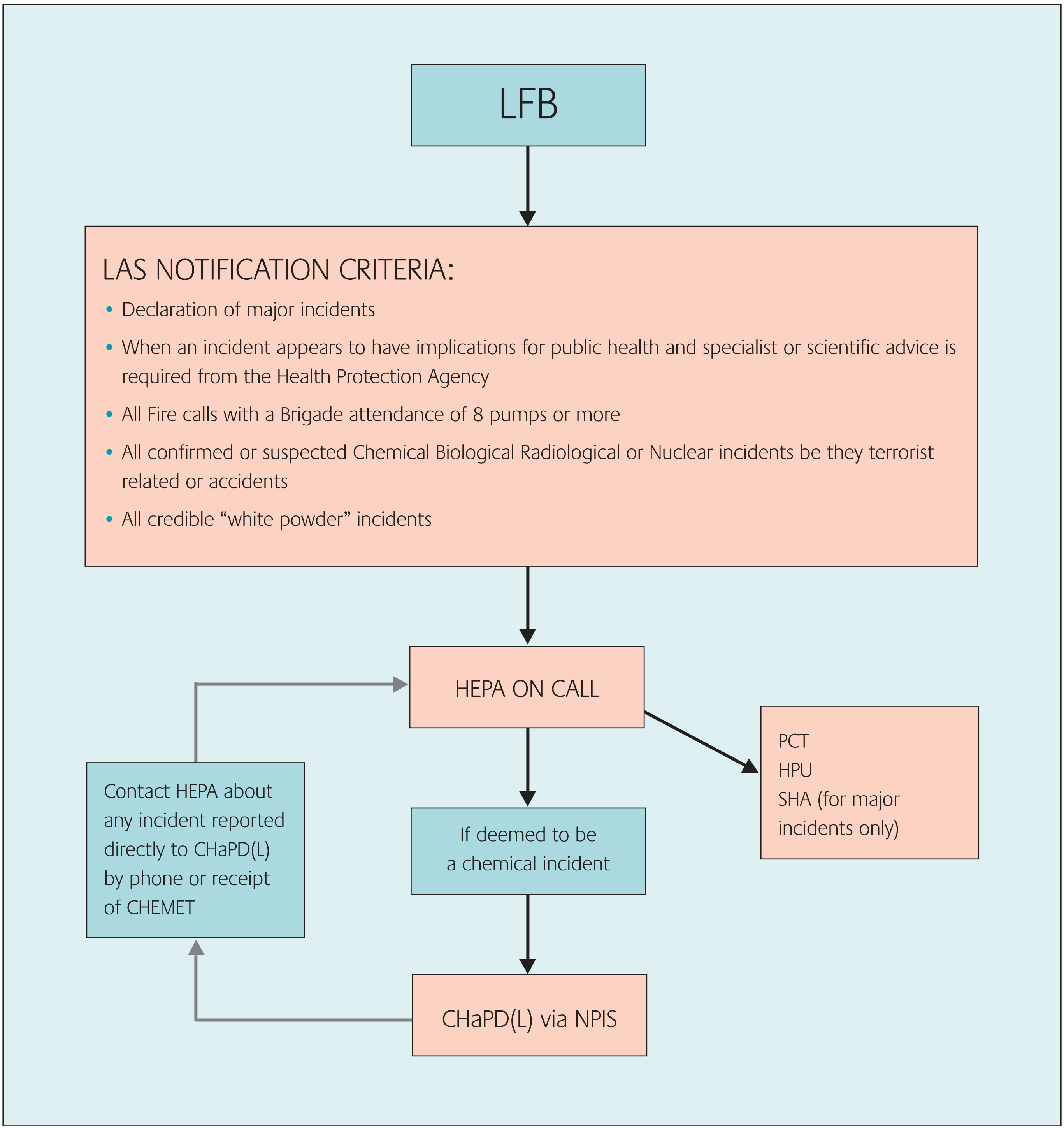

Figure 3: Current Chemical Incident Early Alerting System Pilot for London

The Multi-Agency Initial Assessment Team Trial

Virginia Murray, Chemical Hazards and Poisons Division (London), Health Protection Agency

The Multi-Agency Initial Assessment Team (MAIAT) trial was announced at the House of Commons in July this year.[1] This short summary of the project acknowledges information published in the Home Office's CBRN News.[2]

The aim of the trial is to see whether a dedicated multi-agency initial assessment team could add to the emergency response by providing an early, effective and integrated assessment of the nature and risk of a CBRN incident.

Steve Waspe of the London Ambulance Service is MAIAT's Operational Commander. He leads a team 50-strong comprising members of the Service, the Metropolitan Police and the London Fire Brigade. MAIAT members work in 4 teams of 12 and have been specially-trained and can operate within the 'hot zone' of a CBRN incident, allowing for early identification of casualties' signs and symptoms and a more efficient triage process. This provides a 24 hour response to attend any CBRN incident within 15 minutes of Central London to quickly assess the threat for the operational commanders at the scene.

When the team arrives at the scene, 3 members – one from each of the emergency services –enter the hot zone suitably equipped to carry out their assessment and then withdraw. They are to be supported by other members of the team able to enter the areas if necessary. The team works closely with the Metropolitan Police Service's Anti-Terrorist Branch.

In addition the team will attend major HAZMAT and other non-CBRN incidents and events in support of the operational commanders.

The trial is being formally evaluated to identify the benefits and any drawbacks of the current arrangements elsewhere in London. A report of the trial will be completed in summer 2005.

Photograph 1: Multi Agency Initial Assessment Team exercising. Picture courtesy of the LAS

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- The Minister for Crime Reduction, Policing and Community Safety (Ms Hazel Blears): Multi-agency Initial Assessment Team Trial: (Hansard 20 July 2004; Col 17WS) http://www.publications.parliament.uk/pa/cm200304/cmhansrd/cm040720/wmstext/40720m02.htm#column_17
- CBRN News, Home Office Issue 1; October 2004 email enquiries can be made to cbrnenquiries@homeoffice.gsi.gov.uk

TOXBASE

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Background

The National Poisons Information Service (NPIS) is a UK-wide clinical toxicology service for health care professionals working in the NHS and is a service commissioned by the HPA. The first point of contact for information on management of poisoning is the Internet database TOXBASE, and the second line, for specialist advice, a 24 hour telephone service (0870 600 6266). All six UK NPIS centres (Belfast, Birmingham, Cardiff, Edinburgh, London and Newcastle) together with the National Poisons Information Centre, Dublin and the National Teratology Information Service, Newcastle contribute to and authenticate the content of TOXBASE and it provides an authoritative source of toxicological information.

TOXBASE use and content

TOXBASE originally went on-line in 1983 and transferred to the Internet in 1999. Since then activitiy has increased considerably [1,2] and the userbase has grown from 750 (mainly hospital emergency departments and GP surgeries) at the end of 1999 to 4600 at the end of October 2004, with increasing diversity of users[3]. Usage in terms of number of products accessed increased from 93,000 in 1999 to 837,000 in 2003.

TOXBASE should be used by all medical practitioners and other health care professionals working in the NHS as the primary source of poisons information. The TOXBASE database provides information about routine diagnosis, treatment and management of patients suffering from exposure to a wide range of pharmaceuticals, chemicals (agricultural, household and industrial), plants and animals.

Pharmaceuticals comprise approximately 50% of the database of around 12,000 products and substances, and chemicals approximately 40% with the number of industrial chemicals set to increase in the next year to meet the requirements of CHaPD.

New products and substances are added to TOXBASE continually and current entries reviewed and updated regularly.

As well as product monographs a variety of other types of information is included (figure 1) e.g. availability and dose of antidotes, both for overdose use and in case of terrorist attack; printable leaflets for physicians, and public health personnel in case of chemical release; availability of laboratory services at selected centres; references to the medical literature; and links to other websites.

Surveillance

TOXBASE can be used for surveillance for specific agents and a pilot project on pesticides for the Pesticide Safety Directorate is being extended to cover some chemicals with real-time notification of accesses and on-line forms to gather more information from medical professionals treating exposed patients. TOXBASE can also be used retrospectively to monitor the results of changes in licensing e.g as with thioridazine[4].

Registration

TOXBASE is the primary clinical toxicology database of the NPIS and is available free to UK National Health Service registered users who will normally be departments or surgeries, rather than individuals. It is not intended for personal use of UK NHS staff, nor is it available for public access. By agreement with the Irish Government, TOXBASE is also provided to A&E departments in Ireland. Commercial users are charged an annual subscription of £1000 and overseas and other non-NHS users may be allowed access by negotiation, subject to UK Health Protection Agency approval. To register for TOXBASE please submit an on-line registration form at http://www.spib.axl.co.uk

Figure 1: TOXBASE home page

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TOXALS: a proposed protocol for medical responders working in a chemically contaminated zone

Dr David Baker, Locum Consultant Medical Toxicologist, Chemical Hazards and Poisons Division (London) Health Protection Agency

Despite the public fear of chemical and biological warfare agents most deliberate toxic releases have produced a low ratio of dead to wounded.[1] In mass toxic injury early medical support can break the link between mass injury and mass loss of life.[2] Furthermore most civil accidental releases involve limited numbers of casualties. In any toxic release there will be a spectrum of patients who are (a) contaminated and (b) suffering effects of the released agent. In a number of these the effects on the respiratory system may be life-threatening.[3] These patients require decontamination before they can be moved down the evacuation line and may experience life – threatening delays in early management. The notion that casualties cannot receive skilled medical and paramedical aid during a decontamination process (the warm zone) is not acceptable and medical teams should be trained and equipped to be able to render aid in such situations.

It should be remembered that the identification of the chemical and therefore its specific antidote might take some time. However this must not delay the basic medical management of the casualty.

The International Trauma Anesthesia and Critical Care Society has developed the TOXALS (Toxic Advance Life Support) system. This was first conceived in 1996 formulates a framework for response as a modification of the familiar Advanced Life Support (ALS) responses in a toxic environment.[4] TOXALS formulates dynamic and integrated triage and life support in conjunction with decontamination of the patient, the aim being the treatment of the most life threatening injuries first. TOXALS now operates in France[5] with several countries developing an interest in it such as the UK HAZMAT response.[6]

The lead agencies in emergency HAZMAT response are usually the fire services but these personnel are usually equipped with the highest level of personal protection (sealed level A suits) and self-contained breathing apparatus enabling them to enter the hot zone of the most corrosive releases. Fire personnel usually have limited ALS skills and their protective equipment does not permit a flexible response to the patient. Their job is essentially to remove the patient from the hot zone to the intermediate (warm) zone where triage for the individual's medical condition and any contamination should take place to determine whether the patient requires decontamination.[7]

TOXALS health responders require level C protection (with a lightweight suit, gloves and anti gas respirator) suitable for protection in the warm (decontamination) zone. They should receive training in putting on and taking off suits and respirators. In addition the suits should be worn during routine medical procedures such as the anaesthetic room in the operating room or the Emergency Department to familiarise wearers with the adjustments needed to maintain tactile skills. Simple management of the airway, head tilt and chin lift and the insertion of a Guedel airway and mask ventilation are all skills which are rapidly acquired wearing protective gloves

TOXALS training combines didactic instruction and field exercises to train medical personnel in the management of casualties exposed to chemical, biological, or radiological agents.

Training includes review of the known toxic chemical, biological, and radiological agents in terms of their physical characteristics,(toxicity, latency, persistency and transmissibility) as well as the pathophysiology and diagnosis.

The field training exercises provide experience in the proper use of appropriate level C personal protection equipment, detection and triage of contaminated casualties, as well as the treatment, and decontamination of exposed casualties. Familiarity with the protective equipment and development of tactile skills in non–toxic environments facilitates learning for an effective medical response in a contaminated zone.

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The Response Framework of TOXALS is as follows

Assessment

(1) of the site: the medical team may be first on site and should adopt the correct ambulance first response procedure (in any case where toxic release is suspected park uphill and upwind of the release) until a proper chemical reconnaissance has been carried out. The team should not enter any zone where casualties are visible without correct personal protection.
(2) of the casualty's level of contamination using hand–held monitoring devices such as the Chemical Agent Monitor (Smiths Detection Ltd, Watford UK). This will determine the requirement for decontamination.
(3) of the casualty's triage status. The classification varies in different countries but the system is designed to give the maximum care to the greatest number of potential survivors. It should be remembered that in toxic trauma the triage status can change quickly and re – triage will be necessary

Airway – the airway of the casualty must be maintained at all times. In the unconscious casualty this may involve simple basic airway manoeuvres plus suction of the copious secretions associated with chemical poisoning. There may be a requirement for advanced airway management, such as tracheal intubation or more recently, use of the laryngeal mask airway to protect the airway from the excessive secretions and to prevent aspiration of regurgitated stomach contents. Airway management should be that which is most familiar to the responder in conventional pre - hospital practice.

Breathing must be carefully observed for depth and form until full decontamination and recovery have occurred. Supplemental oxygen may speed the recovery from volatile chemical poisoning. If breathing is compromised it must be supported by artificial ventilation with supplemental oxygen using a self-inflating resuscitation bag-valve-mask or, preferably an automatic gas – powered ventilator. Entrained air must be filtered when ventilating casualties in a contaminated environment. A special ventilator (the CompPac, Smiths Medical International (Luton) UK) has been designed to operate in contaminated zones using filtered compressed air.

Circulation must be carefully observed and monitored. Non-invasive blood pressure and pulse oximetry are feasible inside a contaminated zone. The early establishment of intravenous access will aid the administration of fluids and drugs.

Disability should be assessed using the simple AVPU scale (**A**lert, responds to **V**oice, responds to **P**ain, **U**nresponsive). This assessment should be repeated at frequent intervals to assess the progress of the casualty.

Drugs, especially the specific antidotes, should be administered according to established national protocols. Antidote therapy should be dynamically integrated with life support

Exposure of the casualty is essential not only to assess physical damage but to remove all clothes that have been contaminated by the chemical.

Environment. It is important to remember that the primary management described above may be severely limited by the need of the rescuer to wear protective clothing. Therefore only those skilled in these techniques and trained in protective clothing should enter and treat casualties in a contaminated area. All others should await the casualties' arrival in cold/clean zone, following decontamination

Exercises

Lessons from LIVEX 2004

Matthew Drinkwater, Sarah McCrea, Nima Asgari.
Chemical Hazards and Poisons Division (London)

Background

On 13th and 14th October 2004 a major Emergency Planning exercise – LIVEX 2004 - was held on the Isle of Wight. The exercise scenario, prepared with assistance from CHaPD, tested not only the ability of Island based emergency services and local authority but also the ability of the mainland to respond and reinforce them when dealing with a major incident on the island. CHaPD was well represented at the exercise providing simulated telephone advice at Silver command (photograph 1) and observing Gold command. Box 1 summarises operational (bronze), tactical (silver) and strategic (gold) command.

Agencies involved

The Hampshire (& Isle of Wight) Constabulary, Isle of Wight Fire and Rescue Service, Isle of Wight Ambulance Service, Hampshire & Isle of Wight Strategic Health Authority, Isle of Wight Healthcare NHS Trust, Isle of Wight Primary Care Trust, Environment Agency, Isle of Wight Council, Southern Water and Isle of Wight College. The Fire Service operated in the "hot zone" in gas-tight suits, while the Ambulance Service used NHS personal protective equipment in the "warm zone".

Evolution

Scenario one summary

The scenario started with a simulated accident at a college. This generated scores of students acting as "casualties" with the symptoms of respiratory distress, streaming eyes and skin burns. As the scenario developed the emergency services learned that that cause of the accident was a spillage of bromine and acetone that was being used by a student who was surreptitiously manufacturing 'tear gas': bromoacetone. In the scenario these chemicals were dropped down a stairwell, splashing a number of students. The chemicals were identified from police questioning of the "suspects". CHAPD had pre-prepared information on the chemicals which was then 'distributed' on request.

Field Exercise

As the health spectators made their way from the morning briefing to the college site volunteers from the college acting as "casualties" were cordoned into a hot zone, while the Fire Service set up its mass decontamination unit. The Fire Service personnel began to don their gas tight suits, and the volunteers, clad in their newly donned orange gowns (used to identify those who have not yet been decontaminated), began to be ushered into the decontamination zone (photograph 2). The decision to perform formal decontamination was based mainly on the presentation of numerous casualties displaying similar symptoms, and partly on the nature of the chemicals believed to be involved.

At the same time media students simulating the media began to circulate, interviewing representatives of all the emergency services. Meanwhile the coastguard helicopter, summoned to evacuate "casualties" practiced manoeuvring, and the police arrived, and started to put up their tent.

The field exercise tested the establishment of cordons and deployment of mass decontamination equipment. Despite the poor weather mass decontamination was effectively deployed. However, the speed of deployment was identified as an area for improvement, with some of the health spectators expressing concern for the welfare of the "casualties", who were waiting in the open air for decontamination to commence.

Box 1 Gold, Silver and Bronze Command Source http://www.leslp.gov.uk/frames.htm

GOLD	**STRATEGIC**	**Gold is the Commander in overall charge of each service,** responsible for formulating the strategy for the incident. Each Gold has overall command of the resources of their own organisation, but delegates tactical decisions to their respective Silver command.
SILVER	**TACTICAL**	**Silver will attend the scene, take charge**, and be responsible for formulating the tactics to be adopted by their service to achieve the strategy set by Gold. Silver should not become personally involved with activities close to the incident, but remain detached.
BRONZE	**OPERATIONAL**	**Bronze will control and deploy the resources of their service** within a geographical sector or specific role and implement the tactics defined by Silver.

Photograph 1: LIVEX 2004 'Silver Command' © CHaPD (London) 2004

Scenario two summary

As the morning progressed, "news" began to arrive of a road-traffic accident involving a chemical tanker, containing chlorine gas and a vehicle containing an acetylene cylinder which has caught fire. CHEMETs (Box 2) had been pre-ordered from the Meteorological Office, and were distributed as the scenario evolved. The public were advised to 'go in, stay in and tune in' whilst the incident commanders deliberated a decision on evacuation of the population surrounding the leaking chlorine tanker. As the wind changed direction discussion at Silver and Gold focused on how far to extend an evacuation cordon if required. This discussion emphasised the need for real time modelling to support decision making and highlighted the expectation that CHaPD should be able to provide this service.

A final decision to evacuate people within an 800m cordon highlighted the pressures on resources, particularly police manpower that the evacuation of a large percentage of the Isle of Wight's population would cause.

The exercise continued into a second day testing the ability of Gold command to manage a smooth transition of incident command to the local authority who would lead the recovery phase.

Conclusions

Overall the exercise was a huge success, stretching the capacity and testing the decision making process of each of the participating organisations. From the perspective of CHaPD the exercise highlighted the fact the CHaPD does not, at present, have the facilities to provide real time atmospheric dispersion modelling during chemical incident response although those using CHaPD's on call service have identified this as an area for further consideration.

Box 2 What is a CHEMET?

CHEMET is a service provided by the Emergency Response and Monitoring Centre (EMARC) within the UK Met Office as part of their responsibility for the provision of urgent meteorological advice to the emergency services in the event of an accidental release of potentially hazardous substances into the atmosphere.

Within 20-30 minutes a copy of a map of the local area with an 'area at risk' marked by crosshatch is faxed to the a given telephone number. This information is prepared using ADMS, a well recognised and tested air dispersion modelling system. The 'area at risk' accounts for the likely path of the plume, plus an allowance for plume meander and drift and may be useful to aid decisions to notify a population to shelter or develop evacuation strategies if required.

CHEMET is designed to be very simple for a fast response and so does note take into account certain parameters, such as the nature and duration of chemical released. A typical forecast will be valid for three to four hours and if an incident continues beyond this time or conditions changes, an up-dated forecast may be issued.

Fiona Welch Research Engineer– Air Chemical Incident Response Service, (2002) What is CHEMET? Chemical Incident Report

Photograph 2: LIVEX 2004 'Field Exercise' © CHaPD (London) 2004

Exercise Fern-Vale of Aylesbury Primary Care Trust

Alan Smith, Specialist Registrar on secondment to Chemical Hazards and Poisons Division (London)
Kathy Cann, Consultant in Communicable Disease Control, Thames Valley HPU (Buckinghamshire & Milton Keynes)

Exercise Fern took place in Aylesbury on Wednesday 13th October 2004. The principal participants were the Primary Care Trust (PCT) and the local authority. Supporting players were the local Health Protection Team and emergency services

The key objectives were:
- To exercise the PCT executive team's response
- To exercise communications and response of community hospitals and other community centers
- To exercise communications and response of general practice surgeries
- To exercise the ability of the local authority and PCT to establish and support rest centers.

There were a number of components to the exercise; a theoretical accident involving a chemical tanker on a busy traffic route in Aylesbury; a simulated Silver Command at Vale of Aylesbury PCT under the command of a senior police commander; a simulated Bronze Command at the site of the accident; simulated HPU and PCT command centers at Vale of Ayesbury PCT; simulated press interview with the Director of Public Health; simulated rest centers; volunteer casualties attending local GP practices. Chemical Hazards and Poisons Division (London) were also present at the PCT base responding directly to the queries from the HPU.

The exercise scenario was played in REAL time and involved a release of chlorine (Box 1) from a ten wheeled road tanker following a multi-vehicle road traffic accident on the outskirts of Aylesbury town centre. The scenario was that of a small chlorine leak from a damaged valve followed 30 minutes later by a rupture of the tank and large release of chlorine gas and liquid. This resulted in multiple casualties, several deaths and a large plume

Box 1 - Key Points about Chlorine
- Chlorine is a greenish-yellow gas the odour of which is familiar from household bleach and swimming pools
- Chlorine is a respiratory irritant and may cause coughing, choking, hypoxia, pulmonary oedema and in higher concentrations may be fatal
- Contact with compressed liquid gas may cause frostbite or burns to skin and eyes
- Chlorine is heavier than air and may accumulate in low or confined areas

There were a number of issues that quickly emerged as key decisions for 'Silver Command' (Box 2) in the early phase of the exercise. These included:
- To shelter or evacuate
- To consider closure of local A&E following the arrival of possible casualties. The Acute Trust chose to close the A&E but Silver Command reversed this when it was clarified that casualties had only minor exposure to gas, were relatively asymptomatic and had not been saturated in liquid or vapour
- To consider the exact role of mass decontamination and its value in the scenario. The decision is heavily dependent on an accurate estimate of casualty numbers and the nature of the exposure.
- Location of rest centers outside predicted plume, the provision of medical staff and management of those with pre-existing illnesses as well as those with minor adverse health effects from chlorine exposure
- Managing traffic 'gridlock'

Box 2 - Silver Command
- Police Commander
- Ambulance Service
- Fire Brigade (not playing)
- CCDC (Thames Valley HPU)
- PCT Chief Executive

The decisions that Silver Command needed to make required input from health professionals, agencies and other personnel 'off-site'. Landline phones, mobile phones, faxes and hand-held radio's were all in use at Silver Command.

Exercise Fern posed a significant challenge to all involved. The scenario presented an ideal opportunity to observe the interaction of the HPU and PCT with the police, fire services, ambulance services and the media and note the operational difficulties that emerged in a pressurized emergency situation requiring rapid decision making often with minimal, mis-timed or confusing information. On the day people in the path of the plume were advised to shelter initially as a precaution when the release was limited and then again -urgently as the plume spread. Evacuation was not advised by silver command because of the logistics of evacuating so many people safely.

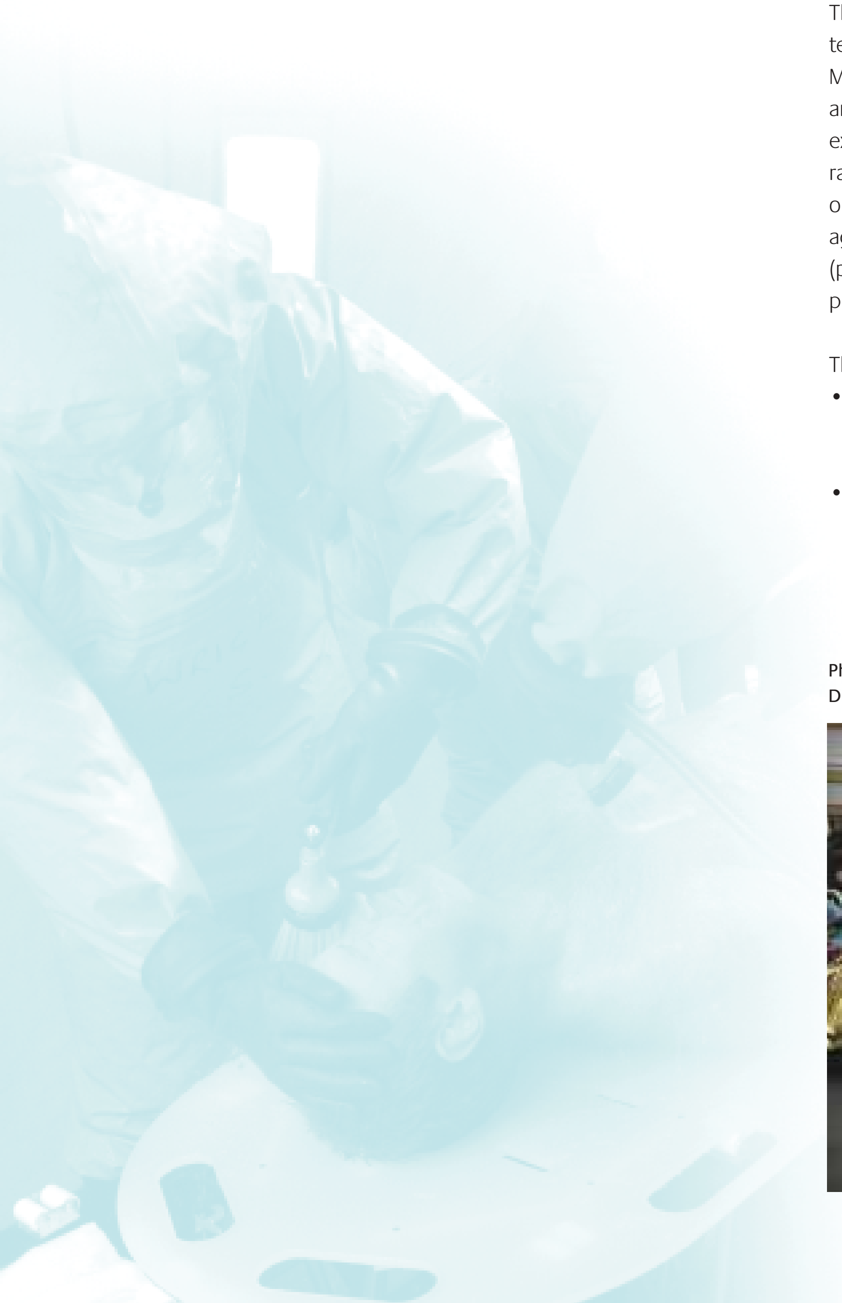
A hot-debrief was held in the immediate aftermath of the exercise with participants across Silver and Bronze Commands, the HPU, PCT, CHAPD(L) and observers. Some of the areas that came up for discussion are shown in Box 3.

The importance of a debrief cannot be over emphasised. An exercise is not complete without it. The aim of a debrief session is not to allocate blame or point the finger but rather to use the opportunity to identify potential problems that can be identified and remedied to ensure that they don't emerge as problems in a real life scenario.

A planned debrief for Exercise Fern was planned for the first week in November 2004 to discuss in detail the issues that emerged for all participants

Box 3 - Outcome of Hot Debrief

- The importance of defining lines of communication
- The importance of clear and precise communication
- The likelihood of individuals facing multiple demands in a pressurized environment e.g. several phones ringing at once
- The need for decision makers to be ‘shadowed’ to allow information and decisions to be logged
- Faxes were not quick enough to share information with the 22 GP practices involved – particularly with a rapidly changing scenario. How to highlight key decisions in ongoing fax and other communications was also an issue.
- Inappropriate use of 999 calls by GP practices when provided with exercise information
- What are the special implications for GP practices if they are in a shelter or evacuation zone?
- Need to use simple language to convey an instruction e.g. “Go to a named point” as opposed to upwind, downwind or east or west etc
- A decision on mass decontamination was probably hampered by the lack of fire service input at Silver Command



Exercise R53: casualty management following the explosion of a radiological bomb

Dr David Baker, Locum Medical Toxicologist, Chemical Hazards and Posions Division (London), Health Protection Agency

Exercise R53 was held in Paris on 10th October 2004. The exercise was designed to test management in a large referral hospital following a terrorist explosion of a radiological (or ‘dirty’) bomb. Such a device involves the dissemination of a radioactive isotope in a pulverised form using conventional explosives. Casualties from such an incident will therefore be expected to be suffering from major and minor penetrating trauma, blast burns and also be contaminated.

The exercise was held at the Hopital Necker in central Paris which is a teaching hospital and also houses the headquarters of Service d'Aide Medical Urgente (SAMU). Medical and nursing staff from the hospital and other hospitals of the Paris hospital service were involved in the exercise as well as personnel from the Fire, Police and the French state radiological protection service. Exercise R53 complemented previous operations to test casualty following release of chemical or biological agents. It was designed to test planning for a radiological device (photograph 1) and to make hospital personnel aware of the special problems involved.

The exercise consisted of two phases:

- management of 50 contaminated walking and stretcher cases who arrived from a notional incident site at a nearby surface metro station without warning at the hospital gates
- management of three seriously injured cases (one of whom was being ventilated) straight to the operating theatre in the hospital without decontamination

Photograph 1: radiological sampling equipment Acknowledgement: Dr Dominique Tillant, SAMU de Paris

Photograph 2: zone control. Acknowledgement: Dr Dominique Tillant, SAMU de Paris

The object of the exercise was to test, teach and inform and to produce a rational and controlled medical response to an important potential hazard facing urban society at the present time. The exercise required precise control in all its phases to avoid confusion and the promulgation of a negative image about management of casualties from a radioisotope release

The exercise showed that a radiological detection and decontamination facility could be set up in the hospital grounds to deal with casualties from a radiological incident and that surgical management of associated major trauma was feasible. Medical staff operated in lightweight level C suits with either facemasks or personal respirators without problems.

The exercise was observed by over a hundred observers from SAMU, fire, police civil defence, Red Cross and military services. It was introduced at the initial briefing by the Paris Prefect of Police who was present during the whole operation, together with the French Minister of Health. The exercise was planned by Professor Pierre Carli, Director of the Paris SAMU and head of the department of anaesthesia at the Hopital Necker who ensured maximal TV and radio coverage on all French channels.

This French exercise demonstrated that a multi – agency approach to a dirty bomb attack is feasible and that the medical response to contaminated and physically – injured patients is likely to be effective. Pre-hospital and hospital medical personnel are able to operate in the difficult conditions of personal protection and plastic lined operating theatres without serious problems.

Lessons learned

The biggest lesson of the exercise was the delays caused by the triage of patients into contaminated and non – contaminated/ injured and non – injured. This lead to considerable delays in decontamination with patients exposed to the cold weather. Once inside the heated decontamination facilities (provided by SAMU itself) it worked well. Another lesson learned was that there must be careful protocols for the operation of safety procedures if a real casualty should occur during the exercise evolution (this system is familiar in naval operations as 'safeguard - safeguard').

Photograph 3: dual decontamination facilities. Acknowledgement: Dr Dominique Tillant, SAMU de Paris

Photograph 4: Practicing interviews Acknowledgement: Dr Dominique Tillant, SAMU de Paris

Photograph 5: preventing hypothermia. Acknowledgement: Dr Dominique Tillant, SAMU de Paris

Review: Risk factors for acute chemical releases in the U.S.

Oliver Morgan MPH, Public Health Specialist Trainee, Centre for Infections, Health Protection Agency

Ruckart PZ, Wattigney WA, Kaye WE. Risk factors for acute chemical releases with public health consequences: Hazardous Substances Emgergency Events Surveillance in the US, 1996-2001. Environmental Health: A Global Access Science Source. 2004, 3:10 www.ehjournal.net/content/3/1/10

Disease surveillance is one of the pillars of public health. They can identify populations at risk, provide a knowledge base for policy making and support planning and preparation for incident response[1]. However, there are few surveillance systems for chemical incidents in Europe[2]. In the USA, one of the largest surveillance systems for chemical incidents is the Hazardous Substances Emergency Envents Surveillance (HSESS) at the Agency for Toxic Substances and Disease Registry[3].

Although only mentioned briefly in the paper, there are many factors that make surveillance of chemical incidents extremely difficult[1]. Consequently, it can be questioned whether the HSESS data provides sufficient coverage or indeed collects relevant risk factors to identify preventable risk factors for chemical incidents. Nevertheless, this paper represents a useful example of how surveillance systems for chemical hazards can be employed.

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In their paper, Rickart et al have analysed HSESS data from 13 states between 1996-2001 to determine risk factors for acute hazardous materials incidents[4]. The analysis focused on incidents resulting in victims and incidents leading to evacuations. Risk factors considered in the analysis are listed in Box 1. Transport-related incidents and incidents at fixed facilities were considered separately. Logistic regression was used to analyse independent risk factors and a multivariate analysis considered combinations of several risk factors.

During the study period, chemical incidents resulted in about 12,000 victims and the evacuation of more than 325,000 people. There were 9,224 transport-related incidents of which 8% resulted in at least one victim and 4% in an evacuation. Of 29,974 fixed facility incidents, 8% resulted in at least one victim and 10% in evacuations. Chlorine was the single most common chemical mentioned. Overall, fire and/or explosions were the strongest risk factors for causing victims or evacuations and for fixed facilities, illegal dumping or deliberate damage was associated with causing victims. Within industry and agricultural settings, chlorine and acid releases respectively were the most important risk factors.

Box 1 - Risk Factors for acute incidents included in the analysis

Temporal factors	Time of day, day of week, season
Type of release	spill, air, fire, explosion, threatened release and other
Factors contributing to the incident	Improper filling or mixing, equipment failure, human error, system problem, beyond human control, illegal dumping or deliberate damage, other
Industry type	Agriculture, forestry and fisheries; construction; mining; manufacturing chemical and allied products; manufacturing petroleum and coal products; manufacturing other; transportation; communications; utilities and sanitary services; wholesale trade; retail trade; finance, insurance and real estate; business and repair services; personal services (hotels etc); public administration; military
Location of incident	Industrial, commercial, residential, agricultural, other
Substance	Acids, ammonia, bases, chlorine, other inorganic substances, paints and dyes, polychlorinated biphenyls, volatile organic compounds, mixtures and others.

Environmental issues

Integrated Pollution Prevention and Control and the Environmental Health and Risk Assessment Unit

Dr Brett Jeffery, Chemical Hazards and Poisons Division, Health protection Agency Head Quarters, c/o NRPB, Chilton, Oxon, OX11 0RQ UK.

Introduction

Integrated Pollution Prevention and Control (IPPC) is a regulatory system to ensure that industry adopts an integrated approach to pollution control to achieve a high level of protection for the environment and human health. Operators of new or proposed installations must apply for a permit from the Regulator (either the Environment Agency or Local Authority) prior to operation, or within a specified time frame in the case of existing sites. The applicant must consider all environmental and health impacts associated with emissions from the installation. As part of the determination process, the Regulator is required to consult with a number of Statutory Consultees including Primary Care Trusts (PCs) in England and Local Health Boards (LHBs) in Wales because of their "specialist knowledge".

IPPC guidance

In March 2004, draft guidance for PCTs and LHBs was made available for consultation via the agency's web site. Following an extensive consultation, the guidance has been published and is available at http://www.hpa.org.uk/hpa/chemicals/IPPC.htm.

Environmental Health and Risk Assessment team

The Health Protection Agency continues to support PCTs and LHBs to fulfil their responsibilities as statutory consultees within the IPPC regime. As part of the ongoing process the Environmental Health and Risk Assessment (EHRT) team was established in September 2004 at the divisional head office in Chilton. The team will provide a focus for environmental health practice, surveillance and research within the HPA and support the rapidly increasing demand for IPPC quality control and demand management.

The Division's IPPC service has been restructured in response to the increasing demand for rapid turn round from the regulators. EHRT has provided support to the London CHaPD unit and will now serve those PCTs previously covered by the London unit.

One of the key objectives of the EHRT team is to facilitate quality assurance of the public health response to the IPPC process. This will be achieved in collaboration with the regulators and colleagues providing IPPC services through sector guidance, improved applications, training, review and the sharing of best practice. Current IPPC support services coordinate activities through an IPPC working group which includes representatives of the regulators and we expect this resource to develop.

The new team is led by Dr Patrick Saunders and currently includes two scientists; Dr Brett Jeffery and Dr Rebecca Gay, who both joined CHaPD on the 6th September based at the divisional headquarters in Chilton.

Dr Jeffery has a PhD in molecular toxicology and has previously worked for the Food Standards Agency, the secretariat for the Spongiform Encephalopathy Advisory Committee (SEAC) and the Department of Health's CJD policy team. Dr Gay joins the HPA with a MSc in Environmental Technology and a PhD in the quantitative risk assessment of contaminated land, both from Imperial College, London.

In order to strengthen links between the HPA and the Environment Agency (EA), Anthony Parsons will be joining the EHRT on secondment from the EA, and will provide expertise and experience of IPPC and environmental health from a Regulator's perspective.

IPPC implementation programme

Surface treatment and the food and drink industry sectors have been the dominant sectors in recent months. In the coming months the next sector of IPPC applications to be submitted to the permitting process will be from the waste disposal and recycling industries. These applications are expected at the beginning of 2005, followed by the inorganic chemicals and chemical fertiliser industries.

Figure 1 (page 34) shows the distribution of IPPC applications received by the Environment Agency between 2001 and 2004. The figure shows the geographical distribution of the regulated industries in England and Wales

Substitute Fuels in Cement Kilns

Over the past year the HPA has considered IPPC applications from the controversial cement kiln sector. The use of substitute fuel in cement kilns is subject to IPPC regulation and has been the source of considerable public concern.

In response to this concern CHaPD has published a position statement on substitute fuels in cement kilns.

To produce the statement HPA scientists and medical colleagues were consulted and external advice was sought. The scientific literature was reviewed and the views of key experts in the field, including reports from the independent scientific advisory Committee on the Medical Effects of Air Pollution (COMEAP), were taken to develop the statement.

The position statement was published on the HPA website on the 13th October 2004. However, given the level of public concern, COMEAP has agreed to review monitoring data from U.K. kilns for further detailed assessment.

HPA Annual Conference 2004

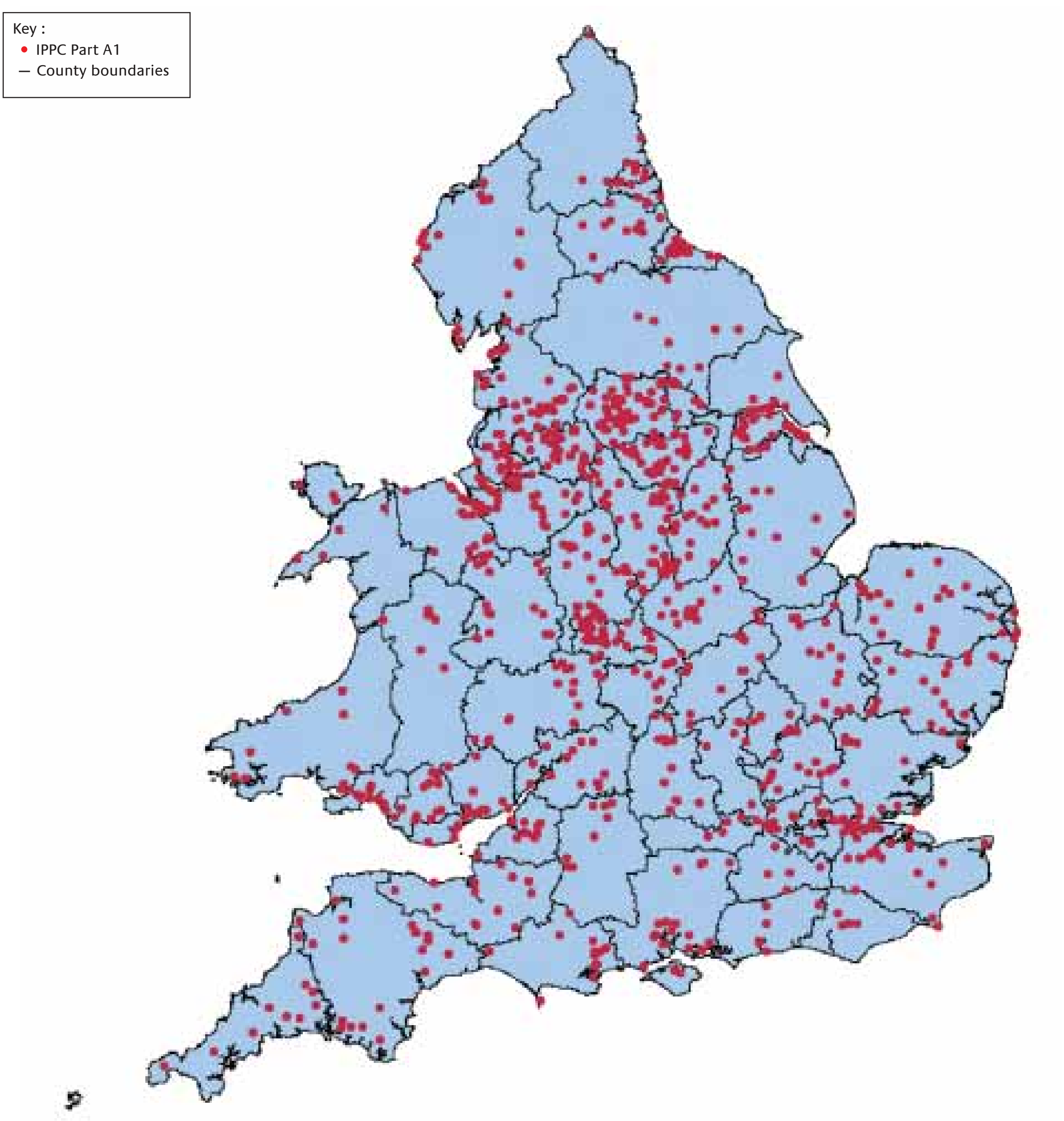
The HPA hosted the second annual conference at the University of Warwick in September. Colleagues from CHaPD in London, Cardiff, and Birmingham, and from LARS South West and the Environment Agency presented papers describing how IPPC can be used as a means of managing our environment from a public health perspective.

Presentations were made on the benefits of health consultees in the IPPC review process, feedback from the Environmental Agency as the regulator of IPPC installations and the validity of using air quality standards derived from occupational exposure standards.
More information on these presentations and others made at the conference can be found at www.hpaconference.org.

Contact details

Further information relating to the EHRT can be obtained by contacting, The Environmental Health and Risk Assessment team, Health Protection Agency, Chemical Hazards and Poisons Division (Head Office), c/o NRPB, Chilton, Didcot, Oxon, OX11 0RQ.

Figure 1: Map of IPPC Environment Agency Part A1 Applications 2001-2004 © Crown Copyright Ordnance Survey. An Edina Digimap/JISC supplied service IPPC data courtesy of Environment Agency



Mercury and the North West

Mr Chris Booth – Consultant Nurse in Health Protection, Greater Manchester Health Protection Unit
Dr Rosemary McCann – Consultant in Communicable Disease Control, Greater Manchester Health Protection Unit

Introduction

The North West has a long industrial past and in the nineteenth and twentieth century it developed a leading reputation for hat making. The process used to shape the felt for hats involved the use of mercury and it was the repeated exposure of the workers to mercury vapour that led to the term ' Mad as a Hatter'. More recently, although the use of mercury in industry is being phased out, it is still used in fluorescent lamps, electrical components, measurement and control devices, the chlor-alkali industry, fireworks, munitions and certain medicines (thiomersal in vaccines, although this is soon to be phased out).

Greater Manchester has had a number of incidents involving mercury spillages and exposure of members of the public. This indicates that mercury is still present in the environment and should be removed to a safe location to protect the public and limit the unnecessary waste of resources that response to such incidents requires.

Mercury can cause considerable morbidity and mortality. For this reason and the recent increase in incidents the North West HPA has taken a proactive approach in trying to remove or reduce the number of mercury related incidents. The North West HPA and CHaPD(London) working closely with the Environment Agency are exploring the feasibility of introducing an amnesty to remove stored mercury from the community and significantly reduce the risk to the public.

Mercury exposures and potential risks to health

Domestic exposures

In the domestic setting problems occur in identifying and removing mercury contamination. For example, in a recent incident a child's clothing became contaminated after playing with mercury. The clothing was washed thereby contaminating the washing machine and other clothing within. In addition the vacuum cleaner used to clean up mercury on a carpet was also contaminated. All the clothing and appliances from this incident then needed to be disposed of as contaminated waste. Examples of contamination of household items and equipment are common in most incidents where mercury has been found in domestic premises. Severe toxicity in humans can result from exposure to only a small amount of mercury. A spillage of as little as 5 ml of elemental mercury left on a rug in a domestic setting, led to severe toxicity in a child[1]

Health care exposures

In the health care setting, mercury is present in medical equipment. The mercury sphygmomanometer has been the mainstay for blood pressure measurement for many years[2] and some clinical thermometers contain small amounts of mercury. It has been estimated that there are around 30,000 mercury sphygmomanometers still in active use by General Practitioners [3] and these have the potential to generate 1800kg of waste mercury.

A review by Markandu et al[4] in a large London teaching hospital examined 500 mercury sphygmomanometers. More than half had serious problems that would have recorded inaccurate readings of blood pressure. The tubing on 168 of the sphygmomanometers was found to be perished near the junction of the mercury reservoir, representing a serious risk of mercury escaping into the environment by direct spillage.

Spillages in health care settings pose similar problems to those in the community. However, higher ambient temperatures often found in health care facilities may increase the rate at which mercury is vaporised and thereby increase the risk of toxicity to patients and staff. However, the risk to patients may be increased due to other medical problems. Earlier this year a Primary Care Trust (PCT) in Greater Manchester experienced a mercury spillage on the floor of a PCT health centre premises. As a result the carpet in the health centre had to be removed and disposed of as contaminated waste at considerable cost to the PCT. This incident prompted the PCT to offer General Practitioners the opportunity to dispose of their mercury sphygmomanometers. Although the offer was by letter and not widely publicised, 100 pieces of equipment were handed in. A mercury recycling company disposed of the equipment and the cost to the PCT was in the region of £1000.

Mercury incident management issues

Dealing with incidents presents many practical and logistical problems for those agencies that are involved. One of the major difficulties is the identification of those individuals who may have been exposed and the practicalities of carrying out health checks and monitoring for mercury toxicity. Children finding mercury and then carrying it home unknowingly spread the contamination to the domestic environment. This then creates problems for Local Authorities who may be faced with the cost of disposing of contaminated personal clothing, domestic furnishings and household appliances such as washing machines, dryers and vacuum cleaners. In one incident alone the cost to the Local Authority was estimated to be £40,000 and the cost to the PCT was estimated to be in the region of £10,000. However these are conservative estimates and do not include the cost of additional manpower. There are also non-financial costs to the families involved such as the uncertainty and anxiety around levels of contamination, particularly in the light of the length of monitoring required following exposure before it is known whether there have been any long term health effects.

The North West has had a number of mercury incidents indicating that mercury is present in the wider environment. It is unclear why or how members of the public have access to or store mercury. In the past mercury had a high scrap value and this may be why mercury continues to be stored. Mercury is now viewed by the NHS and Local

Authorities as a liability and expensive to dispose of. This may result in individuals and companies storing mercury on their premises or disposing of mercury in an unsafe manner to avoid the expense of disposal.

Mercury seminar

As a result of recent incidents a multi-agency seminar was held in Manchester, in March 2004. The seminar was organised by Greater Manchester Health Protection Unit and funded by the Health Protection Agency. The seminar was seen as the first step in exploring the issues surrounding mercury incidents and how steps could be taken to prevent future incidents. Representatives from the following agencies across Greater Manchester attended

- Local Authorities
- Primary Care Trusts
- A&E departments
- Health Protection Agency
- Environment Agency

Objectives of workshop:

- To raise awareness of mercury as a public health issue
- To prevent future incidents involving mercury
- To agree a standard approach to the investigation of exposed persons and premises including:
    - Need for decontamination
    - Choice of specimens, eg urine, blood
    - Transport of specimens
    - Choice of laboratory
    - Sensitivity and specificity of current environmental monitoring equipment
    - Interpretation of results
- To clarify the roles and responsibilities of agencies in incident response
- To identify areas for research and development
- To develop a toolbox for responding to mercury incidents

The seminar was the first step in reviewing the problems faced when dealing with incidents and identifying possible steps towards an amnesty.

Proposed amnesty

Working closely with the Environment Agency, Local Authorities and NHS colleagues it is proposed that an amnesty be introduced whereby mercury can be removed from an uncontrolled to a controlled environment. A well-publicised amnesty period would be an opportunity to inform the public of the hazards of mercury and provide a means by which mercury could be safely disposed of without cost to the public.

Although the majority of incidents have occurred in the domestic environment, some minor incidents have occurred in health care premises. It is the view of the Health Protection Agency that our NHS colleagues should also be offered the means of safely disposing of mercury containing equipment such as sphygmomanometers and thermometers with minimal cost to the various NHS organisations.

It is important to explore the zero or minimal cost aspect of an amnesty. The costs involved in safe disposal are perhaps one of the main reasons that companies and individuals may be retaining stores of mercury, disposing of or abandoning mercury where minors can find it.

Although there would be costs incurred in the short term these are outweighed by the potential long-term benefits in terms of prevention of ill health and avoidance of costly mercury incidents.

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Conference Reports

TraumaCare 2004: Sydney, Australia, 15th – 17th October 2004

Dr David Baker, Locum Medical Toxicology Consultant, Chemical Hazards and Poisons Division (London), Health Protection Agency

TraumaCare 2004 was one of a series of annual congresses of the International Trauma Anesthesia and Critical Care Society (ITACCS). ITACCS was founded about 20 years ago in Baltimore. Despite its name it is a multidisciplinary trauma organisation and this is reflected in a recent name change to Trauma Care International. The meeting attracted over 500 registrants from all parts of the world with a large international Faculty.

Toxic injury is recognised by the society as a branch of trauma and I have chaired the Toxic Trauma and HAZMAT Committee (TTHC) since 1996. One of the most important achievements of the society was the introduction of protocols in 1996 for the safe provision of advanced medical support in a contaminated zone (TOXALS). The TTHC is currently concerned with the continued promulgation of TOXALS.

One of the presentations concentrated on the realities of management of casualties following exposure to chemical and biological agents in one of the main sessions. This presentation included the following:

- hazards exist from a limited range of chemical and biological; each of these hazards possesses intrinsic toxicity, latency of onset, persistency and transmissibility
- chemical releases with short latency of action pose the biggest risk in the urban environment and require rapid life – supporting responses from properly trained and equipped emergency medical responders
- released biological agents act with longer latency and should be regarded as a deliberately - induced epidemic
- CBW agents are not inherently ‘weapons of mass destruction’ but can lead to mass injury. With careful planning and a properly equipped response CBW releases may cause considerably less loss of life than conventional explosive discharges

Most of the congress was given over to conventional trauma but the position of this presentation indicates the importance being given to the management of mass toxic exposure in a general international trauma forum.

The next international meeting of Traumacare International will be held in Paris in May 2005 and this would be a good opportunity to present some of the work of the HPA to a wider audience.

“Addressing urban environmental problems”, The sixteenth conference of the International Society for Environmental Epidemiology (ISEE) New York, USA; August 2004

Nannerl Herriott, Environmental Epidemiologist, Chemical hazards and Poisons Division (London), Health Protection Agency

In August 2004, I attended the ISEE conference. This is an annual event where environmental epidemiologists from around the world present their work. The key themes of this year’s conference were air pollution epidemiology, the role to epidemiology in terrorism, urban growth and theoretical developments in environmental epidemiology. The conference abstracts have been published and can be viewed electronically at **http://www.iseepi.org/index1.htm**

The plenary session on the first day of the conference was about terrorism. Dr. Ed Kilborurne described the facilities and control rooms available to respond to incidents at CDC. This was followed by Dr. Farazah Mostashari from the New York City Department of Health and Mental Hygiene describing how syndromic surveillance was being used to inform the response to terrorism in New York (an abstract relating to this work can be viewed at **http://www.cdc.gov/mmwr/preview/mmwrhtml/su5301a6.htm).** Data about health conditions is being collected from a variety of sources, including the National Poisons Information Service, the ambulance service and all of the emergency departments in hospitals in New York State. They have found that whilst individual sources of information maybe moderately useful combining the information is useful in detecting citywide increases in disease.

An excellent session on environmental public health tracking presented conceptual papers. Talks covered the way in which tracking could be introduced and the components of the proposed tracking system. Ideas about linking environmental exposure and toxicology data to socioeconomic status to try and establish if there are demographic disparities in the population were presented by Ramos R et al (abstract 309 **http://www.iseepi.org/index1.htm**). Methods for linking race/ethnicity, socioeconomic status and measures for tracking children’s health were presented by Woodruff et al (abstract 306 http://www.iseepi.org/index1.htm). A very lively debate ensued and it seems that it maybe some time before environmental tracking moves from a theoretical to an operational system.

I attended a fascinating presentation on the use of epidemiology in ‘toxic tort’ cases in the US. Discussion revolved around the Texas Supreme Courts Hauner decision which requires at least two peer reviewed studies showing a statistically significant risk ratio of 2.0 or more before epidemiological studies can be brought before a jury. Cruth R (425 **http://www.iseepi.org/index1.htm**). It will be interesting to see how this impacts on the UK as we become a more litigious nation.

Education and training in disaster medicine and major incident management

Belgium, 29 – 31 October 2004 World Association of Disaster and Emergency Medicine Education Committee

Virginia Murray, CHaPD (London)

Whilst in 2003 at the World Congress in Disaster and Emergency Medicine held in Melbourne, Australia a request was received from the World Health Organisation for the World Association of Disaster and Emergency Medicine to consider international standards and guidelines on education and training for the multi-disciplinary health response to major events that threaten the health status of a community. An Education Committee Working Group was set up and they published an initial paper on the issues relating to this activity.[1] Since then a series of four working groups have been held leading to an international group meeting in Brussels. Fifty representatives from many countries were present including Austria, Belgium, France, the Netherlands, Germany, Greece, Portugal, UK, India, Iran, USA, Australia and New Zealand. A wide range of multi-disciplinary groups were present including public health, paramedics, emergency medicine practitioners, nurses, intensive care, toxicologists, family medicine, clinical psychologists, social scientists and geographers. They represented governmental organisations, non-governmental organisations such as the West Bengal Voluntary Health Association and the British Red Cross and individuals committed to disaster health management.

Excellent presentations were given to set the scene of the issues relating to education and training. These included papers on

- The Athens earthquake on 7th September 1999 where 85 people were entrapped, 143 died with 750 people wounded. Approximately 100 buildings collapsed, 5,000 buildings were damaged, including 2 hospitals, with 80,000 people were left homeless. Amongst the damaged buildings was a pharmaceutical company and here first responders were contaminated and developed adverse health effects. Further information is available from roumelis@otenet.gr.
- The principles of the management of casualties from fires such as the in Antwerp, Belgium on 31st December 1994 and the Café fire in Volendam, the Netherlands, on 1st January 2001 showed that many burns victims can self present to emergency departments of hospitals and then require intubation and ventilation. Some international guidance on the management of severe burns[2] has been developed but requires wider sharing hopefully leading towards developing educational standards.
- Natural disasters, in developing countries pointed to significant differences between developed and developing countries. Examples of recent incidents included the 2003 earthquake in Bam, Iran, which resulted in over 26,000 deaths in a population of 97,000 and the 2004 Haiti floods. It highlighted a series of excellent publications from the Pan American Health Organisation (PAHO) and the World Health Organisation (WHO).[3, 4]. This paper pointed to the need for reviewing systems for international aid to developing countries in disasters.

Following extensive debate the meeting considered that guidelines and standards for education and training in disaster health need to be developed. It was considered that ‘disasters’ is a term that is difficult to define but should include ‘major events which actually or potentially threaten the health status of a community’. This would include events such as natural disasters, major incidents such as transport accidents, technological disasters, public health crises such as potential infectious diseases, mass gatherings and terrorism. Various papers were also considered such as the 2004 accreditation framework developed by the Association of Schools of Public Health in the European Region.[5]

A paper will be presented on the outcome of the Brussels meeting at the 14th International Congress for the World Association of Disaster and Emergency Medicine. This will be held in Edinburgh on 16-20 May 2005. Further information about this meeting is on http://www.wcdem2005.org. This will provide a significant opportunity for all interested in national and international disaster health and management to participate in this meeting

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Heat waves and cold snaps: a bilateral French/UK meeting:

Dr Giovanni Leonardi, Consultant Environmental Epidemiologist, Chemical Hazards and Poisons Division (London), Health Protection Agency

Heat waves effects on mortality and morbidity in France and the UK was one of the themes of the first bilateral scientific meeting of the HPA and the French Institute de Veille Sanitaire (InVS). Promoted by the Director of CDSC Prof Angus Nicoll and the Director of InVS Prof. Gilles Bruckner, this joint meeting of the two agencies was the first since the start of HPA, and it aims at strengthening health protection work in Europe.

On the first day, an open scientific session on 'Environmental surveillance and response: impact of heat wave and cold snaps on health' had two French and two UK presentations, and all reported on the substantial increase in deaths attributable to extreme heat during summer 2003. The French provided participants with several original findings demonstrating the 'net increase' of deaths (as opposed to 'deaths brought forward by a few days/weeks') over that summer period when compared with past years. They reported a net increase of over 15,000 deaths during the hot weather of the summer 2003. In particular they highlighted risk factors, many of which are potentially preventable, for elderly deaths in institutions. The UK Office for National Statistics reported on the 2,139 excess deaths in England & Wales in August 2003 and on their plans to speed up the death notification process to support the UK Heat Wave Plan in the future. The UK Heat Wave Plan is available on the DoH website.[1] Sari Kovats from the London School of Hygiene and Tropical Medicine reported on recent work in collaboration with HPA and NHS Direct to examine morbidity burden attributable to heat. She also addressed questions in relation to thresholds to be used in the heat wave plan, and the range of available responses in current Heat Wave Warning Systems.

On the second day, a closed bilateral HPA-InVS meeting was held, which provided an excellent opportunity for detailed exchange of information, and exploration of ideas for possible future collaborations on several topics that may add value to health protection activities not simply in relation to extremes of temperature, but to surveillance and response systems in general.

1 Department of Health. Heatwave - Plan for England - Protecting health and reducing harm from extreme heat and heatwaves. 30/07/2004 **http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4086874&chk=opuHhJ**

Education and Training

North West Public Health Voluntary Register Support Programme: Environmental Public Health and Emergency Planning Module.

Helen Casstles: Environmental Health Advisor, Health Protection Agency North West
Dr John Reid: Education & Training Lead, Health Protection Agency North West

The Health Protection Agency in the North West recently organised a training module on environmental public health and emergency planning to 23 candidates undertaking 'top-up' training for registration on the voluntary register for public health. The course was for five days and aimed to provide a broad foundation in environmental public health and emergency planning and enable the voluntary register candidates to fulfil their relevant health protection competencies.

The course was delivered by local and national Health Protection Agency staff, Environment Agency and Local Authority personnel and academic colleagues. The methods of delivery included presentations, case based scenario exercises and structured discussions. A range of topics was covered during the week across the fields of chemical and radiation hazards, emergency planning and response and environmental health. Underpinning concepts such as sustainability, toxicology and human rights were also included.

Evaluation of the training demonstrated that it met or exceeded expectation and the majority of the attendees found it of great value. Trainees were satisfied that the objectives had been met and their knowledge had been updated and gaps filled. Suggestions were made for follow up activities such as site visits and participation in local emergency planning meetings.

There are plans to repeat the course in May/June 2005. For further details please contact Margaret Olorogun (margaret.olorogun@centralliverpoolpct.nhs.uk) or Helen Casstles (h.casstles@livjm.ac.uk).

Short course in Environmental Epidemiology at the London School of Hygiene and Tropical Medicine

London, 20th -24th September 2004

Giovanni Leonardi, Consultant in Environmental Epidemiology, and Nannerl Herriott, Environmental Epidemiologist, Chemical Hazards and Poisons Division, Health Protection Agency

Is environmental epidemiology something HPA staff needs to worry about? Yes, judging by the attendance at the first short course organised on this topic jointly by HPA and the London School of Hygiene and Tropical Medicine (LSHTM). Nineteen participants attended the course which ran between 20 and 24 September 2004. Over half of the participants are employed by the HPA and they came on the course as they needed to use environmental epidemiology to deal with incidents back in their patch. This course was designed for those working in public health, health protection or environmental health with an interest in or experience of environmental epidemiology or who wanted to improve their skills.

The objectives were:

- To summarise the key concepts in environmental epidemiology
- To explore the key concepts in exposure assessment and cluster investigation
- To examine the scope and uses of environmental epidemiology in local agency response to public health and health protection issues.
- To explore study design and practical consequences of choices made when planning and undertaking an environmental epidemiological study. This will include an appreciation of the influence of finance, politics and time constraints on the choice of study.
- To review the advantages and difficulties of multi-disciplinary and multi agency working in environmental epidemiology
- To use strategies for communicating risks concerning investigation of environmental hazards.

The course took place over 5 days, two days of the course were taught in a classroom and three days were taught using an interactive computer programme.The teachers were all actively engaged in aspects of environmental epidemiology, and all had experience of applying theory to practical situations, either at local or national or international level. They included academics such as Paul Wilkinson and Celi Busby of the London School Hygiene and Tropical Medicine, Mark Nieuwenhuijsen of Imperial College, and Norman Parkinson of Kings College, as well as HPA staff Virginia Murray, Pat Saunders, Nannerl Herriott and Giovanni Leonardi.

The largest component of teaching was offered by Irene Kreis, who designed the interactive computer software used on the course and conducted the original work on which the case study is based. She is an environmental epidemiologist formerly at the Dutch National Institute of Public Health and the Environment, and currently at the University of Wollongong, Australia. She has a particular interest in teaching environmental epidemiology. Her teaching was focused on a case study derived from a real scenario of community concerns and scientific complexity in relation to a putative local environmental health hazard. Her methods were largely problem based and involved a mixture of hands on work, simulated public meetings and other communication activities.

The 19 course participants, all with backgrounds in public health, environmental health and health protection, attended from several HPA regions: Eastern, East Midlands, London, North West, South East and South West, as well as Wales, the HPA Chemical Hazards and Poisons Division (London and Head office), and one international student.

The participants completed a short evaluation at the end of each day. The participants gave several comments that will allow us to improve the course design, such as ’examine what type of analysis should be done’, ‘Detail national and local resources available to support exposure assessment and cluster investigation’, ‘Use of computer for shorter sessions’. On the whole, we received such positive feedback about the course, for example ‘Case study an excellent learning tool’, and ‘Feel a lot clearer about what to do’, that we intend to revise the course content and offer it again in April 2005 at Kings College London.

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.

How to Respond to Chemical Incidents
25th January, London
22nd February, London
29th March, London
25th October, 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.

Environmental and Occupational Epidemiology: an Academic Update
28 April 2005, London
(for the HPA Environmental Network, Consultants in Health Protection with a special interest in environmental contamination and academics working in environmental epidemiology)
This is a joint meeting organised by the Chemical Hazards and Poisons Division, Health Protection Agency, the International Society for Environmental Epidemiology and Epidemiology in Occupational Health and the International Commission of Occupational Health. The meeting will address the recent and rapid expansion of environmental and occupational epidemiology and health risk assessment and a scientific need to better understand and explain the effects of environmental pollutants on human health. It will a focus on topical methodological and research issues, largely, but not exclusively, reflecting current work in the UK.
Plenary talks will consist mainly or exclusively of invited speakers with an invited poster session which will be discussed by topic led by a moderator. Please contact Karen Hogan (Karen.Hogan@gstt.nhs.uk) if you are interested in submitting an abstract for a poster. Registration fee will be £25. A maximum of 60 places are available.

Environmental and Public Health Training – Integrated Pollution Prevention and Control (IPPC)
26th May, London
(for PCT DsPH, Local Health Boards, other generic public health practitioners and Local Authority environmental health practitioners)
The general aim of this training day is to cover basic environmental and public health issues including the new IPPC guidance and to show the role of the Primary Care Trust as the statutory consultee to IPPC applications. The specific educational objectives for this training day includes familiarising participants with the terminology commonly used in environmental contamination issues and where appropriate in IPPC applications. It will cover emissions to water, land and atmosphere and provide practical examples. The course will explain why PCT's and Local Health Boards are statutory consultees to IPPC and show how their response can add value to this regulatory process. A maximum of 40 places are available.

Environmental and Public Health Training – Advanced Update to include Integrated Pollution Prevention and Control (IPPC)
28th June, 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 of 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.

Additional training dates for your diaries
27th September 2005
24th November 2005

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.