Chemical Hazards and Poisons Report

From the Chemical Hazards and Poisons Division
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Contents

Editorial

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In this issue, our incident response section focuses on some recent significant incidents including: a fire at a chemical factory; an unusual problem at a primary school that was attributed to idiopathic environmental illness; and the investigation of a contaminated fatality using CR1 Personal Protective Equipment (PPE).

As always, emergency preparedness issues are again identified as important. Two articles are presented on an evaluation of the London Chemical Incident Early Alerting System, along with a paper that outlines body process pathways for both contaminated and uncontaminated bodies; an update on the progress being made on the on-line HPA chemical hazards compendium; a summary of the new guidance on the provision of public health advice during a major incident and an article on Exercise Young Neptune – an important article which outlines lessons identified for mass decontamination of children.

Environmental issues are of note and in this issue we continue our series on air pollution with an article on particulate matter concentrations in the UK. Two articles are also presented on Strategic Environmental Assessment, along with an evaluation of the 2006 National Heatwave Plan for England.

A series of conference reports are included. An article is provided on the international symposium 'The London Bombings -health protection lessons from London and other international incidents', that focuses on lessons identified on strategic arrangements for hazard assessment and environmental monitoring. An overview of the newly established HPA Contaminated Land Forum is also included. Broader issues in environmental public health are given in articles on The Royal Commission on Environmental Pollution's 26 Report and the Children's Environmental and Health Action Plan for Europe (CEHAPE). The November 2006 Advisory Committee on Natural Disaster Reduction meeting is summarized as is the Food Standards Agency workshop on food incident prevention and horizon scanning.

The next issue of the Chemical Hazards and Poisons Report is planned for September 2007. The deadline for submissions for this issue is 1st July, 2007. Please do not hesitate to contact us about any papers you may wish to submit. Please contact us on chap.report@hpa.org.uk, or call us on 0207 759 2871.

We are very grateful to Professor Gary Coleman for his support in preparing this issue.

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Incident Response

Fire at a chemical factory, September 2006

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Introduction

This report describes a fire in a factory storing chemicals used as cleaning agents for health care and swimming pools. Emergency responders at the scene reported skin and mucous membrane irritation and attributed this to plume exposure. This raised immediate concerns for the health of both emergency service staff and members of the public living nearby. Management of the fire was complicated by a substantial liquid chemical leak, from a highly acidic lagoon on the site. The report discusses problems encountered during the incident and the lessons identified. These are important, as there is a paucity of literature on the management of fires involving substantial release of acids.

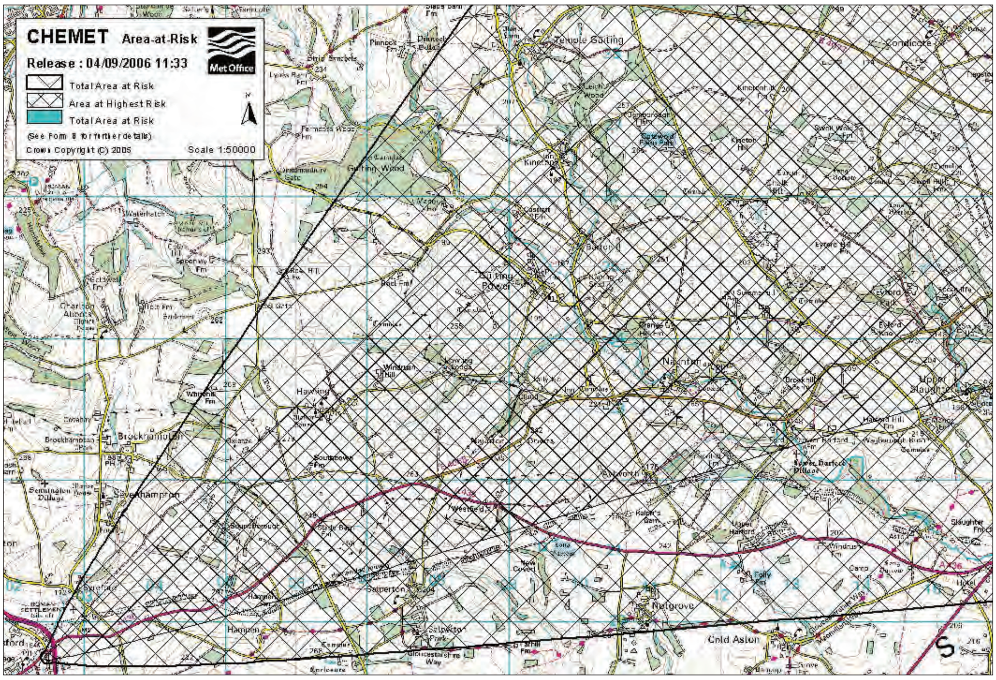

Figure 1: CHEMET issued by Met Office (Crown Copyright)

Incident Summary

On a Monday mid-morning in September 2006, a large fire occurred in a unit on a light industrial estate near Cheltenham. The company made cleaning agents used in health care and for swimming pools. The burning chemicals produced a 40 ft high plume of smoke. The fire resulted in 18 fire engines being deployed to the site and the local police force closed two major trunk roads. A multi-agency Strategic Command Group ('Gold') was set up, attended by the Consultant in Communicable Disease Control (CCDC) from the local Health Protection Team and the Chief Executive and Director of Public Health (DPH) of the local Primary Care Trust (PCT) as well as the emergency services. The Chemical Hazards and Poisons Division (CHaPD), London was asked for assistance, providing information on the potential adverse health effects of the chemicals present as well as advice on exposure assessment. Representatives from CHaPD (London) attended 'Silver' command meetings and undertook a site visit. The fire eventually burned itself out over 24 hours after it had started.

Site Visit

The factory is a low-tier Control of Major Accidents and Hazards (COMAH) site. It is situated in a rural farming area, in the middle of a small village within a valley. As seen on the CHEMET (Figure 1, Box 1), there was a light south-westerly wind and over the course of the afternoon, the cloud cover increased, with some light rain. The plume was dispersing in both vertical and horizontal directions but by late afternoon there was visible evidence of the smoke plume grounding in the valley.

At the time of the site visit, the fire was under control but still burning. Gloucestershire Fire and Rescue Service and the Environment Agency decided not to put the fire out with water due to the potential risks to ground and surface water from polluted fire water run-off. There was a trout farm in the river downstream that was potentially at risk, as well as several private water wells nearby.

> ### Box 1:
>
> CHEMETs are documents produced by the Met Office, they give expected weather conditions and anticipated behaviour of any plume in the event of a chemical incident.
>
> CHEMETs are requested and used by the emergency services and the Environment Agency.
>
> CHEMETs do not take into account the individual nature of the chemical(s) involved or the volume discharged; the initiation of a CHEMET does not necessarily imply that there is a threat to public health
>
> CHEMETs are automatically distributed to a number of organisations including CHaPD.

Figure 2: Fire, smoke plume and liquid chemical leak **© CHaPD (London), HPA**

The site was managed by the fire service using temporary containment measures. There were pliable drain covers put in place and a bunded area of approximately 240m^2. A green-blue, stream of chemicals flowed from the burning warehouse pooling into the bunded area (Figures 2 and 3). The lagoon of liquid chemicals was highly acidic (pH1) and this had started to corrode the bund. The chemicals thought to have been present in the factory included; sulphuric acid, hydrochloric acid, hydrogen peroxide, sodium sulphite, calcium hypochlorite, sodium hypochlorite, dichloroisocyanuric acid, trichloroisocyanuric acid and aluminium sulphate. Therefore, there was concern over the potential for the smoke plume to contain chlorine compounds (such as hydrochloric acid).

Immediate Incident Management

Local residents and those in neighbouring villages were advised to shelter in their homes and not to evacuate. This has been demonstrated in the past to protect against the adverse health effects of a plume containing chlorine and other chemicals.[1,2] There were also concerns for emergency service staff, both the police officers manning

Figure 3: Liquid chemical leak from the site of the fire **© CHaPD (London), HPA**

cordons and fire and ambulance personnel who spent many hours on scene. Some workers on the industrial estate were evacuated to a nearby building.

Two BASICS doctors were present on site with the ambulance service. Communication with NHS Direct and local health providers was established early on in the incident through the Police and PCT incident control centres. Only one member of the public presented formally to a nearby Emergency Department with eye irritation. Two first responders presented to the BASICS doctors with nasal irritation, headaches and minor eye irritation. Two policemen who drove through the plume attended hospital with symptoms of headaches. One of the BASICS doctors at the scene also experienced headaches and nausea up to four days after the incident. None of the local residents presented to their family doctor with any symptoms. The total number of calls to NHS Direct and the reasons for the calls were similar to those received on a comparator day.

Environmental Monitoring and Clean Up

The Environment Agency (EA) took water samples from the River Coln over a number of days following the incident. Chemical compounds were detected consistent with some degree of leak from the incident and there was evidence of damage to local freshwater ecosystems. EA assessments after the fire indicated that there was minimal risk of contamination of ground water and private water supplies.

The company responsible for the chemicals in the warehouse arranged for specialist collection and disposal of the pool of chemicals held within the temporary bund. The site clean up took over two weeks.

Discussion

The public health effects of the fire can only be fully assessed on the basis of an understanding of the toxic nature of the chemicals (both gaseous and liquid), and the extent and duration of exposure from all pathways. CHaPD recommended air sampling close to the fire and at staggered locations downwind. However, this was not undertaken, perhaps because of the fact that currently no national agency has the responsibility for air sampling during chemical incidents. The HPA has taken the lead in discussions with the Department for the Environment, Food and Rural Affairs (Defra), the Environment Agency, the Health and Safety Laboratories, the Health and Safety Executive and other agencies to resolve this issue.

The symptoms experienced by the emergency services staff raised concerns over the exposure to chlorine containing compounds. Chlorine exposure causes irritation of the eyes, skin and mucous membranes, including the respiratory tract. Increased exposure can result in chest pain, vomiting, coughing and at high concentrations, toxic pneumonitis and pulmonary oedema.3

The early advice given to local residents to shelter inside may account for the absence of symptoms experienced by the general public. This supports the findings of a comparative incident involving the leak of a plume of hydrogen chloride gas, where the minimal health effects were attributed to prompt sheltering advice.[1] The advice given to shelter was however difficult to enforce. Despite media warnings, and messages broadcasted from a loudspeaker on board a police helicopter, there were children and adults out walking in the village adjacent to the site.

There are few published reports of the health effects due to fires involving material containing chlorine in the literature. A large scale urban chemical fire in Maryland, USA, resulted in an increase in patients attending local emergency departments with shortness of breath, complaints consistent with exposure to smoke, but no increase in hospital admissions.[4]

An article on a fire in a pool chemical manufacturer in Ontario gives the results of on-site air monitoring for HCl and Cl_2.[5] Real time concentrations were produced, which were stated to alter police and fire service remediation activities but there is no discussion regarding how this affected health advice and outcomes.

Conclusions

This report highlights how little is known about the management of fires involving acids and the best actions to take to minimise both acute and chronic adverse effects to human health. The following lessons can be learned from this incident:

- The need for more effective preparations for the containment of chemical leaks on sites such as this, as per site COMAH site regulations (HSE, 2006);
- The value of the messages that members of the public should shelter (i.e. stay indoors with windows and doors closed) but associated difficulties in ensuring this action is undertaken;
- The importance of early occupational health monitoring and follow-up for emergency services staff, which will increase our understanding of health effects following such incidents;
- That air sampling would have greatly informed risk assessments and the subsequent health-related advice given to emergency services personnel and the public. This may also have supported decisions regarding other aspects of the incident, such as the locations of police cordons and advice to vulnerable groups.

References:

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The first human fatality investigated using the CR1 Personal Protective Equipment

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Introduction

On the 27th September 2005, an engineer at a Lancashire industrial unit was using hoses to purge ammonia from two cooling system valves into buckets of water. The approach taken was that as soon as he smelt ammonia, he would stop and close the valves. However, for some reason this did not occur and he died from very high exposure to ammonia. There was a period of time before his body was discovered adjacent to one of the hoses. During this period of time it was thought that approximately 6-7 tons of ammonia were lost from the system although ultimately only 3 tons was put back in.

Body recovery

Day 1: On discovery that he was missing, the local Fire & Rescue Service attended. An initial snatch rescue was attempted by 3 fire officers, two of which suffered burns due to the use of inappropriate personal protective equipment (PPE) for the environment into which they had entered. Fire officers wearing gas-tight suits were able to retrieve the body of the deceased which was taken outside onto a grassed area. The clothing was removed from the body which was washed with water for 15 minutes. The body was considered to be heavily saturated with ammonia and its external surface appeared to be frozen. The body was relocated to another grassed area, out of the public or employees view, and placed within a scene-of-crime tent. Following conversation with the Health Protection Agency, the body was placed on top of pallets to improve the air circulation around the body. Ammonia released to air from the deceased was monitored periodically using Draeger tubes. At this time the body was black but it later changed colour to red.

Days 2-3: The body remained in the open, within the scene-of-crime tent with continued monitoring of ammonia release being undertaken. The body appeared to freeze and defrost continuously. The levels of ammonia released dropped during this time. The clothing was placed within sealed plastic bags and put inside the tent with (but not next to) the body.

Pathology response

Day 4: The level of ammonia recorded from the body had dropped such that it was considered safe for his body to be moved and, at the request of H.M. Coroner, be examined by a pathologist in order to establish whether the deceased had died from exposure to ammonia or from natural disease possibly leading to the ammonia release. However, the regional Home Office pathologists did not have any PPE suitable for such an examination. This remains the present situation in the UK as only one unit had PPE for responding to Chemical-Biological-Radiological-Nuclear (CBRN)/Hazardous material (HAZMAT) incidents.

The East Midlands Forensic Pathology Unit was contacted by both the HPA and H.M. Coroner to assist in the recovery and examination of the deceased. One pathologist and one anatomical pathology technician (APT) attended the scene where following a multi-agency briefing, it was decided that rather than examine the body *in-situ* (which they had come equipped to do), the body would be moved to Wigan mortuary for examination. This is a stand-alone, modern facility which was considered appropriate to undertake such an examination.

Body movement

The body was placed into a Respirex® chemical body bag by Fire and Rescue Service officers wearing standard PPE. The body at this stage appeared to no longer be releasing measurable concentrations of ammonia to the air. The bag was sealed and the outside washed with detergent and water before it was placed into a vented undertaker's vehicle. Due to the size of the bag, care was required not to puncture it on any projections within the van. Four personnel were required for this task.

Figure 1: An anatomical pathology technician wearing the Remploy® CR1 suit (©Prof. Guy Rutty, 2006).

The examination

The examination was undertaken by one pathologist and one APT wearing Remploy® CR1 suites (Figure 1) following a high-risk autopsy examination protocol. This was the first time that a real chemically-contaminated cadaver examination had been undertaken using this type of PPE.

Figure 2: Body bag being opened by the pathologist (left) whilst the APT monitored ammonia release (right) (©Prof. Guy Rutty, 2006).

Approximately 2 hours passed between the recovery of the body and the opening of the bag. During this time, the bag had fully distended with ammonia. The bag was opened in stages, with levels of ammonia monitored by the APT using a Draeger tube (Figure 2). The readings were conveyed to the local HPA officer who monitored the examination from a sealed observation gallery.

With the bag fully opened and the ammonia levels dissipated, an external and full internal examination was undertaken by the pathologist, with the APT acting as an observer, runner and monitor. All major organs were examined with monitoring occurring at each stage. No residual ammonia was recorded within any body cavity or organ. The cause of death was attributed to the affects of ammonia rather than a pre-existing natural disease.

The examination was completed within the 2 hour working period of the CR1 suit. At the end of the examination, the body was reconstructed by the APT. The bag was sealed and the external surface washed with detergent and water. It was then placed within a fridge where it remained sealed for several days prior to burial. The bag during this time did not re-distend. Decontamination at the end of the examination was provided by the Fire and Rescue Service. The experiences of working within the CR1 suit were conveyed to the Home Office, the HPA and the national Police CBRN training centre.

Learning points

1. This case illustrates how long a body may take to become 'safe' to approach even when left in the open.

2. It illustrates how quickly an apparently 'safe' body can further off-gas into a body bag.

3. It illustrates the usefulness of a multi-agency team approach to the handling, recovery and safe examination of a chemical death. The incorporation of a pathology team at an early stage should be considered with a site visit necessary to consider the nature and size of the event, the recovery strategy and place of examination.

4. It illustrates the first use of the chemical body bags. These bags have been modified since this event following the experiences of those that used it.

5. It illustrates the first use of the CR1 suit with a dead body. From the experience that the unit has built up using the Respirex® Chemoprotex suit and the Remploy® CR1 with cadavers, during trials, exercises and real cases, they have adopted the CR1 suite as their PPE of choice for operational deployment. However, the unit is also equipped with the Respirex® Chemoprotex suit which could be used during incident response if required.

An unusual problem in a primary school: a case of idiopathic environmental illness?

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Introduction

Long-running reports of ill-health with associated odour complaints were first reported by teachers and later on by pupils at a primary school in the north of England. An extensive investigation, which ran periodically over several years, failed to confirm a causative environmental exposure, or to substantiate the reports of ill-health. At a relatively late stage, a diagnosis of 'idiopathic environmental illness' was made by an independent review. This article reviews the investigation and management of this difficult problem (which spanned more than five years) from a public health perspective.

Incident Scenario

The primary school, of around 200 pupils, was originally constructed in the 1970s in an area with a substantial industrial legacy, mainly of deep mining and coking. An 'odour' was first reported in one classroom at the school in 1996. The problem first came to the attention of local public health practitioners in 1999, following the closure of the school by the local authority.

The decision to close the school was made after a teacher collapsed for the second time whilst at the school, during a time when staff were making continued complaints of an odour and associated ill-health effects. The teacher who had collapsed was known to have serious health problems, which were believed by other members of staff to have been caused by the odour problem.

The primary school was re-housed temporarily at a different school. The school later returned to the original site, but was re-established in mobile classrooms sited on the playing field below the original school building. This seemed to resolve the problem. However, in 2002 further complaints of an odour and non-specific health symptoms were made by staff working in the mobile classrooms. A decision was taken by the local authority to close the site altogether and the school was moved to a wholly new location. The problem then recurred in the new school with staff members believing that there was contamination of books and other school materials transported from the older premises to the new school. Pupil's parents also complained that their children were suffering from ill-health.

The 'odour' was variously described as; 'metallic'/'copper', 'solvent'/'paint', 'sulphurous', 'toxic', a 'heaviness' and various other terms. There were several staff who felt it was a 'sensation' rather than a 'smell' and the use of the terms 'smell', and 'odour', became a point of controversy in itself. In addition, that there had been an odour in the school was supported by some of the officials investigating the site who had detected an odour themselves when visiting the original school building.

Apart from the collapse of the teacher at the original site of the school, reports of ill-health were only of non-specific symptoms. These included largely nasal and respiratory symptoms in the adults, and, at a relatively late stage, problems such as sore throats and nose bleeds in the children. High levels of anxiety and at times, frank distress amongst the school staff were apparent to those investigating the problem.

Media interest increased as the problem continued. The issue became a running story in the local newspapers, fostered by complaints of ill-health in pupils and by the involvement of an independent analyst brought in by a parent group. Local councillors also became involved, and the incident and its investigation was the subject of sometimes heated allegations made at public meetings and through the media.

Incident Response

The school was constructed partially on infill land, with the lie of the land sloping down the site. No heavy industry remained in the area, but there was a light industrial estate located uphill from the school. The school site is bounded on three sides by residential areas with a nursing home being present on the other boundary. There were no associated reports of ill-health from the surrounding community.

Extensive environmental testing was carried out. Some environmental sampling was repeated several times, especially for heavy metal analysis. The past history of the site was reviewed, borehole samples were taken and testing of indoor and outdoor air quality carried out.

The first series of investigations did reveal two anomalies. A lack of a proper moisture barrier in parts of original building was noted, which potentially could have led to the ingress of soil pollutants. Volatile organic compounds (VOCs) were also found in the drainage system under the school, though it wasn't clear that any VOCs had reached the classrooms. However, remediation was undertaken as a precautionary measure.

Neither of these findings appeared to be an explanation for the recurrence of the odour in the mobile classrooms on the playing field at the original school site. Moreover, the investigating professionals could see no feasible explanation for the recurrence of the problem at the wholly new site to which the school was relocated.

Apart from one teacher having collapsed twice, the evidence for health effects remained subjective despite various health investigations taking place both on the original school site and then on the new site when the problem recurred. During the first investigation, a comparison of pupil absence levels in the school was similar to a comparable school elsewhere. A staff health survey showed a majority of staff reporting an 'odour' and non-specific symptoms, but there was no more specific or objective evidence of ill-health.

The further multi-agency investigation undertaken in 2002 included the examination of pupils by a paediatrician who concluded that there was "no evidence of clear-cut illness". Toxicological screening of blood and urine samples taken from staff after the relocation of the school produced no significant findings.

Public Health Management

Local public health providers were involved in the multi-agency investigation of this incident in two main phases, though on both occasions a decision had been already been made to temporarily or permanently relocate the school before they became involved. National colleagues from the Chemical Incident Response Service (which is now the London unit of the Chemical Hazards and Poisons Division of the HPA), assisted during the investigation.

The public health professionals involved in the investigations believed there may well have been an odour at the original school site. However, once the school was relocated to mobile buildings on the original site and then moved again to a wholly new site, they were increasingly of the opinion that the problem was psycho-social in origin. That this view was taken by some of the public health professionals became apparent to school staff (even though it was not clearly articulated to them) leading to their increased annoyance. In retrospect, the emerging view that there was a strong psycho-social element to the problem was not put clearly to the school community. Instead, attempts were made to reassure them by undertaking further testing, the results of which were negative.

Following the two local multi-agency investigations, there was a final attempt to resolve the continuing claims of an 'odour' and 'ill-health' in the school by engaging independent consultants to review the investigations.

The independent consultants report concluded: "...it is clear that extensive investigations have been carried out...apart from the initial identification of VOCs...the concentrations of chemicals (found were) insignificant". They also concluded that specific psychosocial factors may have triggered the problem which was best described as 'Idiopathic Environmental Illness' (IEI). One definition of IEI is as follows: 'a subjective illness in certain persons who typically describe multiple symptoms, which they attribute to numerous and varied environmental chemical exposures, in the absence of objective diagnostic physical findings or laboratory test abnormalities that define an illness'.

IEI is a syndrome engendering over twenty names, including 'environmental illness', 'total allergy syndrome', '20th century disease' and 'multiple chemical sensitivity'. When the independent report suggesting IEI was made public, perhaps unsurprisingly the local newspaper ran the headline: "Sicknesses at school are 'all in the mind' ". Following the publication of this report, the problem appeared to have been resolved.

Lessons Identified

The conclusion that the reports of ill-health linked to odour were due to Idiopathic Environmental Illness suggests that psycho-physiological factors and health beliefs were the underlying causes. The multi-agency investigation had however used a medical/scientific model in responding to the problem. Given the need to exclude a specific environmental exposure following the collapse of a teacher, and to act with a degree of caution whilst an environmental investigation took place, this was understandable, certainly during the initial stages of response.

However, once no environmental causes were identified and the view was taken that psycho-social factors were important; the investigators had to adjust their approach to be more bio-psychosocial in nature. Many public health professionals will have little experience in dealing with the sort of incident described and if a similar problem was encountered, could hesitate to conclude that it was psycho-social in origin. If this conclusion is reached, communicating the findings with those complaining of ill-health (such as staff and parents at a school) will be a considerable challenge.

Acknowledgements

We are grateful to the many colleagues, from several agencies, who investigated, managed and otherwise supported this incident. In particular, this includes local public health practitioners, the staff involved from the local authority - especially from the education directorate and health and safety colleagues - and from the former Chemical Incident Response Service (now Chemical Hazards and Poisons Division, London).

Emergency Planning

Evaluation of the London Chemical Incident Early Alerting System: (1) an audit of chemical incident reporting in London, two years on

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Introduction

The chemical incident early alerting system for London was piloted for 9 months from July 2004 and became fully operational from March 2005. This is the first of 2 reports in this issue, describing an evaluation of the system, 2 years since it began. It describes an audit of chemical incident reporting by participating organisations.

Background

The Chemical Hazards and Poisons Division (CHaPD) of the Health Protection Agency (HPA) provides expert scientific advice during chemical incidents, and plays a key role in the notification of appropriate agencies, at the earliest possible stage. In this way, it can prevent or minimise the adverse health effects associated with acute or chronic exposures to hazardous chemicals.

A chemical incident is defined as: 'an acute event in which there is, or could be, exposure of the public to chemical substances which cause, or have the potential to cause, ill health'.[1] Prompt action from CHaPD in the event of a chemical incident relies on rapid notification. In 2004, a project was undertaken to review chemical incident reporting to CHaPD, in London.[2] The volume of chemical incidents attended by London Fire Brigade (LFB) and London Ambulance Service (LAS) were compared with reports to CHaPD for the same time period. This clearly demonstrated that incident reporting to the CHaPD was limited. The London Fire Brigade attended a mean of 72 chemical incidents per month with LAS attending a mean of 29. During the same year, CHaPD (London) were notified of an average of only 12 'actual' (as opposed to 'potential') chemical incidents per month. The need to consolidate and strengthen existing informal reporting arrangements was recognised and it was recommended that chemical incident reporting be formalised into a chemical incident early alerting system for London.[2,3]

The chemical incident early alerting system for London was established in consultation with many stakeholders:

- London Ambulance Service (LAS)
- London Fire Brigade (LFB)
- HPA Health Emergency Planning Advisors (HEPA)
- National Security Advice Centre (NSAC)
- Environment Agency (EA)
- Drinking Water Inspectorate (DWI)
- HPA London Regional Epidemiology
- Guy's and St Thomas' Poisons Unit (GTPU)
- Chemical Hazards and Poisons Division, HPA (CHaPD)
- Department of Health (DH)

The following aims and objectives of the early alerting system were identified at the outset:

1. To result in a more timely public health response;
2. To increase the capacity to act rapidly to minimize adverse health effects and to assist in saving life;
3. To increase the capacity to help to protect NHS resources;
4. To share early alerting data.

The early alerting system is communication system, which ensures the cascade of information from those called to the scene of a chemical incident, such as London Fire Brigade (LFB), and London Ambulance Service (LAS), to those who provide a 24 hour service to advise on the management of individual cases of poisoning and wider public health issues related to chemical hazards: CHaPD, GTPU, HEPAs and Primary Care Trusts (PCT)/ Health Protection Units (HPUs)/ Strategic Health Authorities (SHAs) (Figure 1).

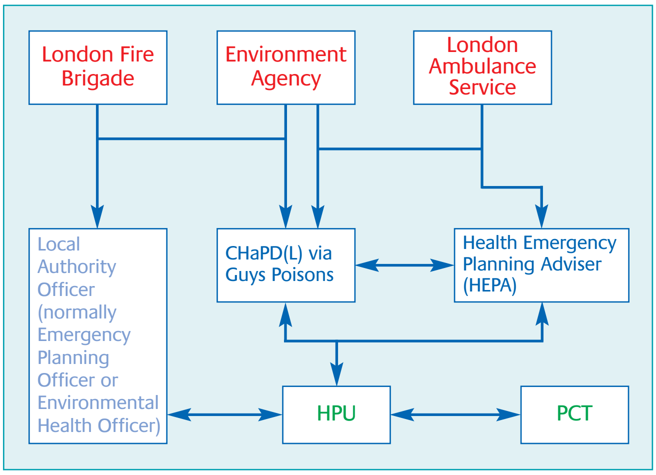

Figure 1: The chemical incident early alerting system for London

Most reporting to CHaPD (London) comes from LFB and LAS, with notifications triggered as per agreed criteria for chemical incidents (Box 1). Other calls to GTPU relating to chemical exposures are triaged prior to notification of CHaPD. Early alerting notifications are also received by email from the DWI and the EA. CHaPD also receives alerts from local authorities, HPUs and the Emergency Departments of acute hospital trusts.

Feedback on the effectiveness of alerting is provided to notifying organisations in the form of a weekly chemical incident summary (which is distributed by email). This gives an outline of chemical incidents notified to CHaPD, giving incident date, time, location, source of notification and incident characteristics.

Notifications via the early alerting system represent only a proportion of the work undertaken by CHaPD. CHaPD also advises on the health effects of chronic incidents that involve actual, or the potential for, exposure to hazardous chemicals in water, soil and air.

Box 1: Notification criteria for chemical incidents as agreed with LFB and LAS

LFB RMC staff are responsible for notifying CHaPD for incidents listed below:

1. Incidents of 6+ pumping appliances
2. Incidents involving hazardous materials
3. Incidents involving acetylene or unknown cylinders
4. Incidents involving radiation
5. Incidents involving bodies of water used for leisure activities (particularly swimming) where there has been contamination by Chemicals, Fuel, Sewage etc
6. Incidents involving bodies of water not used for leisure activities (ditches, streams etc) which involve substantial contamination
7. Spillages of large quantities of oil (over 250 litres)
8. Fly-tipping of hazardous materials
9. Flooding, when hazardous materials are involved (including sewage)
10. Incidents where there is the deployment of the high volume pump
11. Incidents where batch mobilising for flooding is implemented
12. White powder and other deliberate release incidents
13. Explosions
14. Unexplained air pollution incidents
15. Incidents involving large scale evacuation (50 persons or more)

LAS EOC management team are responsible for notification of the incidents listed below:

1. Incidents involving the deployment of Hazardous Area Response Team (HART)
2. Incidents involving hazardous materials
3. Chemical incidents in public places with one or more casualties
4. Incidents involving unknown cylinders
5. White powder and other deliberate release incidents
6. Explosions
7. Incidents involving radiation
8. Incidents involving water used for leisure activities (particularly swimming) where there has been contamination by chemicals, fuel, sewage etc
9. Incidents involving water not used for leisure activities (ditches, streams etc) which involve substantial contamination
10. Unexplained air pollution incidents
11. Incidents involving large scale evacuations or special arrangements to be made e.g. when a rest centre is set up.

Methods

Although the aims and objectives for the early alerting system (EAS) were understood by all stakeholders, they were not formally documented in detail. Initially, there were therefore no prior agree standards against which to evaluate the system, so the following audit questions were developed to guide data retrieval:

- Was the incident reported via the chemical incident early alerting system for London?
- Was the EAS used appropriately, as per written reporting criteria for LFB and LAS?
- Was reporting timely? (within 1-2 hours, same day, delayed?)
- What was the source of notification?
- What was the location of incident (South East, South West, North East/North Central, North West London)?
- What were the incident characteristics (fire, white powder, leak etc?)
- What action was taken by CHaPD?
- How complex was the response necessary (proxy measure of the time to incident resolution, < 1day, <1 week, over 1 week)?
- Was the final outcome recorded?
- Were any adverse outcomes identified?

Data for all chemical incidents in the month of November 2006 were identified from the weekly London chemical incident summary. Incidents to populate the summary were collated from the CHaPD online incident database; the daily incident log sent by GTPU; EA alerts; LAS alerts and LFB daily bulletins.

The completeness of reporting by LFB is routinely determined by cross checking notifications to CHaPD against the LFB daily bulletin which details all incidents attended by LFB each day. Reporting by the LAS is checked on a quarterly basis. The LAS Emergency Operations Centre database is interrogated against certain key determinants which identify chemical exposures. This generate a list of chemical incidents or chemical exposures attended by LAS, which is cross checked against notifications to CHaPD for the same time period.

Results

Incident capture

The review of chemical incident reporting for November 2006 demonstrated that 38 chemical incidents were reported to CHaPD (London) by a number of organisations (Figure 2). Eighty-two percent (31/38) were notified through the chemical incident early alerting system (EAS) via the emergency services or GTPU. Of the 31 incidents notified via the EAS, 23 were reported by LFB or LAS (74%). The other sources were GTPU (6 incidents), an on-call HEPA (1 incident) and EA (1 incident). Of the 7 incidents not reported via the EAS, 4 were reported in the LFB daily bulletin. The other 3 incidents were reported by a HPU, an Emergency Department (ED) and Thames Water.

Appropriateness and timeliness of reporting

The 31 incidents notified via the EAS, were all appropriate i.e. they all fulfilled the LAS or LFB criteria for triggering response. All reporting via this route was timely (on deployment of the relevant emergency service).

Of the 7 incidents not reported through this route, 3 perhaps should have been. These were identified from LFB daily bulletins and involved damaged gas cylinders (contents not reported). Incidents that they involve acetylene cylinders (and those of unknown content) should be reported to CHaPD (London) via the EAS.

The 4 other incidents that were reported to CHAPD outside the EAS came from an HPU, an Emergency Department, Thames Water (TW) and 1 report on the LFB daily bulletin. The incident reported by TW (a water odour complaint at a single property), was not logged on the CHaPD incident log. The call from the Emergency Department was related to 1 patient with a chemical burn. The HPU reported a petrol odour complaint in a work place. The latter 2 calls were timely and are examples of early alerting from sources other than the emergency services.

Completeness of reporting

The cross-check against LFB and LAS records demonstrated that in November 2006, the LFB had notified CHaPD of 86% of chemical incidents meeting notification criteria. LAS reported 100% of chemical incidents meeting notification criteria.

The majority (93% or 13/14) of the out-of-hours calls to CHaPD in November 2006 came through the EAS, although 1 call came from Thames Water which was related to a water odour incident.

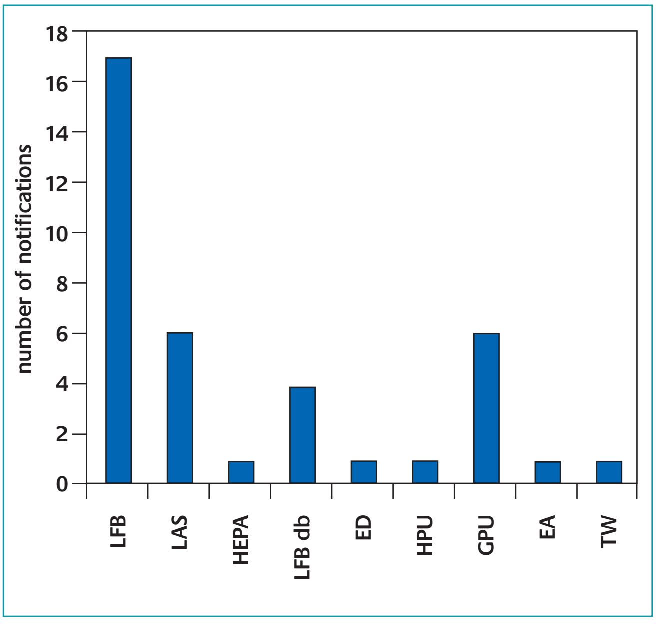

Figure 2: Source of chemical incident notifications to CHaPD, London, November 2006 (LFB db refers to LFB daily bulletin reports)

Type of Incident

A broad range of chemical incidents occurred in November as illustrated in Figure 3. Those reported through the EAS tended to be fires (55%) and chemical leaks or spills (23%). However, a significant number of other incident scenarios (such as odours and white powder incidents) were also recorded.

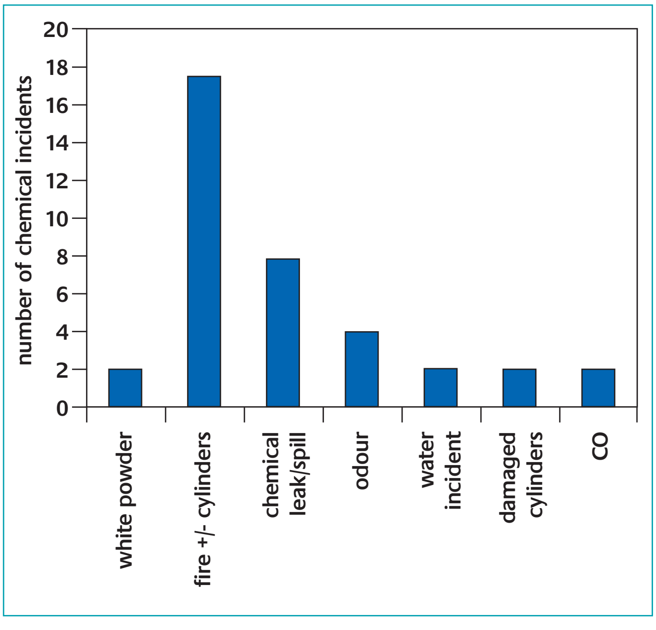

Figure 3: Chemical incident characteristics in London during November 2006

CHaPD actions following notification

Forty-two percent (16/38) of all chemical incidents required notification of other agencies or professionals (Figure 4). Chemical or toxicological advice was given for 24% of all incidents and fact sheets/guidelines were sent out for 11% of incidents. Some incidents required a number of such actions. Of the incidents logged, only 67% had a formal outcome recorded.

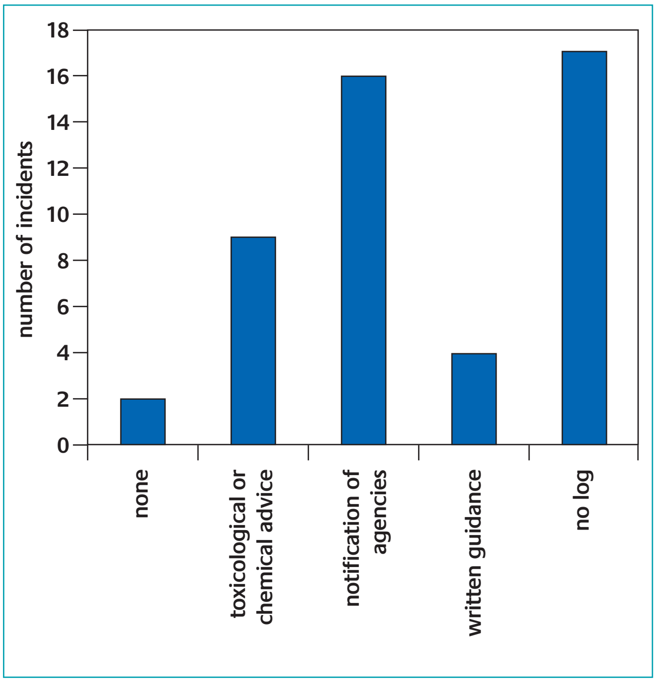

Figure 4: Action taken by CHaPD (London) during reported chemical incidents (n = 38)

The majority (74%) of all chemical incidents reported to CHaPD were resolved the same day they were reported. Three incidents were resolved within 1 week, only 1 required follow-up over 1 week.

There were 17 incidents (45%) reported to CHAPD that were not logged on the CHaPD incident database (but were logged on the London chemical incident summary). These were; 9 fires, 2 damaged gas cylinders, 1 chemical leak, 1 white powder incident, 2 odour complaints and 2 suspected carbon monoxide incidents (11 notifications from the LFB, 3 from GTPU, 2 from LAS and 1 from Thames Water).

Discussion

This study was undertaken to provide a snapshot of chemical incident reporting, 2 years after the commencement of early alerting in London. It was hoped that this would highlight any major problems with reporting which could then be investigated in the formal early alerting evaluation. The study had limitations: only 1 month's data was reviewed and the checking process to determine if all appropriate chemical incidents were reported by LFB and LAS was limited to cross-referencing against the LFB daily bulletin and the LAS quarterly audit of calls. A formal check of reporting of incidents by the GTPU was not performed. However, reliable 'double' reporting of LFB notifications, by GTPU to CHaPD (GTPU also receive LFB pages) indicates that this pathway is working efficiently. Reporting by GTPU has been the subject of previous audits.

Conclusions

Notification of chemical incidents (via the early alerting system for London) to CHaPD has dramatically improved (at least 86% of chemical incidents attended by LFB and 100% of those attended by LAS). However, there are few reports of people exposed reaching an acute hospital service, which suggests that potential exists for broadening reporting. All current reporting via the early alerting system is timely and appropriate.

A wide range of chemical incident types occur in London on a daily basis. CHaPD is able to notify other agencies and professionals of these incidents; to provide real time incident management advice and also to provide written factsheets, checklists and other forms of guidance to health care and emergency service personnel.
A significant proportion of calls to CHAPD (London) were not logged on the CHaPD incident database and a formal outcome was recorded for only 67% of logged incidents. In part, this is a consequence of alerting at the earliest stage of potential chemical incidents; many potential chemical incidents turn out to involve no chemicals at all or no public health risks are subsequently identified.

This audit demonstrated that the current early alerting database (which is used in conjunction with the national CHaPD incident log), might not be meeting all the requirements of the early alerting system. This is explored further in the next article in this issue: 'Evaluation of the London Chemical Incident Early Alerting System: (2) stakeholder interview study'.

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Evaluation of the London Chemical Incident Early Alerting System: (2) stakeholder interview study

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Introduction

This is the second of 2 reports detailing the evaluation of the chemical incident early alerting system for London. It describes the outcome of semi-structured interviews with key stakeholders in the early alerting group. These were designed to determine stakeholder views on the system, 2 years on from its inception, and to capture ideas for future development.

Background

A review of chemical incidents attended by the London Fire Brigade (LFB) and the London Ambulance Service (LAS) in 2003, showed that there was marked underreporting to the HPA[1] and it was recognised that for the HPA to act, and to act promptly, timely notification was of high importance. This would ensure that expert scientific and public health advice informed chemical incident management at the earliest possible stage of response.

A chemical incident early alerting system was established in consultation with many stakeholders. Details of the resulting communication system are given in detail in the previous article in this issue.

The development of the early alerting system was a complex process as each agency had different roles and responsibilities with regard to chemical incidents, and vastly different ways of working. Expectations and requirements from the system also differed. The alerting process therefore developed over some months, with organisations coming on board at different stages.

The pilot ran for nine months from July 2004, with early alerting becoming fully operational from March 2005. Modifications to the communication process have occurred since its inception. This evaluation was performed to determine stakeholder's views on the system as it evolved.

Method

The evaluation followed a descriptive, developmental design, using one-to one semi-structured interviews with 15 key stakeholders. Discussions were based around the following set of questions, but the interviewees were also encouraged to express individual and organisational concerns:

- Were you involved with the development of the EAS?
- What did you understand to be the aims and objectives of the EAS?
- What is the role of your organisation, with regards the EAS?
- Are you happy with the way the EAS is working?
- Are you happy with the availability and quality of chemical, toxicological and public health advice received from CHaPD?
- Are your colleagues and the operational staff within your organisation aware of the role of CHaPD?
- Are you happy with the feedback you receive regarding chemical incidents in London, in real time and in the form of the weekly report?
- What are your requirements with regards an early alerting database?
- Are you happy with the training you receive regarding early alerting and chemical incident response?

The interviews were performed 'face to face' (with the exception of one telephone interview). Written notes taken during interviews were transcribed into more detailed summaries after the completion of each interview. The data were analysed by a method recommended for qualitative information.[2] This involved the classification of emergent themes, with further analysis (going back to interview transcripts) to compare views and test generalisability.

Results

Four key themes emerged from the interviews:

1. Reporting and ongoing communication during and after chemical incidents
2. Content of feedback reports (i.e. reporting of outcomes)
3. Data management and surveillance
4. Training and service development.

1. Reporting and ongoing communication during and after chemical incidents

There is a general feeling that current information flows within the EAS are working well. The majority of incident notifications come from the LFB, LAS and GTPU. These agencies are satisfied that they each have a simple, efficient and robust system to ensure rapid alerting. Similarly, the EA and DWI have developed email based alerting systems which are time and labour efficient.

Three specific themes emerged from discussions on how to improve reporting:

a) The need to improve information sharing during acute incidents

Several stakeholders stated that they would welcome feedback from other agencies on chemical incidents. Similarly, GTPU would appreciate more detailed information from the scene that may be used to forewarn Emergency Department staff due to receive casualties, and to update advice on the clinical management of casualties.

The EA would like to improve its awareness of environmental incidents that are not directly reported to them. CHaPD could develop a system check if the EA are aware of an incident and to notify them if not. The DWI has concerns that CHaPD might not have a duty list for DWI personnel who can be contacted out-of-hours in the event of an incident.

b) Ways to refine the reporting process

The LAS might be able to switch to an automated alert system in the near future so that CHaPD/GTPU is automatically alerted when certain call determinants are logged through the Medical Priority Dispatch system.

c) Broadening capture of chemical incidents

It was recognised by several stakeholders that communications with the police are limited. It is understood that information exchange is often restricted due to ongoing forensic/criminal investigations. However, close links with the police could enhance chemical incident surveillance in London and could provide information of mutual value.

Several stakeholders recognised the need to improve incident reporting from other key stakeholders such as Emergency Departments and local authorities (incidents involving industrial facilities and Control of Major Accident Hazards sites for example).

2. Content of feedback reports

Most agencies agreed that more detailed information should be made available both in real-time during incidents, and in the longer-term for surveillance. The suggestion of a quarterly report (timed to correspond with the stakeholder meetings) was well received.

The National Security Advice Centre (NSAC) are interested in knowing more about the use of emergency resources: the number of units deployed to an incident (and therefore the remaining spare capacity, should this be needed elsewhere); the length of time units are at the scene and the length of time until they would be ready to receive another call. A similar investigation of the burden of chemical incidents on Emergency Departments would be of value, including service access issues (closure of departments due to potential contamination for example). Information on incident outcomes, time and duration would assist the emergency services in optimising use of their resources, including LAS 'HART' teams (Hazardous Area Response Teams).

HPUs would like more detail regarding the number of chemical incidents per London borough or PCT to inform local policy. This information would be accessible if a web-based database were available. The DWI is interested in public health outcomes as these often reflect broader issues.

3. Data management

Many stakeholders recognised the need for a way to allow for emerging threats and trends in incidents to be distinguished from the daily background surveillance 'noise'. There was general support for the development of a restricted access, web-based system with fixed searchable fields. Most stakeholders would like a managed database i.e. for incidents to be logged by one agency (CHaPD). However, many would like password-protected access to look up incidents in real time, for up-to-date information. The DH, NSAC, HEPAs and HPUs would like to search particular incident types, trends and locations. Other agencies, the DWI, EA and LAS are more interested in the reporting capabilities of the system (the efficient generation of more detailed weekly or quarterly reports).

HPUs in particular remarked that they would not be able to enter incidents themselves. All incidents are logged electronically within HPUs and double input would be inefficient. However, the ability to be able to look up the current status of an incident would be useful.

Ideas for ways to improve the current system were discussed. These included:

- To pilot a reporting system from Emergency Departments. This would involve a small number of Emergency Departments, with reporting of all chemical incidents, in a defined time period, by medical or nursing staff;
- Improving recognition of chemical exposures and incidents within Emergency Departments or via NHS Direct (this is currently being discussed by CHaPD and NHS Direct;
- Enhanced chemical data collection (monitoring sales of certain over the counter and prescription medicines for example);
- Monitoring TOXBASE use. Emergency Departments have direct access to this and are encouraged to use it as a first line.

4. Training and service development

Two main themes emerged regarding training. The first theme involved improving the understanding of and response to, emerging threats. The DH is working with agencies such as the Serious Organised Crime Agency (SOCA) to improve awareness of new risks or emerging threats that might confront first responders.

The second training theme related to ways of improving awareness of the early alerting system and the roles of CHaPD and GTPU/National Poisons Information Service (NPIS). It was suggested by LAS that training should be enhanced for control room staff (this would also apply to LFB), as it is these staff that deploy crews and should therefore be able to recognise the potential dangers of a reported incident, which may not be initially apparent.

Staff from several reporting organisations are very keen to learn from the outcomes of incidents. It was suggested that this would help them to understand the value of reporting to CHaPD and to recognise the public health issues associated with incidents, which might not at first sight fulfil the criteria for triggering a call to CHaPD.

Suggested methods for enhancing training included:

a) An early alerting and CHaPD awareness page on stakeholders intranet sites.
b) Teaching sessions within London (e.g. CHaPD 'How to respond to chemical incident' training days). The HART teams are due to attend these.
c) Both the DWI and EA would like to extend an invitation to CHaPD to participate in their staff training workshops.
d) An HPU representative suggested that medical staff should be trained in chemical incident management as early as medical school.

With regard to service development, HPUs would like more guidance from CHaPD whilst in the early stages of improving their competency to handle chemical incidents. This is a learning process for HPUs, who will rapidly gain confidence in handling these appropriately. Practical advice is required by HPUs which reflects an understanding of the difficulties encountered when dealing with multiple local agencies with competing priorities. HPU staff felt that guidance for the follow-up and investigation of specific types of chemical incidents, including expected outcomes, would be helpful.

Discussion

This study was a developmental evaluation, based on the concept that it would enable stakeholders to judge the value of their response to chemical incidents and to discuss ways of improving it.[3] This approach suited this service, which is still evolving. The task of coordinating over 6 reporting agencies into a single early alerting system took some time to achieve and modifications to the communication cascade were necessary when problems were encountered. It was inevitable that the current communication cascade would differ from that originally planned. For this reason, the descriptive design allowed an accurate description of the system currently in place. It also allowed the description of important features of the environment surrounding it, so that users could make an informed judgement of its value.[4] Such information may be of value for those who may wish to set up a similar early alerting system in other regions.

A semi- structured interview technique was used, with open ended questions defining the area to be explored.[5] It was hoped this would allow the exploration of individuals' views and theories for service development, whilst making sure certain topics were covered. It was felt important to qualify outcomes from the perspective of the priorities of individual stakeholders. This approach was possible as the early alerting stakeholder group has a small membership and interviews were restricted to members and HPU representatives (as the main recipients of onward early alerting communications).

There were opportunities for interviewer and interviewee bias. To minimise the former, interviews were conducted by an independent public health physician on secondment to CHaPD, who was not previously involved in the development of the early alerting system. It was made clear from the outset that interviews would form part of the evaluation, which could have introduced interviewee bias (those who wished to project the 'right image' from their agency). However, the early alerting system was originally developed following a transparent, interview-based consultation process and so organisational agendas were already apparent.

Conclusion

This evaluation demonstrates that an effective early alerting system has been created, which has captured the commitment and enthusiasm of the major agencies across London tasked with handling chemical incidents. These agencies are engaged in the process of broadening its ability to capture chemical exposures in London.

The conclusions of the evaluation form the basis of the recommendations agreed by the Early Alerting Stakeholder group, as detailed in Box 1.

Box 1: Recommendations for the London Early Alerting System

1. The London chemical incident early alerting system should be recognised as a core function for CHaPD, London.
2. Aims and objectives for the system should be updated, against which the system can be better evaluated in future.
3. Terms of reference for the early alerting stakeholder group should be updated.
4. Incident capture should be improved by broadening membership of the early alerting stakeholder group.
5. Suggested projects for CHaPD to pursue, to improve reporting include:
    - Pilot Emergency Department reporting
    - NHS Direct chemical incident recognition project
    - Continue work with local authorities to improve reporting
6. Communication systems should progress to allow for the dissemination of information updates from all sources, as incidents progress;
7. More detailed feedback is recommended regarding incident outcomes in real-time and for long term surveillance;
8. A fit-for-purpose, managed, secure, early alerting system database should be developed to fulfil criteria set out by participating organisations.
9. The delivery of chemical incident training in London should be reviewed, in line with emerging threats and the need to reach key operational staff

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Overview and Progress Report: HPA Compendium of Chemical Hazards (C2H).

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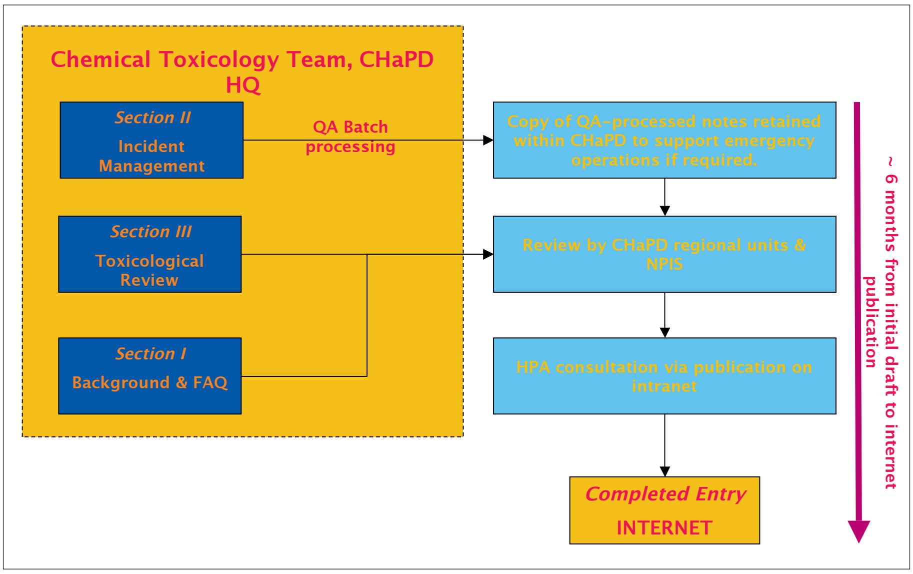

Figure 1: Outline of standard operating procedure for production of individual Compendium entries.

Introduction

One of the roles of the Chemical Toxicology Team at Chilton is to provide a central source of toxicological advice to the Health Protection Agency and other organisations with responsibility for responding to chemical incidents. As outlined in a previous report[1], we recently embarked on a process to harmonise pre-existing documentation pertaining to the incident management and health effects of certain chemicals. The initial output of this work programme is now available on the internet as the 'HPA Compendium of Chemical Hazards'.[2]

Document Structure and Rationale

The Compendium of Chemical hazards (C2H) has been designed to meet the needs of a broad readership. For this reason, each Compendium entry is divided into three sections:

1. The 'General Information' section provides an empirical overview of the routes of exposure, production, applications and health effects of a specific substance or group of chemicals, as well as 'frequently asked questions'. In order to make the information as accessible as possible, the document conforms to plain English guidelines[3] and avoids technical terms and jargon wherever possible.

2. The 'Incident Management' section has been specifically designed to rapidly facilitate the provision of information pertinent to an emergency response. For example, a front page summary details critical effects relating to fire, health effects and the environment and so addresses the very first, basic questions likely to be raised at an incident such as 'will it go bang?' and 'is it likely to cause harm?'. Subsequent sections address substance identity, physicochemical properties, toxicity guidelines and clinical advice for first responders.

3. The 'Toxicological Overview' presents more detailed information on acute and chronic adverse health effects and is primarily intended for interpretation by suitably qualified personnel to support potentially complex decisions involved with incident management. For example, cordon radius, closure of public amenities, evacuation or shelter, health and safety of staff at scene, etc.

The chemicals prioritised for inclusion in the Compendium were originally identified from an internal audit of incidents and enquiries reported in England and Wales in 2002/03 and are reviewed on a regular basis in order to provide a comprehensive source of information for chemical incident response or media enquiries. Each Compendium entry pertains to either one specific chemical, a particular mixture of chemicals (e.g. petrol, diesel) or a whole class of substances (e.g. phthalates, dioxins). Whilst the documents are primarily written for use within the UK, Compendium entries have also been utilised by international organisations in support of humanitarian operations.[4]

Document Preparation

Clearly, it is critical that the information conveyed within each Compendium entry is both accurate and up to date. Therefore, document preparation is subject to a standard operating procedure (SOP; outlined in Figure 1), internal quality audit (QA) process and constant review of published articles. Each incident management section is subject to a QA procedure whereby all safety-critical elements (e.g. guideline toxicity values, Emergency Action Codes, Emergency Response Planning Guideline, etc.) are double-checked to ensure accuracy. An internal review of the incident management and toxicological review sections is then conducted by regional units of the Chemical Hazards and Poisons Division (CHaPD) of the Health Protection Agency and all clinical information is subject to review by the National Poisons Information Service (NPIS) via members of the TOXBASE[5] editorial board. Following appropriate revision, the full compendium entry is subsequently posted on the internal HPA website and comments are invited from all HPA employees after which any further amendments are made prior to publication on the HPA internet website.

Published Entries

The Compendium currently addresses nineteen priority materials and this will be supplemented with a further eighteen entries by March 2008 (Table 1).

Table 1: Progress summary for delivery of the HPA Compendium of Chemical Hazards (C2H). Full Compendium entries for chemicals 1 – 19 are now available on the HPA website.[2]

Number	Compound / Class	Publication date
1	Cadmium	June 2006
2	Arsenic	
3	Sulphuric acid	
4	Kerosene	
5	Chlorine	
6	Carbon monoxide	October 2006
7	Lead	
8	Ammonia	
9	Hydrogen cyanide	
10	Diesel	
11	Mercury	January 2007
12	Phenol	
13	Methanol	
14	Ethylene glycol	
15	Petrol	
16	Sodium hypochlorite	March 2007
17	Hydrochloric acid	
18	Phosgene	
19	Benzene	
20	Asbestos	July 2007
21	Phosphine	
22	Toluene	
23	Nitric acid	
24	Chromium	
25	Acrylonitrile	
26	Polycyclic Aromatic Hydrocarbons	
27	Arsine & Stibine	November 2007
28	Naphthalene	
29	Chloroform	
30	Phthalates	
31	Styrene	
32	Dioxins	
33	Nitrobenzene	March 2008
34	Tetrachloroethylene	
35	Trichloroethylene	
36	Vinylchloride monomer	
37	Formaldehyde	
38	Brominated fire retardants	

Subsections of Compendium entries may be viewed on the HPA website[2] (Figure 2). Alternatively, each entry can be downloaded from the website either as a full document or as individual sections for viewing or printing using 'Adobe Reader™'.

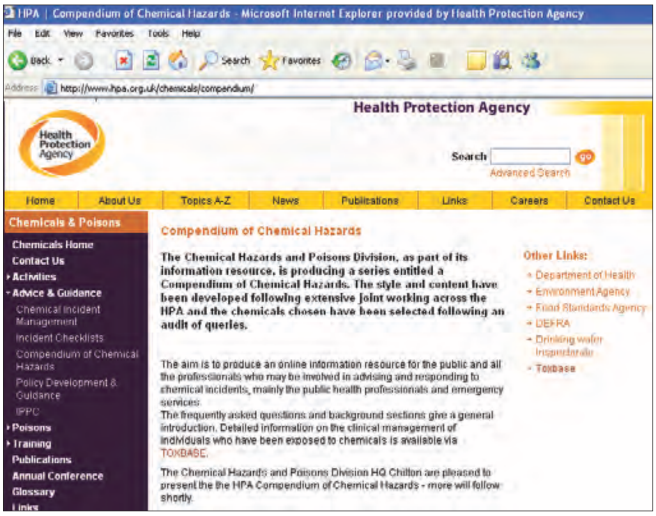

Figure 2: View of Chemical Compendium home page.

Acknowledgements

The authors wish to thank all those at CHaPD Birmingham, Cardiff, London and Newcastle and members of the NPIS who have made invaluable technical contributions to the Compendium of Chemical Hazards and also to regional members of LARS who provided a diverse range of comments which have improved the practical utility of the documents.

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3. **Plain English Campaign: http://www.plainenglish.co.uk/guides.htm**
4. **World Health Organisation International Programme on Chemical Safety, Chemical Incidents and Emergencies, Lebanon Crisis: www.who.int/ipcs/emergencies/lebanoncrisis/en/index.html**
5. **National Poisons Information Service, TOXBASE: http://www.spib.axl.co.uk/**

Exercise Young Neptune: Mass Decontamination of Children Field Exercise, 2nd of December 2006

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Introduction

Exercise Young Neptune was the first UK field exercise on the mass decontamination of a large group of unaccompanied children. It was undertaken as the result of discussions of the Department of Health working group on the management of children in major incidents, particularly those exposed to chemicals. It was agreed that children needed to be more involved in major incident practices and that they should be routinely involved, where appropriate, in national and local exercises. A number of field exercises had been carried out testing mass decontamination procedures both in and out of hospital, but few had involved significant numbers of children and none had been undertaken in the UK using only children as the volunteers. It is known that a paediatric exercise was carried out at Boston Children's Hospital in the USA, inside the hospital itself, and another in Perth, Australia, conducted outside in warm temperatures and favourable weather conditions using older children as participants.

It was therefore felt necessary to conduct an exercise involving:

1) The UK Fire & Rescue New Dimension Programme and UK NHS Ambulance decontamination equipment
2) A large number of children in a wide age range, including younger children.
3) Potentially having to deal with cold weather
4) Receiving feedback from the participating children from both practical and psychological perspectives

The exercise included many participating organizations (Box 1) and was led by the Health Protection Agency's (HPA) Centre for Emergency Preparedness and Response (CEPR).

This summary outlines the objectives of the exercise and the resulting lessons and issues identified for future action.

Box 1: Exercise Young Neptune: Participating Organisations

Health Protection Agency
Dorset Fire & Rescue Service
Devon Fire & Rescue Service
Great Western Ambulance Service
Hampshire Police – Operations Support
New Dimension Training & Procedures, Fire Service College, Glos.
Welsh Ambulance Services
Wiltshire Fire & Rescue Service

Aim and objectives of the exercise

The aim of the exercise was to examine the mass decontamination process in relation to children and to subsequently inform NHS major incident management and guidance.

The following objectives were established by the exercise planning team:

- To evaluate the efficacy of the mass decontamination process with regards to children
- To identify any specific needs for children
- To examine behavioural & psychological responses of children undergoing the decontamination process, within the limitations of the exercise.

Exercise scenario

A notional scenario was developed purely for exercise planning purposes only. This notional scenario was the accidental release of a contaminant as a result of a road traffic collision requiring the decontamination of a large number of children in the vicinity.

Exercise design and development

1 Advance preparation

Sixty-five children, aged 6 -14 years, were recruited locally from St John Ambulance Cadets and local Scouting and Guiding groups, together with children of HPA and Defence Science and Technology Laboratory employees. Comparable numbers of children of both sexes were included in a number of age groups as far as possible. Informed consent from all participants and parents was obtained by using age-appropriate explanation leaflets. Emphasis was made from the start that the Emergency Services required the help of the children in assessing the suitability of the mass decontamination process for children. Additional consent was obtained for photographs/film to be taken. Parents were required to fill in a medical questionnaire about their child, and children were only excluded after further evaluation and consideration by a consultant paediatrician on an individual basis and according to the resources able to be put in place for this particular exercise.

2 Child protection

It was agreed that child protection and modesty issues needed to be addressed scrupulously. For this reason, a designated senior nurse for child protection for the Wiltshire area was a member of the main planning group. All staff working directly with the children underwent Criminal Records Bureau (CRB) checks. A briefing on child protection was given to participating staff by the designated nurse either on the day of the exercise or the week preceding the exercise.

Children were requested to attend already wearing swim wear under their clothing. All showering and re-robing /dressing areas were segregated. Photography and filming was strictly limited to that necessary for teaching and learning from the exercise and was carried out by officers from the New Dimension training procedure team at the Fire Service College. The exercise took place at the Police National CBRN Training Centre which affords a high level of security and privacy and to which the public do not have access without permission.

3. Health and Safety

A specialist Health and Safety advisor, responsible to the Project Manager, was appointed for the exercise. The advisor, together with members of HPA health and safety staff, was involved in all aspects of the planning and execution of the exercise, and all were on site on the day of the exercise.

A wide range of emergency paediatric / pre-hospital expertise was present on the day as exercise staff and had agreed to offer any emergency treatment required if needed. Radio headsets were used for communication between directing staff and evaluators in order that observation positions could be maintained throughout the exercise.

A consultant child psychologist reviewed the volunteer documentation prior to the exercise and was on hand during the exercise. Each volunteer group had adult chaperones in a ratio of two adults to five children, with ambulance 'casualties' having an adult supervisor at all times throughout the decontamination process. Written guidance was given to all staff involved on site on symptoms of hypothermia and what actions to take if there were concerns about a child. A paramedic front line ambulance was available on site for volunteers and exercise staff. Paramedics and all other medical professionals present were provided with the latest Joint Royal Colleges Ambulance Liaison Committee (JRCALC) guidelines on the management of hypothermia. An extended heated re-robing area was provided in case children were slow at re-robing.

The forecasted weather conditions for the exercise were monitored in the days preceding, and plans were in place to cancel the exercise if necessary in the case of severe inclement weather. In the event, weather conditions were mild and bright on the day, with a recorded air temperature of 11.2°C.

Photograph 1: Police instructing on disrobe procedure

Exercise method

Sixty children were briefed for disrobing in two groups of 10 at a time; a total of twenty in each briefing. The first and third groups of twenty were briefed by the Police and the second group by Fire & Rescue, in order for each emergency service to have the opportunity to practice the disrobe process. The decontamination process used the Fire and Rescue Service New Dimension equipment[1]. Disrobing to swim wear took place in a large building heated with portable heaters. Once disrobing had taken place, the children were escorted to the shower area and suited firefighters instructed them on final disrobing. The children disrobed and were showered in the usual way. Re-robing was supervised by two ambulance paramedics. The children were then transported to a heated building to change back into their clothes. Following changing, the children had lunch, completed questionnaires and spent approximately 30 minutes in small focus groups. Five children of assorted ages were selected as 'non ambulant' patients to be decontaminated by the ambulance service.

Photograph 2: Volunteers waiting to enter the decontamination unit

Exercise Evaluation

An exercise evaluation was accomplished using a variety of methods including:

- Reports from designated evaluators representing the HPA in the disrobing, shower and re-robing areas
- Reports from Ambulance, Fire and Rescue and Police evaluators monitoring and evaluating their respective services
- Feedback from personnel working in the exercise
- Feedback from the volunteer participants

Additionally, the chaperones of volunteer groups provided feedback by way of evaluation sheets commenting on the disrobe and re-robe aspects of the process, and observers to the exercise were also invited to contribute comments. Key outcomes are outlined in the 'Recommendations' section. It should be noted that this practical exercise took place in a controlled environment and therefore care has been taken in interpreting the feedback and extrapolating the lessons identified for a real life situation.

Volunteer Feedback

The children's participation in a mass decontamination exercise was assessed using two self-completion questionnaires and focus group discussions. The majority of children reported that they had enjoyed the experience and had found it interesting. This was evident from both the questionnaires and focus group discussion sessions.

- Results from an adapted version of the Positive and Negative Affect Scale for Children[2] (PANAS-C) questionnaires showed that the children gave strong endorsement to positive words describing their emotional responses to the exercise, and little endorsement to negative words. It was noted that the older age group scored proportionally lower on the positive scales compared to the younger age group. Further investigation would be needed to establish whether this was as a result of their experiences of the exercise, or whether it could be attributed to older children being better able to distinguish between degrees of emotions on a 5 point scale, and therefore generally less likely to endorse the highest response points.
- The children's responses on an adopted version of Reactions to Research Participation Question for Children[3] (RRPQ-C) indicated that they supported a positive rather than a negative appraisal of the exercise, and the majority endorsed statements associated with informed consent and their right to withdraw. However, some children responded negatively to at least one of the questions on the RRPQ-C. Importantly, these children did not report more negative experiences of the exercise when compared to the main group on the PANAS-C. The RRPQ-C covers four main content areas, including the children's understanding of informed consent and their rights as a participant, such as the right to withdraw. The majority of children positively endorsed these items and this may reflect the contingencies that were in place both before and during the exercise enabling children to drop out if they wanted to, and the presence of specialist staff who were on hand to support children who needed assistance. Issues of consent and participant rights are crucial to the success of exercises of this kind, and planners must consider these issues carefully in the preparation and execution of future exercises.

Photograph 3: Decontamination of non-ambulant volunteers by Ambulance Service

- The children gave full and frank responses to the questions in the focus groups. Important issues were identified, such as their experience of the exercise instructions, the decontamination procedures and their perceptions of the exercise personnel in their PPE equipment. The children reported that they hadn't been able to hear the personnel who were communicating the washing instructions to them before they entered the showers. As a consequence they felt they had not done a very good job of washing themselves, as they were not sure what they should have been doing. A further issue that was identified was their preference for personnel with suits that allowed them to see their full face, as this made communication much easier.

In conclusion, the feedback sessions demonstrate that the children coped well with participation in an emergency decontamination exercise. They showed that they were fully engaged in the exercise, and were able to give unique insights into their experiences of the decontamination process. The children's positive appraisal of their experiences and their useful observations of the emergency services procedures show that children need not be excluded from emergency preparedness exercises of this kind, and this exercise sets a precedent for addressing the needs of young children and vulnerable groups in emergency planning.

Recommendations

Over 17 issues were identified with the following five being of particular note:

- The New Dimension Programme to consider options for further enhanced non-verbal communication for children in order to gain the quickest and most efficient response, e.g. large boards displaying pictorial instructions, step-by-step actions demonstrated by instructors at all times.
- The New Dimension Programme to consider formalising plans to encourage a 'buddy' system, pairing younger children with an older child or an adult throughout the decontamination process.
- The Police to review the effectiveness of communication in disrobe area in their current PPE and to consider different ways of enhancing communication.
- The New Dimension Programme to consider a full user evaluation of the disrobe packs with regards to the needs of children when replacing existing stock, with modifications to be made where appropriate and necessary.
- The Emergency Services to review the need for data collection at disrobe stage of the decontamination process and consider placing at the re-robe stage.

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Identification of the 'Body Process Pathway' and its role in incident management

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Introduction

Chemical, biological or radioactive (CBR) agents may be released to the environment either accidentally or deliberately. Depending upon the degree of exposure and the availability of prompt medical intervention, such a release could result in contaminated fatalities that may pose a serious risk to both those handling them and emergency responders. Historically, there are few reports in the scientific literature of major incidents that have resulted in CBR-contaminated fatalities. However, smaller-scale industrial incidents have highlighted the importance of careful incident management procedures which aim to avoid the spread of contamination from casualties or fatalities to responders.[1,2,3] Consequently, the need for research into the potential secondary exposures and resultant risks posed to responders in the aftermath of a CBR incident has been identified.

The HPA has extensive experience of advising on the management CBR incidents and has been commissioned to develop an evidence base to inform guidance on the safe handling and disposal of contaminated fatalities. This is the first research project that involved collaboration between the Chemical Hazards and Poisons Division, the Radiation Protection Division, and the Centre for Infections within the HPA.

'Body process pathways' have been developed for both 'normal' and 'contaminated' fatalities from the scene of exposure/death to final disposal. These body process pathways can then be used to identify the nature and potential for secondary contamination of responders to occur.

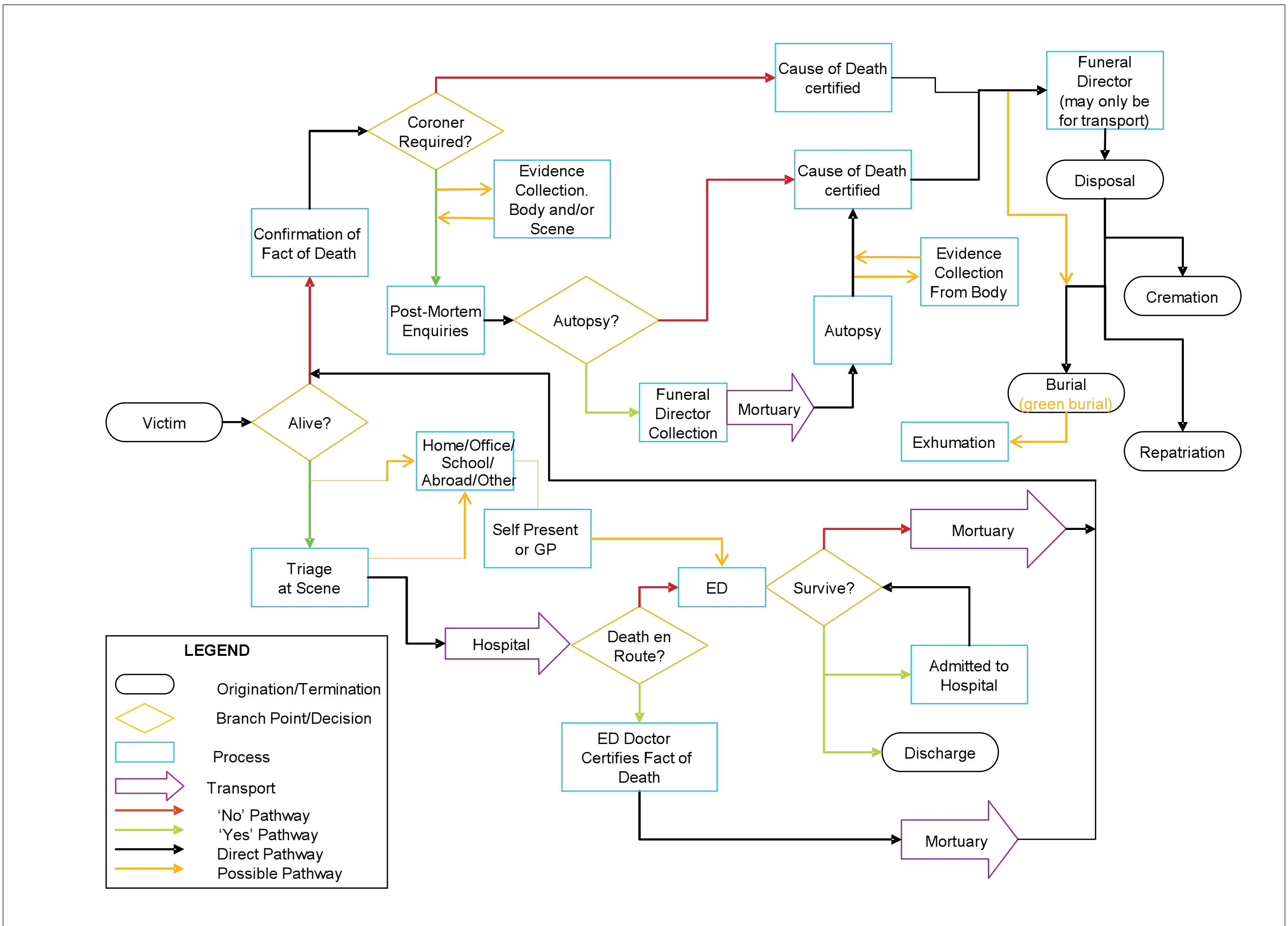

Figure 1: The 'Uncontaminated' Body Process Pathway

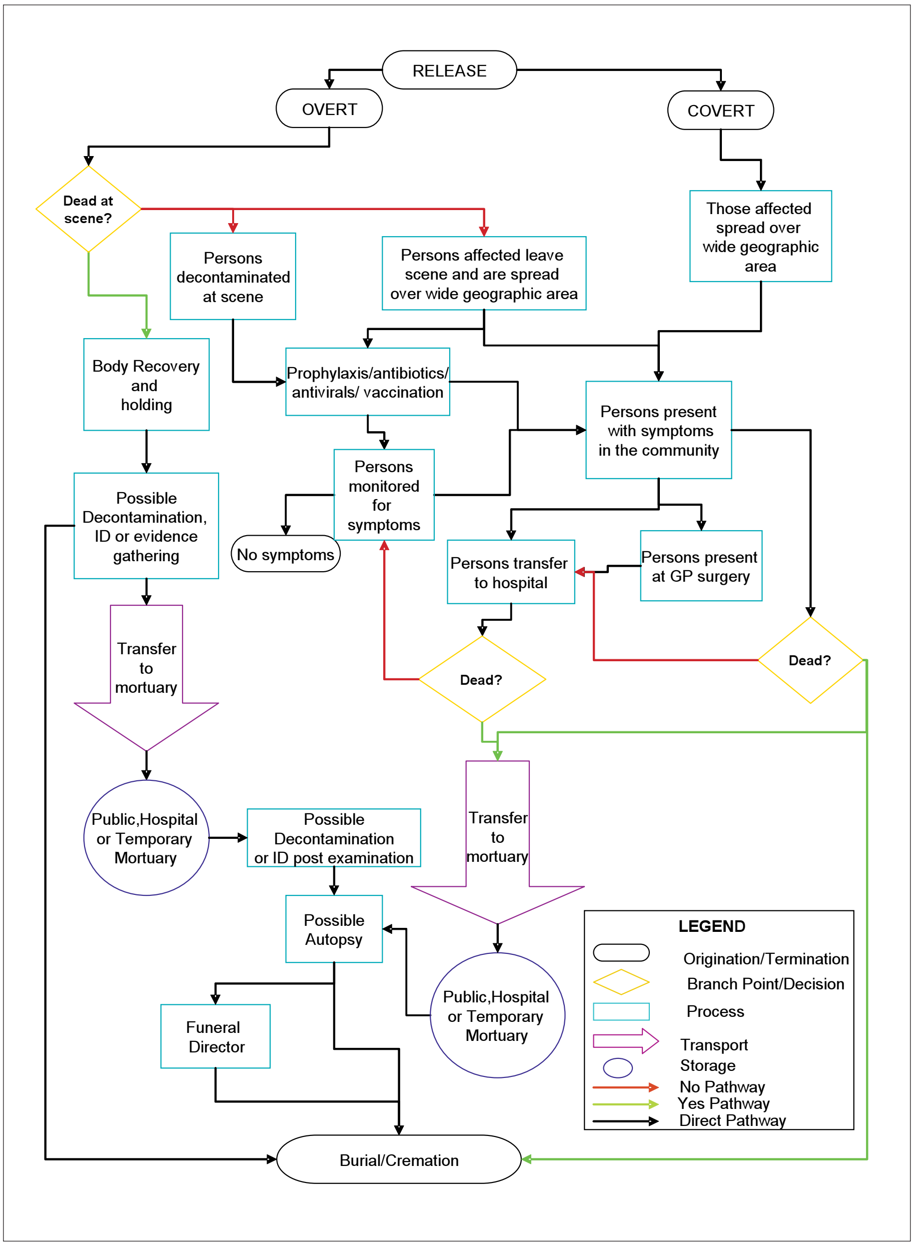

Figure 2: The 'Contaminated' Body Process Pathway

Methods

Two body process pathways were identified by consultation with first responders, coroners, pathologists, funeral directors, and other relevant stakeholders. The first body process pathway identified was termed 'normal', or 'typical' and is currently in place for the everyday management of single uncontaminated bodies. This 'normal' pathway was then used as a template to formalise a 'contaminated' body process pathway that describes the management of a body following an overt or covert release of a CBR agent. The body process pathways were developed in flow-chart format which include processes, decision points, transport procedures, and an indication of the feasibility of certain pathways.

Results and Discussion

The two body process pathways identified are given in Figures 1 and 2. The development of the body process pathways indicated that in the event of a release of a CBR agent, the management of a contaminated body would need to be significantly different to that of one which is uncontaminated. In addition, while developing the CBR (i.e. 'contaminated') body pathway, it was necessary to look at overt and covert incidents separately, as the processes and personnel involved could differ markedly between the two types of incident. An overt incident is described as an incident in which it would be immediately apparent that a C, B or R agent was involved. Conversely, a covert incident is one in which the deliberate use of CBR agents would not be immediately obvious: there would be no incident 'scene' and exposed people may die in the community or in hospital.

The body process pathways allow the identification of those responders who are potentially at risk from secondary contamination (Table 1). This provides a framework for further research into assessing the associated risks and informs future guidance on incident response.

Table 1: Activities and personnel that could come into contact with a contaminated fatality

Activity/Location	Personnel involved at this stage
Risk Assessment phase	Police personnel Fire and Rescue service personnel Scientists
Body Recovery	Chemical-Biological-Radiological incident trained Police Body Recovery Officers Fire and Rescue Service Engineers and Utility service personnel
Decontamination	Personnel to be confirmed
Victim identification and forensic assessment	Forensic pathologists Anatomical Pathology Technologists (APTs) Police Disaster Victim Identification (DVI) personnel Police (anti-terrorist branch) Other specialist personnel
Transport (away from scene) Autopsy	Police Commercial provider Forensic pathologists Anatomical Pathology Technologists (APTs) Police Disaster Victim Identification (DVI) personnel Mortuary personnel
Transport from mortuary to funeral director	Police Funeral directors Commercial provider
At the funeral directors	Funeral director and their employees Embalmers
Transport to burial/ cremation	Police Funeral directors Commercial provider
Death in hospital/ medical centre	Medical staff Non-medical staff Current patients Relatives and Friends Members of the public Police
Death en route to hospital	Paramedics Emergency Department (ED) personnel Relatives & Friends
Death in the community	HM Coroner (and staff) General Practitioner (GP) Paramedics Funeral Director Relatives and Friends Members of the public Police
Transport to mortuary	Police Funeral directors
Autopsy and mortuary	Forensic pathologist Anatomical Pathology Technologists (APTs) Police Mortuary staff
Transport to funeral director At the funeral directors	Funeral director Funeral director and their employees Embalmers Relatives and Friends
Burial or Cremation	Funeral directors Pall bearers Grave diggers Religious representatives Family members Crematorium staff

Conclusion

The contaminated body process pathway has identified the potential management 'routes' a fatality may follow after a CBR incident, from recovery, through storage, transportation, to final disposal. In addition, the range of health professionals and other persons involved in managing fatalities (who are thus also potentially at risk from secondary exposure) has been clarified. This information will be invaluable to those involved in emergency planning and/or the management of incidents involving CBR-contaminated fatalities.

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Providing Public Health Advice during a Crisis.

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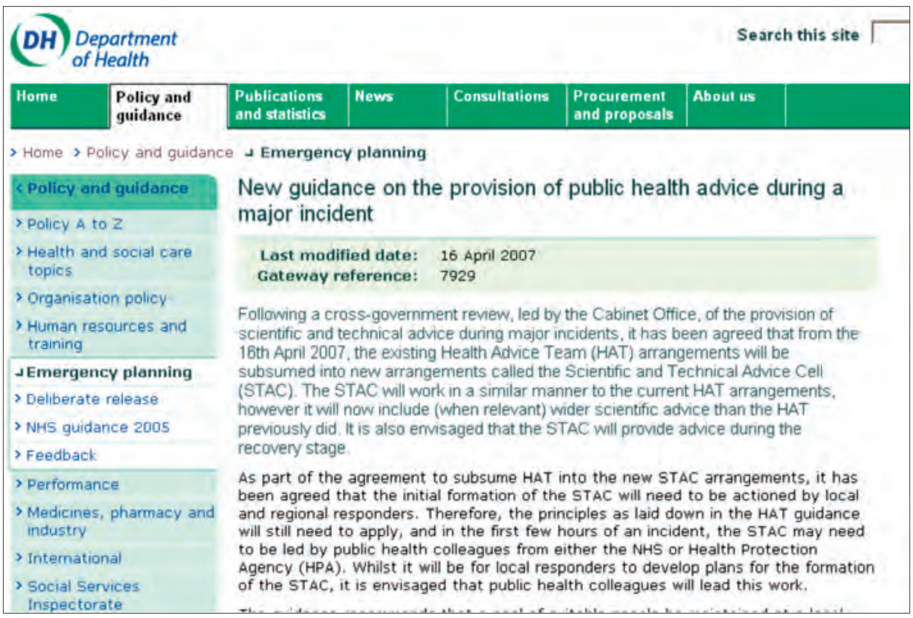
Identifying issues that might affect the health of the population is always a challenge, but consider having to provide this advice during a crisis when there is limited information available and very little time to consider it.

During the past decade, there has been recognition that the need for public health advice during a major incident is a fundamental part of the response to any disaster, but with this recognition has come the difficult process of ensuring advice is timely, accurate and relevant. As no two incidents are the same, there is often the need to consider numerous competing technical issues through rapid analysis and assessment usually from a group of subject matter experts. Achieving consensus in this type of environment is challenging and requires a unique skill set for the chair of this specialist group, not only been accepted by their technical peers, but also commanding the respect (under pressure) of the Gold (Strategic Co-ordinating Group) commander.

Following the explosion at the Buncefield oil terminal in the East of England in December 2005 and similar complex incidents across the UK, it became apparent that a more coordinated approach to providing scientific and technical advice to the Strategic Coordinating Group would be needed. A group led by the Cabinet Office, including membership from the Health Protection Agency and the Department of Health Emergency Preparedness Division, considered how various agencies provided scientific and technical advice during major incidents. From this multi-agency group it was identified that where there is likely to be a requirement for coordinated scientific or technical advice within the multi-agency Strategic Coordination Group. This would best be provided through the establishment of a Scientific and Technical Advice Cell (STAC). Designed to work in a similar manner to the current Health Advice Team (HAT) arrangements (formerly known for years as a Joint Health Advisory Cell or JHAC), the STAC will now include, when relevant, wider scientific advice than the HAT previously did. The driving principle behind this was the need for all technical specialists to share the information each subject matter expert had on the type of incident. This pooling of knowledge would reduce the duplication, and therefore the potential for contradiction, of advice supplied to the gold commander around the 'gold table' which often occurred due to the silo working of some of the previous advice models. A repeated theme raised by gold commanders in most debriefs.

Another major advancement in the new STAC arrangements was the acceptance that scientific advice, including public health advice, should be considered during the recovery stage. This is particularly relevant to the work completed by the Health Protection Agency, and especially the Chemical Hazards and Poisons Division, which need to look more long-term than just the immediate incident response. This work is vital to ensure the longer- term recovery for the health protection of the local population. Although the guidance has been released for consultation, this should be seen as only the first stage in a long journey, which will start and consolidate the difficult process of providing scientific and technical advice during an incident, which will enhance the response and continue to build on improving the public's confidence in those managing complex incidents.

All comments on the consultation document http://www.dh.gov.uk/en/Policyandguidance/Emergencyplanning/DH_073846 should be returned to the author by the end of June 2007 (phil.storr@dh.gsi.gov.uk)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New guidance on the provision of public health advice during a major incident

Last modified date: 16 April 2007
Gateway reference: 7929

Following a cross-government review, led by the Cabinet Office, of the provision of scientific and technical advice during major incidents, it has been agreed that from the 16th April 2007, the existing Health Advice Team (HAT) arrangements will be subsumed into new arrangements called the Scientific and Technical Advice Cell (STAC). The STAC will work in a similar manner to the current HAT arrangements, however it will now include (when relevant) wider scientific advice than the HAT previously did. It is also envisaged that the STAC will provide advice during the recovery stage.

As part of the agreement to subsume HAT into the new STAC arrangements, it has been agreed that the initial formation of the STAC will need to be actioned by local and regional responders. Therefore, the principles as laid down in the HAT guidance will still need to apply, and in the first few hours of an incident, the STAC may need to be led by public health colleagues from either the NHS or Health Protection Agency (HPA). Whilst it will be for local responders to develop plans for the formation of the STAC, it is envisaged that public health colleagues will lead this work.

Environmental

Particles as Air Pollutants 2: Particulate matter concentrations in the United Kingdom

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Introduction

This is the second of a short series of papers setting out what is known, or what should be known by those commenting on the effects of airborne particles on health. The first paper summarised some of the principles of aerosol science as applied to particulate air pollution including some description of the methods used to measure particles concentrations in ambient air (Maynard and Myers, 2006). This second paper aims to provide information on particulate matter (PM) concentrations in the UK. Some information is provided on the chemical constituents of airborne PM and the sources of these different components. It also covers how PM concentrations vary from place to place and how they have changed over time. It concludes with some comparisons of both recent measurements and predicted concentrations for the future with limit values set out in the EU Ambient Air Quality Directives. This review draws heavily, but not exclusively, on an extensive review of particulate matter published by the UK Air Quality Expert Group in 2005 (AQEG, 2005).

What are PM_{10} and $PM_{2.5}$?

We start with a recap of some definitions. PM_{10} is

- Airborne particulate matter passing a sampling inlet with a 50% efficiency cut-off at 10 µm aerodynamic diameter and which transmits particles of below this size

and $PM_{2.5}$ is

- Airborne particulate matter passing a sampling inlet with a 50% efficiency cut-off at 2.5 µm aerodynamic diameter and which transmits particles of below this size.

These are rather technical descriptions. A simpler, but less precise description of $PM_{2.5}$ would be airborne particles smaller than 2.5 µm and of PM_{10} would be airborne particles smaller than 10 µm. It is important to remember from the definitions that PM_{10} includes PM2.5 (sometimes known as the fine fraction) along with particles between 2.5 and 10 µm ($PM_{2.5\text{-}10}$, sometimes known as the coarse fraction).

It is worth noting that there are many more measurements of PM_{10} than of $PM_{2.5}$ in the UK. AQEG (2005) noted that there were 240 sites measuring PM10 in 2003 but only 15 sites measuring $PM_{2.5}$. Proposals for a revised EU Air Quality Directive (Commission of the European Communities, 2005) envisage a significant expansion of $PM_{2.5}$ monitoring across member states in the future but $PM_{2.5}$ monitoring remains limited in the UK at present. This means that there is a much smaller measurement base on which to develop the understanding of the source apportionment, modelling and possible policies for the abatement of $PM_{2.5}$ than for PM_{10}. Remember, however, that $PM_{2.5}$ is a subset of PM_{10}.

Another important point to remember is that when measuring the mass of particulate matter in ambient air, what you get depends on how you measured it. For a gaseous pollutant such as SO_2 (or for a chemical constituent of particulate matter such as sulphate, assuming the particle size to be measured has been clearly defined) there is a precise definition of what is to be measured and in some senses measurements provide a correct result. For PM mass, what you measure is highly dependent on how the sample has been collected, particularly the extent to which the more volatile components are collected and weighted. More details of the measurement method used in the UK have been provided in the first paper in this series (Maynard and Myers, 2006) and by AQEG (2005). Most of the monitoring data presented in this current paper has been collected using TEOM or gravimetric instruments. TEOM instruments are known to collect only the non-volatile components, while a gravimetric instrument should collect both the non-volatile and volatile components. The reference method for the EU air quality directives (Council Directive 1999/30/EC) is gravimetric and a scaling factor of 1.3 is commonly applied to TEOM measurements before comparison with objectives and limit values, although this is only an approximation. With PM it is advisable always to note measurement method used and any scaling factors applied when describing ambient air concentrations. Measurement data from the UK national monitoring networks is available from the UK Air Quality Archive (2006).

What is particulate matter made of?

AQEG (2005) have provided a useful summary of the chemical components of PM averaged over several urban background sites and this is illustrated in Figure 1. The mass closure model described by Harrison et al. (2003) was used to derive these components from the masses of the chemical species collected using gravimetric instruments. Major components of the fine fraction include organic compounds, ammonium sulphate, sodium nitrate, elemental carbon and bound water. Iron rich dust is the largest component of coarse PM. Other important components include sodium chloride, sodium nitrate, organic compounds and calcium sulphate.

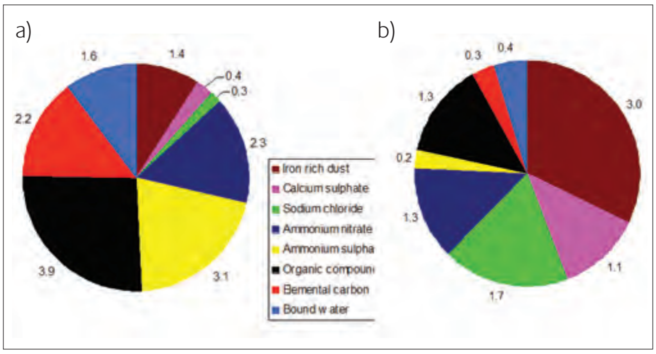

Figure 1: Chemical components (µg m^{-3}), gravimetric at urban background sites. a) fine fraction, b) coarse fraction

PM concentrations are generally elevated close to roads compared with the surrounding area, as discussed below. The 'roadside increment' of PM concentrations contains principally additional elemental carbon and organic compounds in the fine fraction and additional iron rich dusts in the coarse fraction.

Sources of particulate matter and precursors

The sources of PM can be summarised as follows. Ambient PM can usefully be described as consisting of primary, secondary and other PM and the sources of each of these constituents are distinct. The sources of primary PM and the sources of the precursors of secondary PM are considered in this section and we then consider the origins of the remaining ambient PM mass.

Primary PM consists of particles directly emitted into the air. These particles are produced by combustion sources such as traffic exhaust, power stations and domestic and industrial combustion. There are also industrial sources of primary PM from process emissions, which includes mechanically generated particles, such as those resulting from quarrying. Combustion sources generally emit particles in the fine fraction, while mechanically generated particles are generally in the coarse fraction. The primary component of ambient PM largely results from local emissions (in the same town or city) although there is also a component from more distant UK or European sources, this can be described as a contribution from the long-range transport of air pollutants.

Secondary PM is formed in the air by chemical reactions, principally the oxidation of gaseous compounds to produce sulphates, nitrates and ammonium compounds (secondary inorganic aerosol) along with secondary organic aerosol. Thus the important precursor emissions resulting in the formation of secondary PM include sulphur dioxide, oxides of nitrogen, ammonia and volatile organic compounds. The main sources of sulphur dioxide include power generation, industry and shipping, which are also important sources of oxides of nitrogen along with road traffic exhaust emissions. Agriculture is an important source of ammonium while emissions from natural vegetation make a contribution to the emissions of volatile organic compounds along with emissions from traffic and industry. Secondary PM takes time to form in the atmosphere so ambient secondary PM is largely the result of emissions distant from the point of measurement and in the UK includes a significant proportion from emissions outside the UK including those from other European countries and shipping.

Estimates of the emissions of primary PM and the precursors of secondary PM in the UK are calculated annually by the National Atmospheric Emissions Inventory (Dore et al., 2006).

Other sources of PM make up the residual of ambient PM that cannot be directly linked to the emissions of primary PM or secondary PM precursors as generally included in emission inventories. Other sources of PM include wind blown dust, sea salt and bound water. The contribution of ambient PM from these sources is not very well understood but it is a significant proportion of ambient PM, particularly PM_{10} since the majority of the particles generated in this way will be in the coarse fraction.

Simple receptor modelling carried out on ambient PM_{10} monitoring data from the UK in the mid 1990's, suggested that primary, secondary and residual components of PM_{10} each contributed roughly one third of ambient PM measured at urban background sites (APEG, 1999). Reductions in the emissions of primary PM and the precursors of secondary PM have lead to a reduction in the contribution of secondary and especially primary PM in the UK, meaning that the contribution from other sources of PM is becoming increasingly important.

While splitting PM into primary secondary and other sources is a useful way of summarising PM concentrations it is important to understand that PM is processed in the atmosphere so most particles in ambient air are a mixture of different components and not attributable to a single source.

How particulate matter concentrations vary from place to place

Figure 2 gives a general indication of how PM_{10} concentrations in the UK vary from place to place. The measured annual mean concentrations during 2003 at a total of 196 monitoring sites are shown along with the average concentrations for each type of site: roadside, urban background and rural. Roadside concentrations are, on average, higher than urban background, which are higher than rural but there is considerable overlap on an individual site basis. This is because there is a large regional background component to both urban and roadside PM_{10} concentrations. The urban and roadside increments above this background are, on average smaller than this regional background, which includes the great majority of the secondary PM, residual sources such as wind blown dusts and sea salt and a contribution from regionally transported primary PM. The urban and roadside increments, on the other hand, demonstrate the contribution from local emission of primary particles. A similar plot for

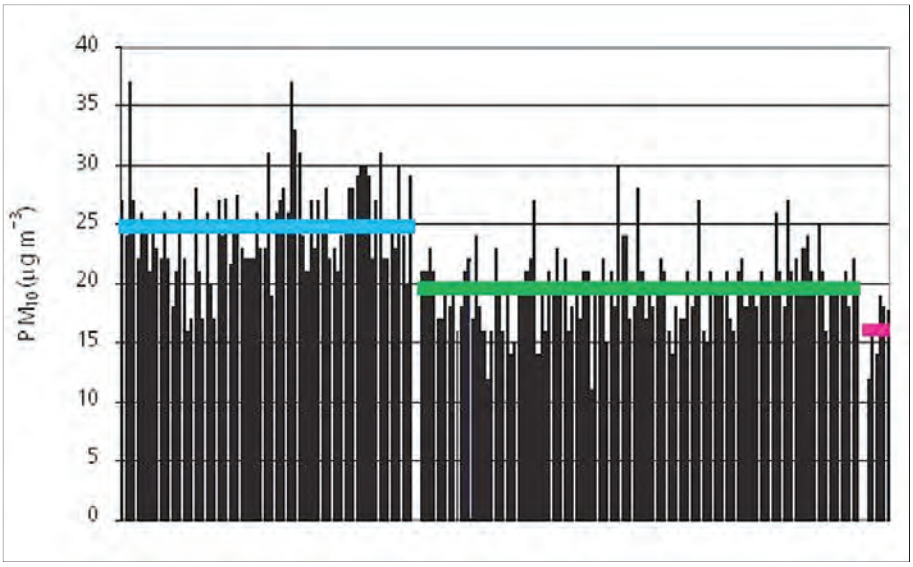

Figure 2: Roadside (blue), urban background (green) and rural (red) annual average PM10 TEOM concentrations in 2003 (Source AQEG, 2005 © Crown Copyright, 2005).

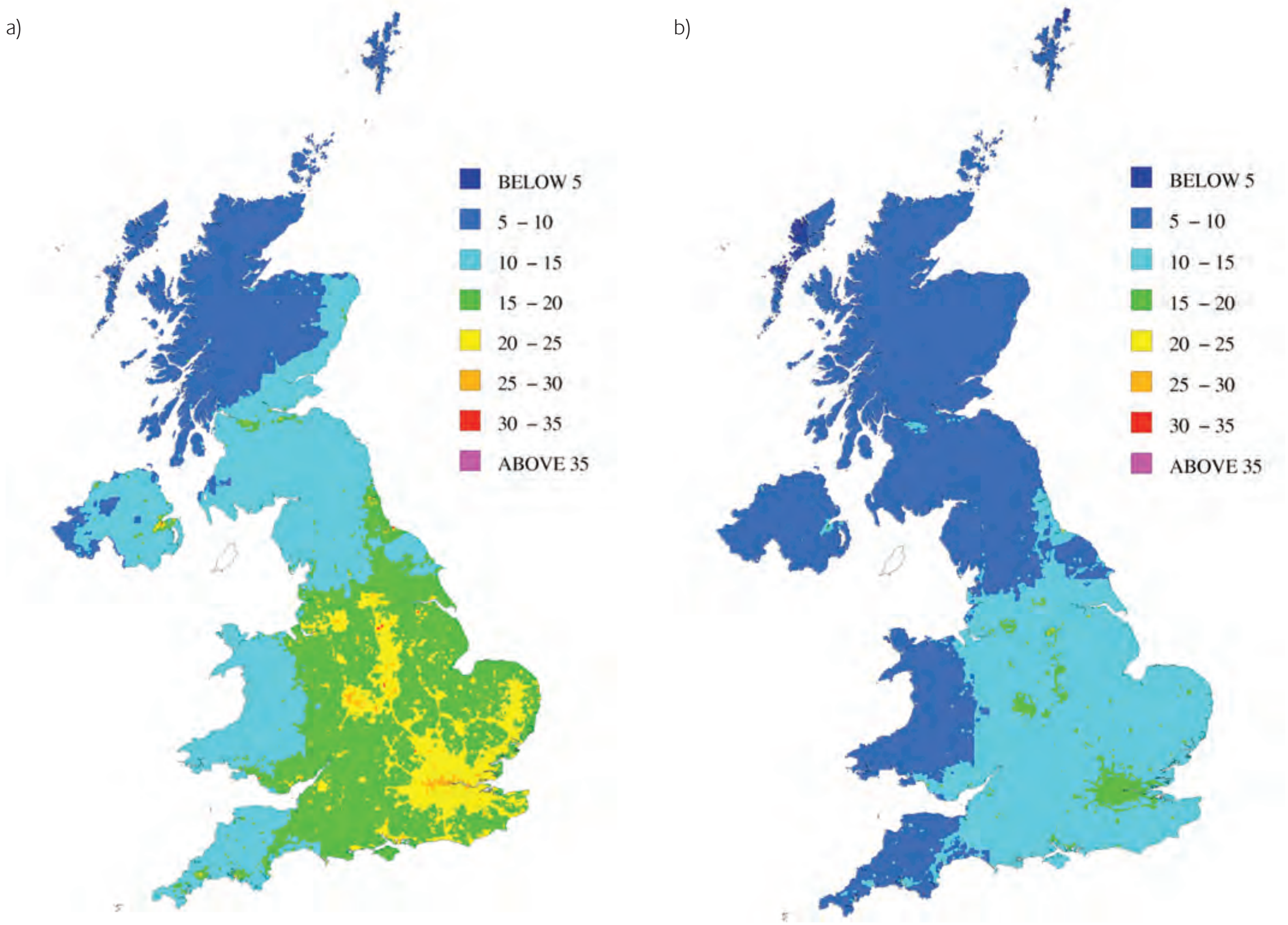

Figure 3: Mapped PM concentrations across the UK in 2004 ($\mu g\ m^{-3}$, gravimetric). a) PM_{10}, b) $PM_{2.5}$ (Adapted from Stedman et al., 2007).

an air pollutant more strongly influenced by local primary sources, such as oxides of nitrogen, would show a rather different pattern with a relatively smaller contribution from regional background concentrations and much bigger urban, and especially, roadside increments.

Our understanding of the contributions that the different sources of PM make to ambient concentrations has been used to develop methods to map concentrations across the UK. Figure 3 shows maps of annual average PM_{10} and $PM_{2.5}$ concentrations across the UK. These maps have been built up from a number of components including:

- Local primary PM, derived from estimates of PM emissions using an atmospheric dispersion
- Regional primary PM, derived from estimates of PM emissions using a long-range transport model
- Secondary inorganic PM, derived from interpolation of measurements of rural sulphate, nitrate and ammonium concentrations
- Secondary organic PM, derived using a chemical transport model
- Residual PM assumed to the constant across the UK.

Full details of the modelling methods have been provided by Stedman et al. (2007).

The maps show that estimated $PM_{2.5}$ concentrations are roughly two thirds of PM_{10}, which is consistent with comparisons of co-located measurements. The maps clearly show a south east to north west gradient in regional background concentrations, this is largely due to the concentrations of secondary inorganic PM, which are lowest at locations most distant from the sources of precursors. The maps also show the influence of local primary emissions with the highest concentrations evident in urban areas and close to the major road network.

Historical trends

Measurements of PM_{10} and $PM_{2.5}$ have been made in the UK since the 1990s using modern monitoring methods. Measurements of black smoke concentrations have been made for much longer and in this section we present the results of an attempt to reconstruct a historical time series of ambient $PM_{2.5}$ for London from 1954 to 2005.

Figure 4 shows measured annual mean black smoke concentrations averaged across all the monitoring sites operation in London since 1954. This plot indicates that concentrations were above 200 $\mu g\ m^{-3}$ black smoke in the 1950s, declining to about 50 $\mu g\ m^{-3}$ by 1970 and to less than 10 $\mu g\ m^{-3}$ in the late 1990s.

The measured black smoke concentrations for London have been combined with statistics for measured annual mean sulphate and nitrate concentrations to provide the estimate of annual mean $PM_{2.5}$ shown in the figure. Data for the period from 1954 to 1988 have

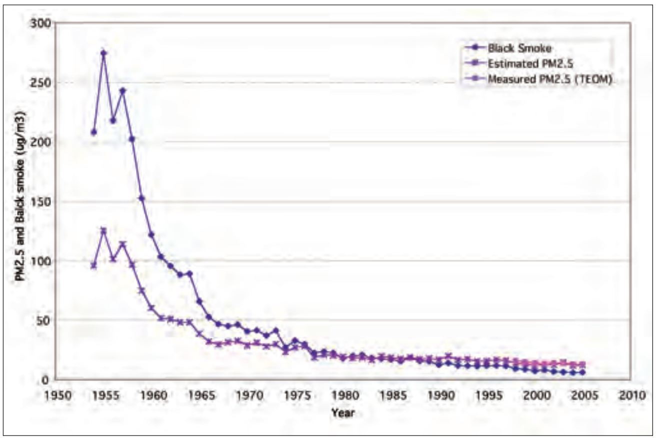

Figure 4: Measured annual mean black smoke and estimated $PM_{2.5}$ in London 1954 – 2005 and measured $PM_{2.5}$ at London Bloomsbury in 1998 – 2005 (µg m^{-3}).

been taken from the monitoring site at Chilton in Oxfordshire (RGAR, 1990) and estimates for 1989 to 2005 for the south of England have been derived from network means calculated from rural monitoring across the UK (Air Quality Archive, 2006, CEH, 2006). We have estimated PM_{10} as the sum of measured black smoke multiplied by a factor of 0.64, as suggested by an receptor modelling analysis carried out on data from the mid 1990s (Stedman et al, 1998), measured sulphate and nitrate concentrations and a residual PM concentration of 7.2 µg m^{-3} as suggested by Stedman (2002) from receptor modelling on PM_{10} concentrations in London for 1999. We then estimated $PM_{2.5}$ from the estimate of PM_{10} using a factor of 0.66.

The results of this, admittedly fairly crude analysis, suggest that annual mean ambient $PM_{2.5}$ concentrations at background locations in London were of the order of 100 µg m^{-3} in the 1950s, falling to roughly 50 µg m^{-3} in the 1960s, 20 µg m^{-3} in the 1970s and to around 15 µg m^{-3} in recent years. Note that the estimated $PM_{2.5}$ concentration is greater than the measured smoke concentration from the late 1980s onwards. Figure 4 also shows measured $PM_{2.5}$ at the London Bloomsbury monitoring site since measurements started in 1998, which show reasonably good agreement with the estimated concentrations for recent years. This analysis suggests that there has been a sharp decline in ambient $PM_{2.5}$ since the 1950s as a result of reductions in domestic and industrial coal use in cities.

More recent trends

More recent trends are illustrated in more detail in Figure 5. This plot shows the annual mean PM_{10} concentration averaged across 9 long-running urban background monitoring stations across the UK since monitoring began in 1992. There was a fairly steady decline in concentrations during the 1990s but the rate of decline has slowed considerably since 2000. Modelling studies and comparison with emission inventories suggest that the decline during the 1990s can be explained by a combination of reduction in primary PM emissions (primarily from road traffic exhaust) and of secondary PM concentrations as the emission of the precursors NO_x and particularly SO_2 have declined across Europe (Stedman, 2002). The much slower decline since 2000 may be a result of a reduction in the rate of decline of road traffic exhaust emissions and a levelling off of secondary inorganic aerosol concentrations. It is also worth noting that emissions from road traffic brake and tyre wear have been increasing as traffic volumes increase in contrast to exhaust emissions, which have declined as a result of tighter emission standards for new vehicles. Projections from the NAEI suggest that UK urban road traffic brake and tyre wear emissions were roughly half the magnitude of exhaust emissions in 2005, will be of similar magnitude by about 2010 and will be greater than exhaust emissions soon after 2015. The decline in secondary inorganic PM is illustrated further in Figure 6, which shows network mean sulphate and nitrate concentrations over the same period. It is likely that this is because the atmosphere is not reacting linearly to reductions in the emissions of secondary PM precursors and thus ambient secondary PM concentrations have remained roughly constant since 2000, at a time when precursor emissions have continued to decline.

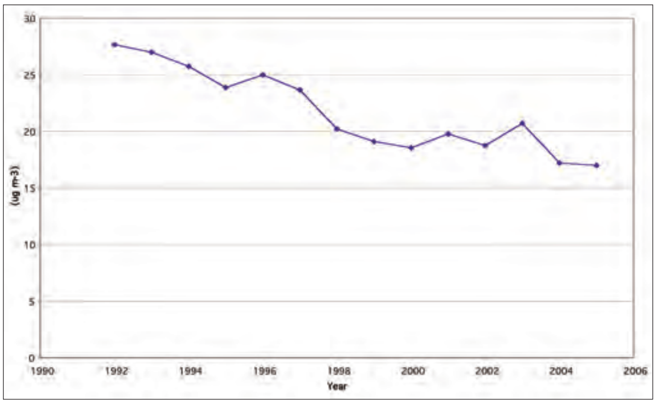

Figure 5: Annual mean PM_{10} averaged across 9 long running national network monitoring sites (µg m^{-3}, TEOM).

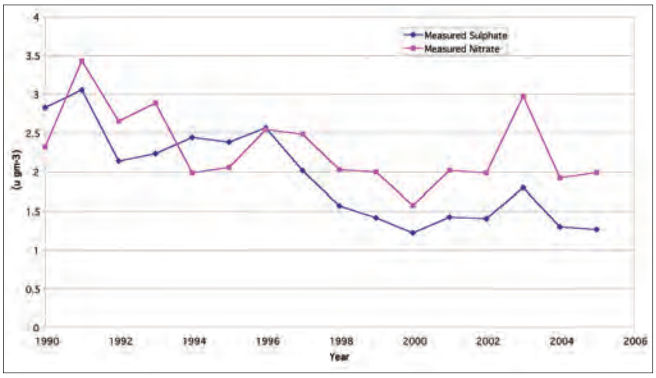

Figure 6: Network average annual mean sulphate and nitrate concentrations 1990 – 2005 (µg m^{-3}).

Both the PM_{10} and inorganic aerosol plots also show that concentrations vary considerably from year to year as a result of meteorological variations in addition to the longer term trends. These variations are generally related to the occurrence of episodes of elevated PM concentrations such as are evident in 1991, 1996 and 2003 in Figures 5 and 6. Episodes are discussed in the following section.

Particulate matter air pollution episodes

Episodes of elevated PM concentrations can be defined in many ways. A useful definition is to consider events where the daily mean concentration exceeds 50 µg m^{-3}, gravimetric (the EU limit value and UK air quality objective) as episodes. Episodes can be caused by a wide range of different sources and sometime more than one source can impact at the same time. The causes of PM episodes have recently been reviewed by AQEG (2005) and by Kent et al. (2006) and the following types of episode have been identified.

- Local
    - Traffic
    - Demolition and construction
    - Domestic heating
    - Bonfire night
- Long Range transport
    - Secondary PM
    - Saharan dust
    - Biomass burning
- Others
    - Sea salt

It is interesting to look at the frequency of episodes across the UK and Figure 7 shows the number of daily exceedences of 50 µg m^{-3} (TEOM x 1.3) measured each month between January 1996 and December 2004 at UK national network sites, normalised by the number of operational monitoring sites. This analysis shows that there is considerable month-to-month variation in the number of exceedences. It also shows that the number of exceedences has generally declined since 1996; however, the number of exceedences in 2003 was unusually high. There were notable winter secondary PM episodes in January and March 1996 and in early 2003. The photochemical episode in August 2003 is also clearly shown. The episodes in 1996 and in the summer of 2003 have been described by Stedman (1997, 2004). There were also episodes caused by poor dispersion of primary pollutants during the autumn of 1997. The long-range transport dust events such as March 2000 and early 2003 are also evident in Figure 7. This analysis also suggests that March is the most polluted month of the year across the network, and that the summer months of June and July exhibit fewer PM10 exceedences on average than the rest of the year. It also identifies August as a month in which there tend to be many exceedences across the network (But note, however, that heatwave PM episodes during the summer of 2006 occurred in June and July!)

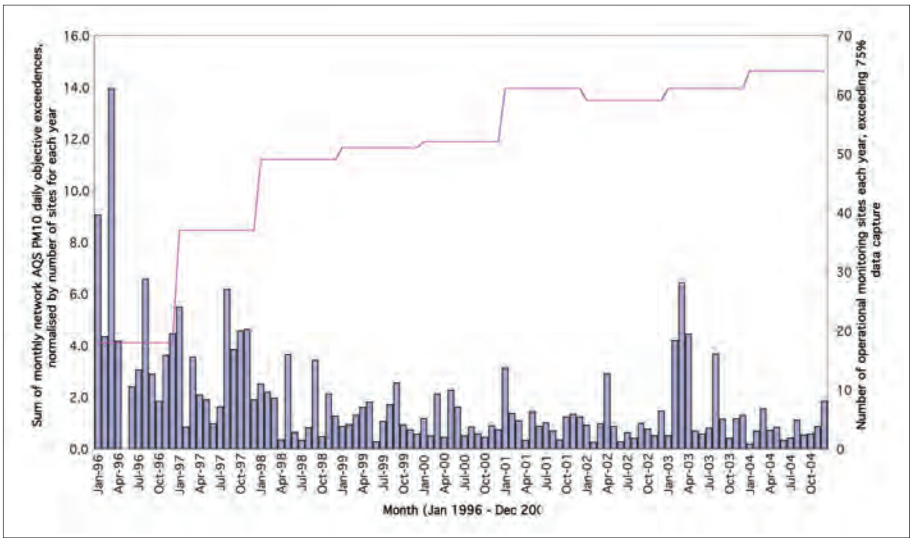

Figure 7: Number of daily gravimetric PM_{10} AQS exceedences summed across the UK by month (1996-2004) (Source: Kent at al., 2006. Red line shows cumulative number of exceedances © Environment Agency, 2006, used with permission)

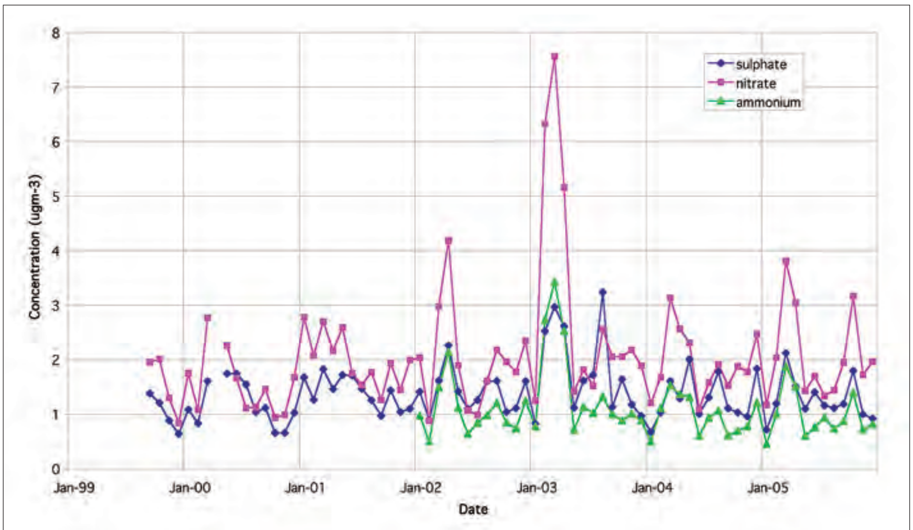

Figure 8: Network mean sulphate, nitrate and ammonium aerosol concentrations (µg m^{-3}).

The most common type of episode identified by Kent at al (2006) was episodes of elevated secondary PM with a significant contributions from the long range transport of PM across national boundaries. This source contributed to between 75 – 85% of the episode days measured at an urban background monitoring site in London and two rural sites in the south of the UK.

Secondary PM concentrations are extremely variable on a day-to-day basis and are strongly dependent on the weather. Figure 8 shows monthly mean concentrations of sulphate, nitrate and ammonium averaged across all 12 rural monitoring sites in the UK (CEH, 2006). There are notable rises in sulphate and nitrate levels in the spring seasons of both 2002 and 2003, with nitrate exhibiting the more marked increases, especially in 2003. The increase in sulphate and nitrate associated with the August 2003 heat wave can also be clearly observed. Sulphate at this time rose to exceed the monthly concentrations of that spring, whilst nitrate levels remained significantly lower than the dramatic rises seen earlier in the year. This rise in secondary pollution from Europe during the spring season is usually due to synoptic changes in the weather during this time of year, which brings in air masses from the southeast and east.

Wind-blown dust is the largest natural source of particles on the global scale, after sea spray (IPCC 2001). Dust source regions are mainly deserts, dry lake beds and semi-arid desert fringes. The atmospheric lifetime of dusts depends on particle size; large particles are removed quickly from the atmosphere by gravitational settling, whilst sub-micron particles can have atmospheric lifetimes of weeks. Long-range transport of Saharan dusts across the Mediterranean Sea into Southern and Central Europe (Rodriguez et al., 2001) has been relatively frequently recorded. The transport of dust from the Sahara have lead to elevated PM concentrations in the UK on several occasions, including March 2000, October 2001 and the spring of 2003. Comparison of available PM_{10} and $PM_{2.5}$ measurements confirms that the majority of these long range transported dust particles are in the fine fraction (AQEG, 2005). Figure 9 shows a satellite photograph of the UK in which the passage of hazy grey/brown Saharan dust is clearly visible over the UK and north western Europe.

Other episode types including those associated with bonfire night celebrations, the long range transport of smoke from biomass burning, sea salt during periods with high winds and local construction and demolition have been reviewed and described by AQEG (2005) and Kent et al. (2006)

Comparisons with limit values

The achievability of current and proposed EU air quality targets for ambient PM has been reviewed by AQEG (2005) and more recently by Defra (2006). These reviews build on the type analysis of monitoring data, source apportionment and modelling of current concentrations presented here by using the same models to predict PM concentrations in the future. Such predictions make use of projections of emissions, which are derived from economic, energy and transport forecasts along with an analysis of the impact of current, or possible future, national and international environmental policies.

These analyses suggest that for current policies the 1st Daughter Directive (Council Directive 1999/30/EC) annual mean limit value for 2005 of (40 µg m^{-3}, gravimetric) is likely to be achieved across the UK except for close to the very busiest roads in London. The 24-hour limit value of non more than 35 days above 50 µg m^{-3}, gravimetric is more stringent and some exceedences are possible, mostly at the roadside in London and the extent of exceedence will be dependent on local sources and meteorology. The more stringent indicative limit values for 2010 are likely to be widely exceeded at roadside and urban background locations across the UK. The modelled extent of exceedences is relatively uncertain and is dependent on the exact source apportionment of current concentrations and predictions of future meteorology.

Proposals for a revised Air Quality Directive were published in 2005 and included targets for $PM_{2.5}$ for the first time (Commission of the European Communities, 2005). Modelled predictions for the UK (Defra, 2006) suggest that with current policies the proposed concentration cap for 2010 of 25 µg m^{-3} as an annual mean is likely to be achieved at all locations across the UK. The proposed exposure reduction target of a 20% reduction at urban background locations between 2010 and 2020 is likely to be more challenging and analysis suggested that a reduction of about 11.5% would be possible for current policies, or about 15% for a package of additional measures to reduce emissions including more stringent exhaust standards for new road vehicles.

Figure 9: Satellite image illustrating passage of Saharan Dust to UK, 30th October 2001
(Image courtesy of the SeaWiFS Project, NASA/Goddard Space Flight Centre & ORBIMAGE, Inc., ©Environment Agency, 2006 used with permission).

Acknowledgement

This work was funded by the UK Department for Environment, Food and Rural Affairs, Welsh Assembly Government, the Scottish Executive and the Department of the Environment in Northern Ireland under contract CPEA 15. Smoke data for London from 1954 to 2005 was kindly provided by Alison Loader of netcen.

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Strategic Environmental Assessment (SEA): Frequently Asked Questions

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Introduction

This article is intended to provide a quick review of the SEA process for HPA staff not familiar with this assessment process.

Strategic Environment Assessment

European Directive 2001/42/EC, known as the 'strategic environmental assessment' or 'SEA' Directive, requires a formal environmental assessment of certain plans and programmes. In undertaking this assessment, the likely significant effects on the environment of implementing these plans and programmes must be considered, including effects on population and human health.

SEA therefore provides a significant opportunity for the populations' health to become a central part of assessing plans undertaken by plan makers (identified in the UK SEA Regulations as Responsible Authorities (RAs)). RAs include Local Authorities, the Environment Agency and others whose plans and programmes are captured by the SEA Directive.

The Department of Health, in close collaboration with the Health Protection Agency and in consultation with the Department for Communities and Local Government, has recently published draft guidance on Health in Strategic Environmental Assessment. This guidance out for consultation till the 19th June 2007 and can be accessed at:

http://www.dh.gov.uk/en/Consultations/Liveconsultations/DH_073261

This draft guidance explains potential ways of considering the likely significant effects on the environment in relation to population and human health topics. It sets out the benefits of considering health, the requirements of the SEA Directive and Sustainability Appraisal, what health covers and who to contact in health organisations. Moreover, the relevant health input at the five stages of SEA is described with examples and links to additional resources. Key messages of this document are that:

- SEA consultation must be carried out with the public and certain named organisations (known as Consultation Bodies). As a health organisation is not included amongst the Consultation Bodies this guidance encourages interaction between RAs and health organisations to ensure the population's health is assessed during the SEA process;
- SEA is a major opportunity to prevent ill health and tackle health inequalities as set out in the White Papers: Choosing Health and Our Health, Our Care, Our Say;
- RAs should know and understand how health is affected by their plans and programmes, so that in assessing them, major relevant health issues are covered, maximising positive effects and preventing, offsetting or minimising negative ones and promoting healthier planning as set out in the White Paper Strong and Prosperous Communities; and
- Health organisations should be effectively engaged in the process, with the health needs of the population being addressed in the SEA process.

SEA Frequently Asked Questions

Below is a series of frequently asked questions (FAQs) that have been identified during a series of workshops that were held to inform the guidance development.

1. **What is the difference between Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA), Health Impact Assessment (HIA) Integrated Pollution Prevention and Control (IPPC) and Sustainability Appraisal (SA)?**

SEA applies to plans and programmes, typically concerned with broad proposals and their alternatives, whilst EIA is project-specific and requires more detailed information on the effects of a particular proposal (usually individual installations). SEA can help the preparation of an EIA but does not remove the need for one, where it is required. IPPC is a 'permit to pollute' and undertaken outside

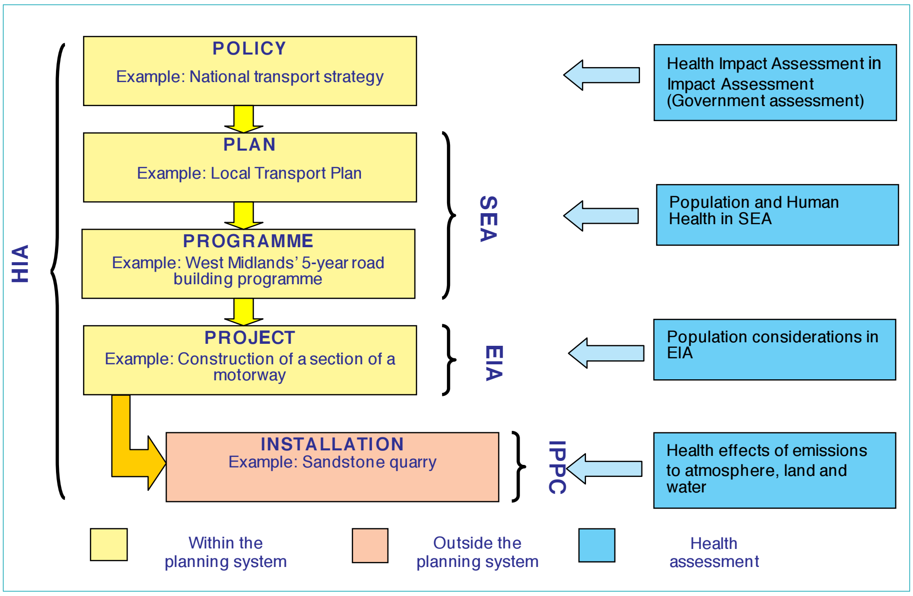

Figure 1: Other assessments and their relationship to health.

planning (again at the level of single installations). Separate HIAs can be carried out on developments and policies at any level. SAs are a broader assessment of the 'triple-bottom-line' of economic, social and environmental impacts carried out on regional strategies. The important thing to remember is that SAs must also meet the requirements of the SEA Directive.

Health is assessed to differing degrees within each of these assessments (see Figure 1).

2. Should a separate Health Impact Assessment be carried out?

No. It is recommended that the effects on health be fully integrated into the SEA process. This will reduce costs/burdens whilst also ensuring the SEA (and within this any health-related recommendations), are considered during the decision-making process. However the SEA may need to address all the relevant links to the wider determinants of health and health effects should be clearly visible within the Environmental Report.

3. Who is responsible for paying for and writing up SEAs?

SEAs will be carried out by public bodies who are preparing plans or programmes subject to the SEA requirement. These are known as 'Responsible Authorities'. Most will be Local Authorities, who have a legal requirement to carry out SEA of their Local Development Documents. A number of SEAs will be carried out by the Environment Agency on its internal plans and programmes. Some organisations, e.g. water companies, may voluntary carry out SEAs. The help of consultants may be sought by Responsible Authorities.

4. Who should I contact for a health response?

In order to cover the full range of health effects in SEA it is recommended that RAs contact the relevant Director of Public Health for comment on the coverage of the population's health at the same time as they engage with the Consultation Bodies, particularly at the scoping stage and during consultation of the draft plan or programme and Environmental Report. The Responsible Authority may, therefore, find it useful to contact:

- **National plans and programmes** – The Department of Health, Health Improvement Directorate
- **Regional plans and programmes** - make contact in the first instance with the Regional Director of Public Health (RDsPH) in the Regions.
- **Local plans and programmes** - where the plan or programme covers the same geographical area as the local Primary Care Trust (PCT) make contact in the first instance with the Director of Public Health (DPH) for the relevant PCT.
- **Regional / Local** - Where a plan or programme covers more that one PCT, consult with both the Regional DPH and each of the relevant PCTs for the area.

The PCT covering a particular town or county can be found at:

http://www.nhs.uk/england/authoritiestrusts/pct/townSearch.aspx

Further health data and consultation responses can be gathered from a variety of organisations.

5. When should health organisations be consulted?

At the same time as Consultation Bodies, first during scoping and then at full public consultation on the draft plan or programme and accompanying Environmental Report.

6. How many SEAs are expected?

Based on current statistics, there are around 300-400 per year for England with the majority from LA planners and around 50 from the Environment Agency.

7. How should I assess which determinants of health, health outcomes, health effects or health targets/objectives are important?

An initial breakdown can be achieved by thinking of health in terms of:

1. Impacts on health and facilities;
2. Adverse impacts; and
3. Beneficial impacts.

Simple risk assessments can also be useful. Using basic significance criteria the magnitude and probability of an effect can be worked out (see Figure 2). This process should be fully transparent and the criteria stated clearly in any assessment.

Figure 2: Risk Assessment

Effect (beneficial or adverse)	Probability	Significant?
HIGH	HIGH	YES
HIGH	LOW	MAYBE (if there is an exceptionally high effect)
LOW	HIGH	MAYBE (cumulative effects may result in significant effects)
LOW	LOW	NO

8. Which key plans and programmes inform other planning documents?

The two key documents are the Regional Spatial Strategy (RSS) as it feeds into other regional programmes and the Local Development Framework (LDF) as a health input here should inform other local plans.

9. What is the difference between the plan (e.g. a Local Transport Plan) or programme and the SA/SEA?

The plan sets out the Responsible Authority's vision and how this will be achieved. The SA/SEA is an independent assessment of the effects of implementing the plan or programme. SEA must be undertaken at the same time as the preparation of the plan or programme. The plan and SEA targets and objectives may be different and therefore the long-term goal of influencing the plan or programme should be kept in mind whilst engaging with the SEA process.

Strategic Environmental Assessment (SEA) and Planning

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Introduction

Addressing health in the SEA process requires knowledge of both the relevant health issues and the planning system. The Department of Health (DH) has recently produced draft guidance on Health in Strategic Environmental Assessment in close collaboration with the Health Protection Agency and in consultation with the Department for Communities and Local Government. Workshops undertaken to inform this guidance highlighted a lack of understanding of the planning system within the health community. This article intends to give a brief introduction to the planning system (which has changed considerably due to the Planning and Compulsory Purchase Act 2004) for health professionals.

The Planning System

As England is one of the most crowded countries in the world with over 90 per cent of the population living in urban areas, planning for the future of our cities, towns and countryside is extremely important.

In England, we have a ‘plan-led’ system which sets out what can be built and where it can be built. The highest tier of this system are national policies including Planning Policy Statements (PPS), which explain statutory provisions and provide guidance to local authorities and others on planning policy and the operation of the planning system. They also explain the relationship between planning policies and other policies which have an important bearing on issues of development and land use. Health considerations are found throughout many PPSs. See also:

http://www.communities.gov.uk/index.asp?id=1143803

In the UK, most plans and programmes subject to SEA are spatial plans. Sustainability Appraisal (SA) must be undertaken for spatial plans, which involves an assessment of the economic, social and environmental effects of implementing such plans, i.e. Regional Spatial Strategies (RSSs), Development Plan Documents (DPDs) and Supplementary Planning Documents (SPDs). Health considerations are relevant to all three components of assessment. The requirements of SEA have been fully incorporated into the SA process in England.

Regional Planning Bodies and Local Planning Authorities must give consideration to PPSs in preparing Regional Spatial Strategy (RSS) revisions and Local Development Frameworks (LDFs) respectively. LDFs are comprised of:

- Local Development Documents (LDDs) - Development Plan Documents (DPDs) and Supplementary Planning Documents (SPDs);
- A Local Development Scheme, setting out the program for LDD preparation;
- A Statement of Community Involvement (SCI) specifying how the authority intends to involve communities and stakeholders in all aspects of the planning process;
- An Annual Monitoring Report, setting out progress in terms of producing LDDs and implementing policies, and also meeting the requirements of the SEA Directive where applicable; and
- Any local development orders and/or simplified planning zones that have been adopted.

DPDs, together with the relevant RSS, form the statutory development plan for an area. An overview of the spatial planning system in England is provided in Figure 1.

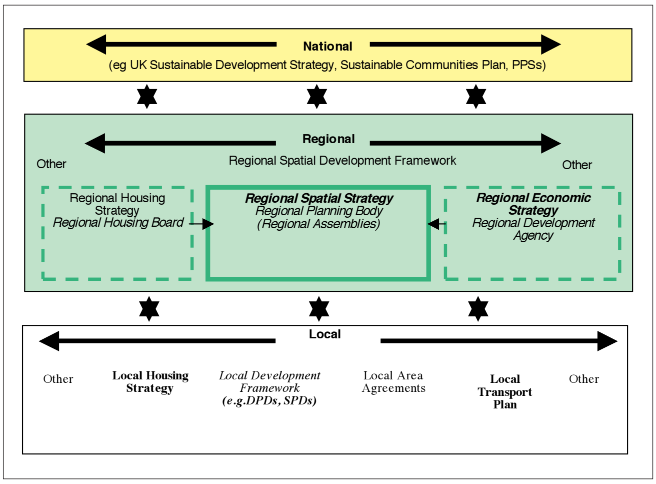

Figure 1: The Spatial Planning Framework in England

Source: Department of Communities and Local Government

(NB. Plans requiring SEA are in bold and spatial plans are in italics)

There are already set processes for involving health organisations and health considerations in planning. For example, Strategic Health Authorities (SHAs) are specified consultation bodies for both RSS and LDFs, and are therefore already likely to be involved in the spatial planning process. Similarly, PCTs may already be involved in commenting on emerging Statements of Community Involvement (SCI) for LDFs.

Future Guidance

The Department of Health is developing Guidance for the NHS on Town Planning, and separate guidance for Local Planning Authorities on the NHS, which will be available on the DH website.

Summary of the Evaluation of the 2006 National Heatwave Plan for England

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Introduction

Following the heatwave conditions experienced during the summer of 2003 throughout Europe and the large number of excess deaths associated with it, the Department of Health developed and issued a national heatwave plan. The frequency of such extreme weather events is likely to increase due to climate change and the 2003 heatwave highlighted the need for a defined plan of action to allow appropriate preparedness for heatwave situations and to minimise the number of excess deaths associated with them.

The national heatwave plan for England has been revised twice. In 2006 the national heatwave plan was re-launched and published along with supporting documents (Department of Health, 2006). The heatwave plan included fact sheets which gave specific advice on supporting vulnerable people before and during a heatwave for health and social care professionals and for care home managers and staff. A guide for the general public on looking after themselves and others during a heatwave was also published. The heatwave plan and supporting documents described the responsibilities of a number of organisations including Primary Care Trusts (PCTs), Local Authorities (LAs), Strategic Health Authorities (SHAs) and NHS Trusts. The Core elements of the plan are:

- 'Heat-Health watch' over the summer months which trigger levels of responses (Levels 1 – 4, Box 1)
- Advice and information direct to the public and health and social care professionals
- Guidelines for the identification of individuals at risk and local advice for assisting these individuals
- Extra assistance from the voluntary sector, families and others to care for those most at risk
- The use of the media to get the information disseminated both before and during a heatwave

The summer of 2006 was the first time in which 'Heat-Health watch' alert level 3 had been issued. On 4 July 2006, alert level 3 was issued in five regions. A second hot period occurred and on 19 July 2006 all nine regions in England reached alert level 3. Therefore this heatwave gave organisations across England the opportunity to implement specific measures outlined in the plan.

Following the end of the 'Heat-Health watch' period (1 June to 15 September), the Department of Health commissioned the HPA to evaluate the heatwave plan. This was to assess the impact of the plan on the various actions it proposed, and to test whether these had had an effect on heatwave related morbidity and mortality.

Box 1 Levels of Response of the 'Heat-Health watch' system included in the National Heatwave Plan for England (Department of Health, 2006)

The 'Heat-Health watch' system comprises four levels of response. It is based on threshold day and night-time temperatures as defined by the Met Office. These vary from region to region, but the average threshold temperature is 30ºC during the day and 15ºC overnight.

Level 1 Awareness – This is the minimum state of vigilance. Both before and during this period, preparedness must be enhanced and maintained by the measures set out in the heatwave plan.

Level 2 Alert – This is triggered as soon as the Met Office forecasts threshold temperatures for at least three days ahead in any one region, or that there is an 80% chance of temperatures being high enough on at least two consecutive days to have significant effects on health.

Level 3 Heatwave – This is triggered as soon as the Met Office confirms that threshold temperatures have been reached in any one region or more.

Level 4 Emergency – This is reached when a heatwave is so severe and/or prolonged that its effects extend outside health and social care, such as power or water shortages, and/or where the integrity of health and social care systems is threatened.

Evaluation Method

This evaluation was completed in three parts. Part one was an epidemiological study analysing morbidity and mortality over the heatwave period. Part two was a questionnaire based study that assessed awareness of the heatwave plan and overall impacts of a number of key organisations with roles in the heatwave plan. Part three was a multi-agency seminar to discuss the results of the two previous studies, other relevant research and to develop an expert consensus view. The multi-agency seminar included representatives from the Department of Health, Office for National Statistics, The Met Office, the London School of Hygiene and Tropical Medicine, Defra, the NHS and other organisations. Workshop sessions considered possible areas for research; future evaluations and audits, including surveillance; conclusions from 2006 and recommendations for future years.

Results

Overall the evaluation showed that there is high awareness of the heatwave in the key organisations and there was a positive response to the plan. Many organisations also stated that the plan assisted them in the heatwave situation.

The studies presented at the multi-agency seminar described the impacts (morbidity and mortality) of the 2006 heatwave and the sources currently available to measure impacts. The information presented indicated that the 2006 heatwave was less severe, both in impacts and weather, than the heatwave of 2003.

Figure 1: The Department of Health heatwave plan for England, 2006 (Reproduced under the terms of the Click-Use Licence)

Outcome

A full evaluation report with recommendations is being sent to the Department of Health who are currently revising the plan for summer 2007. The report includes recommendations on improvements to the plan include methods of improving communication, re-visiting definitions of and the expectations for caring for vulnerable individuals, and re-visiting the measures and thresholds that the plan and the associated levels are based around. Limitations are discussed, both for this study and the move general question of the correct baselines and comparisons to describe the impacts of heatwaves.

The study has also identified areas where further research would be beneficial. This includes further epidemiological studies on heatwaves and associated effects and research to determine the most appropriate ways to evaluate interventions.

The evaluation process was viewed positively by all organisations involved and further evaluations are also planned to assist in the overall development and implementation of the Heatwave plan in the future.

Reference

Department of Health (2006) Heatwave: Plan for England - protecting health and reducing harm from extreme heat and heatwaves. (http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4135296)

Acknowledgements

We would like to thank Giovanni Leonardi and Virginia Murray for their input into this report.

Conference Reports

The London Bombings: health protection lessons from London and other international incidents, Royal College of Surgeons, 30 November 2006

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On the 30th of November 2006, the Health Protection Agency hosted an international symposium at the Royal College of Surgeons on the July 7th 2005 London Bombings, specifically on the lessons identified from this other major international incidents (http://www.hpa-events.org.uk/30November).

The day began with a welcome address and opening remarks from Prof. Mike Catchpole on behalf of Prof. Pat Troop (Chief Executive of the HPA). Many very informative presentations were given on both health protection issues related to the London Bombings and lessons identified from other international incidents of note. With regard to the London Bombings, the presentations covered several broad themes: psychological impacts and public communications; environmental hazard identification, sampling for health risk assessment; inter-agency and public health response frameworks for major incident response; UK data protection laws and inter-agency sharing of information; long-term public health follow-up. An illuminating survivor's account of the incident was also presented. In order to identify and discuss wider health protection lessons from major incidents, a number of overseas speakers were invited to give presentations on other incidents such as the September 11th 2001 attacks on the World Trade Center, the Madrid train bombings, the Enschede fireworks disaster and the El Al plane crash in Amsterdam. The presentations resulted in a range of stimulating questions being asked by the audience and promoted useful discussions on health protection issues.

The multi-agency London Bombings highlighted the importance of environmental monitoring, as did the Buncefield oil depot fire.[1,2,3] This was reiterated by two presentations: (1) 'London Bombings: Immediate Environmental Assessment' and (2) 'Environmental Investigation Framework'. The first presentation gave an overview of the hazardous material assessment and environmental monitoring that was undertaken in the aftermath of the blasts. The key findings included that there was no evidence that there was a significant release of asbestos fibres to air, and as such, the risks that asbestos posed to both emergency responders and members of the public present in the vicinity of the blasts was likely to be negligible.

The second presentation identified environmental sampling/analysis requirements for health risk assessments during major incident response (specifically, the London bombings and the explosion and fire at the Buncefield oil depot). The presenter gave an overview of the multi-agency environmental investigation framework that is currently being developed, which aims to: assess current environmental monitoring capacities; identify improvements/additional resources that are required for environmental monitoring during major incident response; and, to develop a formalised, function-based, multi-agency environmental monitoring response framework. It is hoped that the framework will maximise the effectiveness of response to major incidents.

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1. **Wilson, J., Murray, V., Carlton, O., Wickham, P., Kettle, N. (2006) Environmental sampling and analysis on the London Underground in response to the 7th of July 2005 bombings: lessons identified for major incident management. Chemical Hazards and Poisons Report 7, 19-20. (http://www.hpa.org.uk/chemicals/reports/chapr7_jun2006.pdf)**
2. **Murray, V. Mohan, R. Aus, C. Wilson, J. (2006). Air Quality Annex 4: Atmospheric Modelling and Monitoring: The Public Health Impact of the Buncefield Oil Depot Fire. Health Protection Agency.**
3. **The need for the provision of specialist scientific advice at Gold command – a lesson identified from recent major incident response in the UK. Chemical Hazards and Poisons Report 9, xx-xx.**

HPA Contaminated Land Forum

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Background

The United Kingdom has a rich industrial heritage, reflecting the industrial revolution of the nineteenth century. This led to increased mechanisation, the development of power driven machinery and a concomitant increase in demand for coal and iron ore and the building of new factories and foundries. Although such advancement undoubtedly contributed to scientific innovation and economic prosperity, industrialisation also lead to a legacy of chemically-contaminated sites. However, the industrial landscape of the UK, changed in the late 20th Century and many traditional industries either contracted or became obsolete. Consequently, many previously used 'brownfield' sites (which may have become contaminated through their previous use) have become available for redevelopment. Furthermore, this redevelopment has been underway for several decades and many housing developments have already been built upon derelict sites, including former Victorian town gas works, without adequate remediation. There are many reports of sites being contaminated with both inorganic and organic compounds, including metals (such as cadmium, lead, chromium, nickel, copper and zinc), metalloids (such as arsenic), dioxins, phenols, polycyclic aromatic hydrocarbons and other hydrocarbons.

Legally, a contaminated land site is defined as "Any land which appears to the local authority in whose authority it is situated to be in such a condition, by reason of substances in, or under land that significant harm is being caused or there is significant possibility of such harm being caused" (Part IIA of the Environment Protection Act (1990, Section 78(A)). It is estimated that there could be as many as 33500 contaminated sites in England and Wales alone covering 67000Ha. These form a sub group within 325 000 sites (approximately 300 000 Ha) that have been identified by the environment agency as having had previous land uses which could have led to contamination.

The requirement for redevelopment of brownfield sites has been recognised by central government, which in a bid to reduce development on 'green field' sites and thus conserve and prevent disruption of sensitive and fragile ecological sites, has encouraged 'brown field' site development. Thus, through planning policy guidance (Note 3: Housing (PPG3)), government has prioritised the development of previously developed sites before green field land; indeed, by 2008, government policy in England has set a target of 60% of additional housing being built on previously developed land.

Therefore, with the reutilisation of 'brownfield' sites there is significant potential for large sections of the community to be exposed to environmental pollutants, should stringent safeguards not be enforced correctly. The major environmental sources of exposure are inhalation of volatile compounds, ingestion of soil, contaminated food and water and direct dermal contact with pollutants in soil. Ingestion of soil is a potentially significant source of exposure, particularly in young children who may spend considerable time engaging in outdoor activity, as well as those occupationally exposed to soil particles and also sportspersons, where significant loading of hands, feet and knees may occur. It is clear therefore that there is in many cases a plausible completed route of exposure between a source of contamination and an exposed community (in accordance with source–pathway-receptor models).

Furthermore, the UK government has initiated an action plan based on the development of sustainable communities. This action plan, and £38 billion investment programme is designed to create thriving and vibrant communities which will improve everyone quality of life. This holistic approach to development of the communities in which we live outlines a large range of principles regarding the services and facilities essential for communities to deliver this high quality of life, so vital to many health indicators. These include a clean, safe environment and open public space where they can relax and interact. This takes the issues of land contamination beyond a traditional approach of 'significant possibility of significant harm' outlined by Part IIA and encompasses the effect of derelict land on the communities in which it resides, and the remediation of spaces for social interaction as well as housing.

It follows, therefore, that risk assessment of contaminated land must have, at is centre, a broad consideration of the potential public health consequences of exposure to contaminated land and that this should be undertaken in a in a multi-disciplinary, multi-agency manner, with robust and resilient channels of communication between public health professionals, local authorities, private consultants and the Environment Agency.

The Chemical Hazards and Poisons Division, therefore, has been developing a model in order to promote a standardised and consistent approach to handling and interpreting human health risk assessments, within the public health sector, pertaining to contaminated land. In order to do this, a contaminated land working group was established.

The Working Group

A contaminated land working group was established in 2006 in order to promote multi-agency working in this field, thereby enhancing communication and collaboration and underpinning a standardised and consistent national approach to public health risk assessment. The group was composed of representatives from the Chemical Hazards and Poisons Division and Local and Regional Services of the Health Protection, the Welsh Assembly Government, the National Public Health Service for Wales, Health Protection Scotland, local authorities and the Environment Agency and concluded that:

- Intra-and inter-agency channels of communication need to be robust, resilient and well established. External links with local authorities in particular were viewed as being of particular importance, as they hold statutory responsibility for contaminated land under Part IIA. However, links with other regulatory agencies, such as the EA and FSA were also undoubtedly of importance.

- Joint 'horizon scanning' and early notification and involvement of the HPA in the risk assessment and planning process were considered to be essential, allowing due consideration of the issues and time for a balanced, measured and critical assessment. Fortification of existing channels would allow this approach and add value and benefit to an integrated risk assessment.

- Public health implications (in the context of decisions on remediation of contaminated land), need to address physical aspects of disease, as well as psycho-genic and psycho-social aspects, in conjunction with wider indicators of health, such as economic factors and local environment. Therefore, a holistic approach is required, consistent with the concept of sustainable communities.

- Early communication of risk in a consistent, open and transparent message is vital, allowing rapid interaction, and in many instances allaying public concern. Therefore, the process requires multi-agency, multi-disciplinary consensus, allowing a consistent, unambiguous message to be provided to the public, minimising conflicting advice and related anxiety.

- Public health risk assessments pertaining to contaminated land need to be approached in a similar, consistent and nationally standardised manner, taking account of generic physico-chemical and toxicological properties as well as local community health issues and good practices in risk communication, required to ensure quality of life is not impacted, or at best improved.

- A research and development strategy is required, such that risk assessment regarding public health can be more precise. Additionally, factors outside the risk assessment criteria (e.g. socioeconomic factors, and perceived risk) can be better understood in the context of contaminated land. This requires interagency consideration and a discipline-bridging approach.

The achievement of such goals requires the development of a complimentary infrastructure. Accordingly, it was concluded that the following model should be developed:

- PCTs/ (Local health boards (LHBs) in Wales) should be the portal of entry for health care advice and support. Therefore, robust and resilient links between local authorities and local health care providers are crucial, providing the context for local communities, economic considerations and local amenities and allowing issues pertaining to contaminated land to be viewed in the context of sustainable communities. Where necessary and as appropriate, front line health services can liaise with:
- LARS (National Public Health Service in Wales; NPHS) who can provide further support and experiance in risk assessing the likely public health implications of exposure to contaminated land and its remediation. Where appropriate and necessary, further advice and support can be provided by:
- CHaPD, providing considered critical input to the local process, ensuring expert, but generic toxicological, environmental, chemical and epidemiological input that subsequently can be tailored to the site in question. CHaPD will also function as a "tertiary structure" for providing advice and support to allied agencies and organisations, such as Health Protection Scotland and the Environment Agency.
- A national centre of excellence responsible for developing a standardised, harmonised and consistent approach by distribution and dissemination of relevant material, co-ordination of training activities, development of standards and audit as part of on-going governance. This will be the remit of CHaPD-Cardiff.

The Forum

Following on from the conclusions and recommendations of the working group, a contaminated land forum has been established. With current representation from the HPA, the devolved administrations, The National Public Health Service for Wales, local authorities, the Environment Agency and the British Geological Survey, its agreed terms of reference are:

- To provide a platform for multi-disciplinary, multi-agency discussion around contaminated land, promoting an integrated, holistic approach, consistent with sustainable communities.
- To promote a consistent local, regional and national approach, thereby promoting uniformity and standardisation.
- To draw upon global experiences, such that national practice reflects best available evidence and practice and contemporary expert consensus opinion, thereby ensuring excellence.
- To develop protocols and guidelines for public health professionals, such that consistency is promoted and against which activity may be audited.
- To widely disseminate conclusions and recommendations, thereby promoting good practice
- To highlight current issues and ensure complimentarity with on-going training.

The inaugural meeting was held at Manchester in January 2007 and a further meeting was held at Newcastle in April 2007.

References

1 **Planning Policy Guidance Note 3: Housing (PPG3). DETR 2000. The Stationery Office (formerly HMSO), PO Box 29, Norwich NR3 1GN.**

2 **Indicators for land contamination, Science Report SC030039/SR, Environment Agency, Bristol, UK. ISBN: 1 84432 480 X**

3 **Survey of Contaminated Land in Wales. Welsh Office HMSO, London 1998.**

4 **http://www.environment-agency.gov.uk/subjects/landquality**

The Royal Commission on Environmental Pollution's 26th Report: The Urban Environment

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The Royal Commission on Environmental Pollution launched its twenty-sixth report: 'The Urban Environment', on the 6th March 2007, after considering all the evidence submitted, including that provided by the Health Protection Agency. The report focuses on three main themes:

- the built urban environment
- the natural urban environment
- health and well-being

According to the report, cities consume three-quarters of global resources and produce three-quarters of global waste, while only occupying 2% of the total land surface. There is currently an absence of a coherent urban environmental policy framework that tackles the quality of the urban environment and quality of life in an integrated and sustainable way, according to the Commission, although in the UK four out of five people live in cities and urban areas. Many of these urban areas are already experiencing difficulties meeting demand for good air quality, adequate water availability, affordable housing and a sense of place, compounded by the threat of climate change.

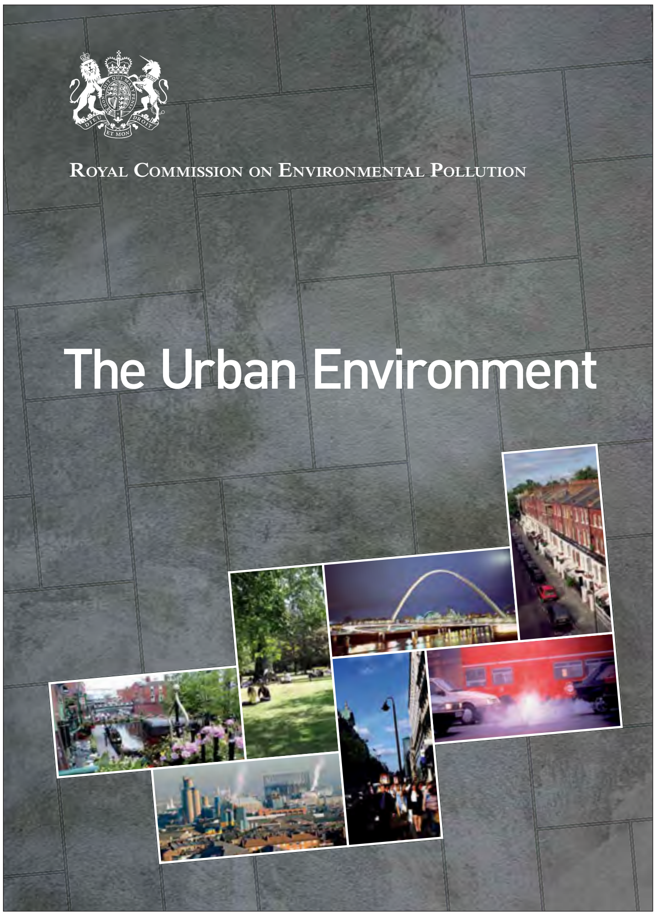
There is a complex interaction between well-being and the environment within which people live and work. According to the report, though there have been major improvements in British urban environments since the Victorian era, through the creation of parks, water and sewerage systems, the Clean Air Act of 1950, river clean up in the 1980's and 1990's, today's challenges are equally difficult. These include the threat of climate change, wasteful use of natural resources, pollution of air through the release of particles and a vast array of chemicals (including ozone, sulphur dioxide and oxides of nitrogen).

Environmental issues that were considered within the report, include the threat of climate change and tackling carbon dioxide emissions from urban areas; road traffic as a source of air pollution that causes damage to buildings, the natural environment and human health; local environmental quality; waste; water; the natural environment, including green space and brownfield sites; and the environmental impact of urban expansion.

The report considers the influence of the urban environment on the health and well-being of the people who live and work in towns and cities, focusing on air quality, climate, urban buildings, water and flooding, noise, infectious disease, and mental health. Traditionally, environmental factors have often been dealt with as single issues whereas individuals and communities are affected by a range of interacting factors. For example, road transport has direct impacts on health in terms of air quality and traffic accidents, but also influences the design of urban areas leading to an indirect effect on the well-being of residents. These effects include noise, air pollution, diffuse water pollution, reduced opportunities for exercise potentially contributing to obesity and cardiovascular disease, as well as impacts on landscape and communities. The report suggests that there should be a shift towards urban areas that promote the well-being of those using and living in them, in order to deliver positive public health outcomes, rather than just attempting to ameliorate the negative impacts of existing urban systems.

The report discusses how the natural environment of towns and cities should be protected and enhanced to maximise the benefit for urban ecosystems and people's health and well-being, and how the built environment needs to be improved as it can have major impacts on the environment through the use of resources and carbon emissions as well as impacting on attractiveness of the urban environment for those who live and work there.

According to the report, the urban environment places stresses and strains on human health and wellbeing that contribute to tens of thousands of deaths a year and a considerable burden of ill health. Major issues include air pollution, climate, obesity and mental health. Therefore, some of the recommendations of the report that are specific to health and well-being (Chapter 7) are that:



- the UK government, devolved administrations and local government implement further measures to reduce traffic levels in the air pollution 'hot spots' of towns and cities and, in particular, to bear down heavily on the most polluting vehicles. The Commission commends for wider adoption the recent proposal in London for a Low Emission Zone;
- the UK government promotes the concept of exposure reduction for reducing the overall health impacts of outdoor air pollutants and actively pursues such measures in domestic, EU and international policy on air quality;
- central and local government raise awareness of air pollution levels, including their effects on health, among all those who contribute to them, not just those who are at particular risk from detrimental health effects.
- Health Impact Assessments be incorporated explicitly in Sustainability Appraisals, Strategic Environmental Assessments and Environmental Impact Assessments. In order to implement this, the Commission recommends that the UK government and devolved administrations develop a statutory framework for including Health Impact Assessments in the planning process, accompanied by appropriate guidance.

The report can be accessed at:
http://www.rcep.org.uk/urbanenvironment.htm

FSA International workshop on food incident prevention and horizon scanning to identify emerging food safety risks, organised in co-operation with the European Food Safety Authority 5-6 March 2007

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Introduction

Although this meeting was particularly targeted by food regulators at farmers, manufacturers, retailers and caterers, the need for health links to food incident prevention was apparent from the Food Standards Agency (FSA) and international presenters. The workshop is a first step towards delivering the recently revised strategic plan objective of the Chemical Safety Division building and maintaining the trust of stakeholders in our handling of food safety issues and in particular, the target of working with the food industry, local authorities and other stakeholders to improve mechanisms for preventing and responding to food-related incidents.

The workshop is also the first project to be taken forward by to deliver European Food Safety Authority's (EFSA) recently adopted strategy on scientific cooperation. The strategy for networking and cooperation was agreed by EFSA's Advisory Forum in December 2006 and endorsed by the Management Board. Horizon scanning to identify and manage emerging risks was identified as one of the potential projects for cooperation.

A summary of the workshop can be found at:
http://www.food.gov.uk/news/newsarchive/2007/mar/emerging0307.

From the manufacturers' view, the following potential causes of incidents affecting food safety were:

- change in raw material/supplier (including change of origin of supply and variation in growing conditions)
- change in ingredients/recipe
- change in processing conditions and processing defects
- change in packaging, storage and/or distribution conditions
- inadequate training
- failure to be aware of, and comply with, legislative changes
- fraudulent practices and malicious activities
- new information on hazards associated with the product
- more sensitive analytical methods

UK Presentations

The FSA presented a summary of the food incidents by category in 2006 (Figure 1). The presentation indicated that food safety incidents may occur due to a variety of causes, the three most significant being environmental contamination, natural toxicants and microbial contamination.

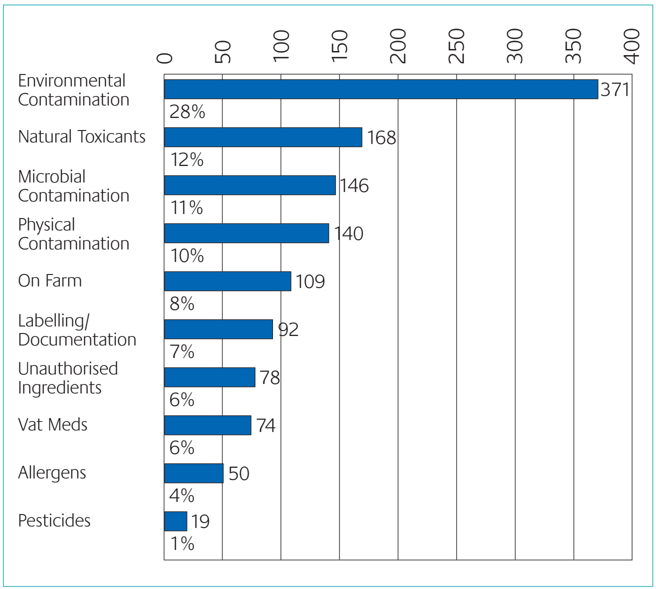

Figure 1: Food incidents by category in 2006 (data courtesy of the FSA)

Alistair Boxall from the Food Standards Agency (FSA) presented recent work he has undertaken with colleagues on horizon scanning for emerging environmental contaminants. He summarised the risk of environmental contaminants entering the food chain (Figure 2). He reported that the challenges from environmental contaminants which should be considered are:

- a large and diverse group of chemicals are found in environmental contamination
- there is a need for new analytical methods
- such chemicals may behave differently to 'traditional' contaminants
- the effects in humans may be subtle and difficult to determine
- limited data are available for environmental contaminants

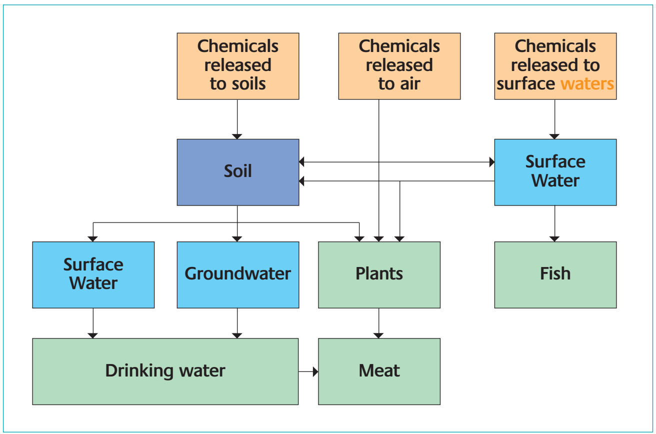

Figure 2: Schematic representation of the pathways by which chemical contaminants may enter the food chain (adapted from Boxall et al., 2007)

International Presentations

A number of presentations were given on behalf of a number of both other national and international bodies. **Dr Eric Poudelet, presented the approach to incident prevention of the Health & Consumer Protection Directorate General, European Commission**. Of particular note was information on the network of 40 community reference laboratories of which 13 are concerned with animal health, 12 with biological risk, 13 with chemical risk, one with genetically modified organisms and one with feed additives. For these the EU provides a 2007 budget of 10.5 million Euros. Each community reference laboratory has to co-ordinate the national reference laboratories by organising workshops, proficiency testing, sharing and developing reference methods and other activities. (For further information see http://ec.europa.eu/dgs/health_consumer/index_en.htm)

Dr Djien Liem, Head of Scientific Committee & Advisory Forum Unit of the European Food Safety Authority (EFSA) reported on the Opinion of the Scientific Committee related to the early identification of emerging risks. Scientific Committee Opinion on Emerging Risks (adopted on 31 May 2006) mentions the following sources for the collection & exchange of information:

- scientific literature
- members of Scientific Panels and Scientific Committees and their Working Groups and EFSA staff
- Advisory Forum
- Stakeholder Consultative Platform
- food agencies outside EU (e.g. US Food and Drug Administration, US Environmental Protection Agency, Health Canada, Japan Food Safety Commission, Food Standards Australia New Zealand)
- DG-Research projects
- EU [e.g. non-food SCs, European Medicines Agency(EMEA), European Centre for Disease Prevention and Control (ECDC), European Environment Agency (EEA)]
- international organisations [WHO, World Organization for Animal Health (OIE), Food and Agriculture Organization of the United Nations FAO, International Life Sciences Institute (ILSI), and others]

The aim is to monitor indicators to predict emerging risks that are often indirectly connected to the food and feed chain. Key tools for identifying emerging risks are early warning or horizon scanning systems. However this is resource demanding, requiring collaboration with organisations with similar interests. Some examples of the programmes and tools available for identification of emerging risks are listed below:

- GPHIN: Global Public Health Intelligence Network Public Health Agency of Canada
  http://www.phac-aspc.gc.ca/media/nr-rp/2004/2004_gphin-rmispbk_e.html

- INFOSAN: International Food Safety Authorities Network (WHO)
  http://www.who.int/foodsafety/fs_management/infosan/en/

- Pathfinder; Centers for Epidemiology and Animal Health Centers for Emerging Issues
  http://www.aphis.usda.gov/vs/ceah/cei/usaboutcontact/aboutus.htm

- GOARN: Global Outbreak and Alert and Response Network (WHO)
  http://www.who.int/csr/outbreaknetwork/en/

- GLEWS: Global Early Warning and Response System (FAO, WHO OIE)
  http://www.medindia.net/news/view_news_main.asp?x=12769

Dr Samuel Godefroy, Bureau of Chemical Safety Food Directorate, Health Canada showed the value of close links between health and food regulation. The Bureau has strong links to public health and Food/Diet and the Food Safety and Quality mandate allows for health of Canadians to be protected through ensuring safety and nutritional quality of food. He reported the concern over allergenic effects and the possibility of saving life as he speculated that it was thought that there were about 10-15 deaths each year from anaphylactic reactions to allergens in food. He reported that the most significant cause for food recalls was allergens (199 in 2000/1, 259 in 2001/2 and 159 in 2002/3).

Dr Nega Beru, Director of the Office of Food Safety Center for Food Safety and Applied Nutrition U. S. Food and Drug Administration (FDA) presented a paper on the FDA's Food Incident Prevention Activities. Of particular interest he reported that the FDA is now considering a new concept for relative risk of a food incident, which should be considered a function of:

- the *severity* of health effect
  - moderate: not usually life-threatening; no sequelae; normally short duration; symptoms are self-limiting; can include severe discomfort
  - serious: incapacitating but not life threatening; sequelae infrequent; relatively moderate duration
  - severe: life-threatening; substantial chronic sequelae or long duration

- the *likelihood* of hazard in a product consumed/used to cause the health effect with three categories: very likely; likely; and unlikely. The factors considered include:

  - the epidemiological link between the hazard and health effect due to consumption/use of the product (i.e., outbreaks, research)
  - frequency and level of the hazard associated with specific product (i.e., surveys, recalls, research, expert opinion)
  - frequency of consumption or use of product and amount (i.e., survey, expert opinion)
  - effect of production, processing, handling in terms of how they influence the hazard in the product at the point of consumption/use (i.e., lethality step in processing)

This severity and likelihood assessment is based on information submitted by FDA programme offices, other available data, and judgment. If multiple hazards are identified for a product, the hazard with the highest severity used to determine the overall relative ranking of that product.

Steve Crossley from Food Standards Australia New Zealand (http://www.foodstandards.gov.au/) reported that there were 68 product recalls in 2006. Of these 93% were consumer level recalls. The causes included undeclared allergens (e.g. peanuts, gluten), metal/glass/plastic fragments, Listeria and Salmonella, viral contamination (e.g. Hep A) and incorrect formulation.

Jenny Bishop, Department of Food Safety, Zoonoses and Foodborne Diseases, WHO, presented on **INFOSAN, the International Food Safety Authorities Network** (http://www.who.int/foodsafety/fs_management/infosan/en/). INFOSAN is a global network of national food safety authorities which improves national and international collaboration throughout the food chain continuum and disseminates important global food safety information. It is managed by WHO and was developed in 2004 in collaboration with FAO and has 51 Member States. The mandate for INFOSAN is food safety events that may have international implications. The Codex Guidelines make WHO responsible for a list of official contact points for food safety emergencies. Some recent INFOSAN Emergency Alerts include September 2006: metal fragments in dried fruit exported to six countries, November 2006: glass in oatcakes exported to three countries, November 2006: *Salmonella* in chocolate exported to one country and in December 2006: undeclared Vitamin K in milk and yogurt products in eight countries.

Lessons identified from INFOSAN Emergency Alerts include:

- surveillance and recall messages rarely contain enough information to determine international significance
    - information on international distribution is generally lacking
    - an initial verification request is required to collect information
- primary distribution can be traced and allow for targeted ALERT messages
- INFOSAN ALERT messages can be rapidly sent to specific affected countries
- secondary and tertiary distribution is often difficult to track to specific countries
- rapid ALERT messages to specific countries is not always possible
- INFOSAN has alerted the entire network

http://www.who.int/foodsafety/fs_management/infosan/en/index.html

Health Protection Issues

Following a series of workshops, some clear messages for health protection were identified. It was thought that is was very important for the FSA to collaborate closely with all stakeholders including manufactures, retailers, caterers as well as the Health Protection Agency. Manufacturer recall data is a measure of how often issues occur with food products but was not felt to be sufficient to document health hazards and risks. Some very positive developments internationally are occurring such as INFOSAN and EFSA. These groups also recognised the need for more health surveillance data on adverse health effects related to food.

Reference

Boxall, ABA, Rose M, Stein J, Sinclair CJ, Murray A (2007) Horizon scanning for emerging environmental contaminants. Project No. CO1040 Final Report, Food Standards Agency, UK.

Fourth Asian Congress of Emergency Medicine (ACEM), Kuala Lumpur, March 2007

Prof. David Baker (Consultant Medical Toxicologist)
Chemical Hazards and Poisons Division (London)

The fourth annual congress of the Asian Society of Emergency Medicine took place in Kuala Lumpur between the 23rd and 25th March 2007. Organised jointly by the fast growing Asian Society for Emergency Medicine, the Malaysian Society for Traumatology and Emergency Medicine and the Malaysian Ministry of Health, the meeting covered the full range of topics of concern to emergency physicians including the management of toxicological emergencies and chemical incidents. There is growing realisation worldwide that trauma may be physical, toxicological or a combination of both and that there are common pathophysiological pathways and emergency medical responses. The requirement for early Advanced Life Support (ALS) for management of airway and ventilation in a contaminated zone is a good example. The requirement to provide ALS following a chemical release has been defined as 'TOXALS' for over 10 years.[1]

Several countries now have medical and paramedical personnel who are trained and equipped to provide ALS in a contaminated zone for casualties who would otherwise perish before decontamination and onward evacuation. The United Kingdom Department of Health has recently launched its own initiative in this area, the 'Hazardous Area Response Teams' (HART) which are now operational in London and may be extended to the rest of the country. The author gave a presentation to the congress which covered the requirement for TOXALS, the special equipment options available for the management of airway and ventilation in a contaminated zone and the development of the HART initiative.

The importance of urban radiological release was recognised by the congress with a keynote lecture by Professor Kazuhito Maekawa from Tokyo, who has done much to raise awareness of the problems of radiological and nuclear trauma over recent years. The presentation emphasised that emergency medical treatment must take precedence over decontamination and that 90% of radiological contamination can be removed by taking off clothing, a point which is also thought to be relevant to chemical contamination.

In another plenary presentation, Dr Rick Lau (Director of the Hong Kong Poison Information Centre) covered recent advances in clinical toxicology which are pushing the boundaries of current emergency medical practice. The Hong Kong centre was set up over two years ago and provides a 24-hour service and a training programme in toxicology. Dr Lau noted the major worldwide expansion in information services which had contributed to emergency practice, citing POISINDEX ® and TOXBASE ® as examples which are used in his service. However there are major differences around the world in what modern advances are available for toxicological use. In Hong Kong for example, human botulinum immune globulin is not available and hydroxycobalamin for cyanide poisoning is not used because of its high cost.

Other advances affecting emergency medical practice that were mentioned included the abandonment of gastric lavage in Hong Kong as a routine practice and the advantages of the use of activated charcoal which was highlighted by a clinical trial in Sri Lanka for oleader poisoning.[2] New advances in antidotes were also discussed, including the use of human botulism immune globulin for the treatment of infantile botulism and the use of recombinant factor VIIa for warfarin poisoning.

In a more controversial area, the Hong Kong department has recently changed its use of pralidoxime for organophosphate poisoning based on the findings of a recently published study by Pawar and colleagues in India.[3] This study is the first known randomised trial that includes large doses of pralidoxime and suggests that higher continuous doses would be superior to the lower dose (less than 6 g a day) intermittent bolus regime that is most commonly used in Asia. This region is important because it is where most of the pesticide poisoning in the world takes place (accounting for approximately two-thirds of suicide deaths). The study also challenges another accepted assumption that dimethylated acetylcholinesterase responds poorly to oximes because such drugs do not prevent the dimethyl ester from rapidly ageing (ageing refers to a further chemical reaction of the inhibited enzyme, which completely prevents subsequent reactivation). Two-thirds of the high-dose group had ingested dimethoate, which is more lethal and less responsive to oxime treatment, and yet their mortality was low at 1%.

However, it should be noted that accompanying the original paper the Lancet published an editorial which was critical of the Pawar study.[4] This was an unusual step, since the journal had assisted in the reporting of the study by providing two reviewers, who assisted in the preparation of a revised manuscript, one of whom travelled on-site to discuss critical issues with the author. Specific criticisms in the editorial included: (1) a lack of data to confirm or explain a causal link between the treatment and the outcomes; (2) the response of acetyl-cholinesterase and neuromuscular function was not measured, nor was the effect of treatment on the pesticide concentration; and (3) the specific pesticide ingested was not even confirmed. There were also aspects of the trial design that might have inadvertently led to bias, the trial was underpowered, there was no blinding, there was a small fixed-block size that could have undermined allocation concealment and there was no reproducible algorithm for atropine dosing or pralidoxime cessation.

These problems might relate to the limited support for clinical research in Asia, especially for independent clinical investigators outside the few centres of excellence. This is of particular importance given that most future studies on pesticide poisoning will be in such settings in developing countries. Some thought should be given as to how best to support future studies, because at present, there is no coordinated international support for such efforts, even though there are many individuals, organisations, and governments who might be regarded as stakeholders. The Lancet editorial asks whether the support provided by the journal in the publication process might have been better deployed earlier in the design of the study.

Given the findings of the high dose oxime and the editorial criticism, the decision to change emergency department practice in Hong Kong might be considered to be premature. However, what is certain is that pesticide poisoning remains a major problem for emergency physicians all over Asia who should have the continued support of colleagues in Western Countries. Meetings such as ACEM provide an excellent opportunity to enable this to occur.

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Children's Environment and Health Action Plan for Europe International Expert Workshop World Health Organization Regional Office for Europe International Workshop, Oxford, 5th and 6th March 2007

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Summary

An international workshop was organized by the WHO Regional Office for Europe and hosted by the Chemical Hazards and Poisons Division (CHaPD) of the HPA. The meeting brought together topic specific experts to further develop the Children's Environment and Health Action Plan for Europe (CEHAPE) table of child-specific actions. In detail, the meeting aims were to discuss (1) the methods to be applied; (2) the list of interventions to be scrutinised to determine their effectiveness to improve children's environmental health; and (3) the corresponding literature than needs to be reviewed. The experts came to an agreement on the methodology used to evaluate the effectiveness of these actions, reviewed and updated a list of child-specific actions relevant to reducing risks of disease and disability arising from exposures to chemicals, ionising and non-ionising radiation and noise during pregnancy, childhood and adolescence. Once finalised, these tables will provide national and local health and environment authorities from WHO Europe with a list of actions they can take to protect children from environmental risk factors.

Background

A European Environment and Health process was established in 1989 (First Ministerial Conference on Environment and Health, Frankfurt-am-Main) to support WHO Member States as they plan and implement national and international environment and health policies[1]. This process is led by the Regional Office for Europe and has resulted in a series of five-yearly ministerial conferences on environment and health. The most recent took place in 2004 in Budapest and resulted in the development of the Children's Environment and Health Action Plan for Europe (CEHAPE) committing all Member States of the WHO European Region to the development of national Children's Environment and Health Action Plans (CEHAPs), with a view to protecting the health of children from environmental hazards[2] (Box 1). The CEHAPE consists of four Regional Priority Goals (RPGs), focusing on water supply and sanitation; injuries and physical activity; air pollution; and biological, chemical and physical hazards (Box 2).

To help Member States in developing CEHAPs that specifically address their priorities and needs, WHO provides guidance and support to national and local health and environment authorities to facilitate the development of national CEHAPs and to enable the sharing of information between Member States (see website for further detail[2]). Part of this guidance included developing an original set of tables containing a set of actions that have been proved to be effective in protecting children's health and environment[3]. These tables were put together for the 4th Ministerial Conference in 2004 with contributions from Member States, international agencies and non-governmental organisations (NGOs) and are meant to be a practical tool to provide Member States with a list of actions they can take to protect children from environmental risk factors. In establishing these actions, it is important that they are backed up by scientific evidence that supports the effectiveness of the actions. For further details on the full list of the original table of child-specific actions refer to WHO (2005)[3].

Box 1: Budapest Declaration

The declaration of the Fourth Ministerial Conference on Environment and Health in 2004 calls on the Member States in the WHO European Region to adopt the Children's Environment and Health Action Plan for Europe (CEHAPE) and in doing so, *"... reaffirm the commitment to attaining the Regional Priority Goals referred to in the CEHAPE and be guided by the* ***table of child specific actions*** *on environment and health for possible inclusion in national plans."*
(Budapest Declaration, paragraph 19b)[4]

Box 2: Children's Environment and Health Action Plan Regional Priority Goals

Regional Priority Goal I. We aim to prevent and significantly reduce the morbidity and mortality arising from gastrointestinal disorders and other health effects, by ensuring that adequate measures are taken to improve access to safe and affordable water and adequate for all children.

Regional Priority Goal II. We aim to prevent and substantially reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure and supportive human settlements for all children.

Regional Priority Goal III. We aim to prevent and reduce disease due to outdoor and indoor air pollution, thereby contributing to a reduction in the frequency of asthmatic attacks, in order to ensure that children can live in an environment with clean air.

Regional Priority Goal IV. We commit ourselves to reducing the risk of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), physical agents (e.g. excessive noise) and biological agents and to hazardous working environments during pregnancy, childhood and adolescence.

Aims and objectives of the workshop

When the original table of child-specific actions was developed, there was an expectation that it would be reviewed in light of new evidence and experience with the aim of preparing and presenting a revised version of the table (WHO, 2005)[3]. The WHO in Rome was charged with the task to develop the tables and to undertake a thorough review of the literature regarding the effectiveness of actions. This process is on-going and has included holding a number of international workshops to review the child-specific actions for each RPG. The purpose of the Oxford workshop was to review the actions relevant to RPG IV and to specifically focus on actions relevant to reducing risks of disease and disability arising from exposures to chemicals, ionising and non-ionising radiation and noise during pregnancy, childhood and adolescence. The ultimate goal of this process is to reduce the proportion of children which may suffer ill health from exposure to these agents, to include for example, the proportion of children with birth defects, developmental disorders and to decrease the incidence of melanoma and non-melanoma skin cancers in later life and of other cancers in childhood.

Process and outcomes of the workshop

This international workshop was organised by the WHO Regional Office for Europe and hosted by the Chemical Hazards and Poisons Division (CHaPD) of the HPA. It took place in Oxford on the 5th and 6th of March 2007. The meeting brought together topic specific experts to further develop the CEHAPE table of child-specific actions. In detail, the meeting aims were to discuss (1) the methods to be applied; (2) the list of interventions to be scrutinised to determine their effectiveness to improve children's environmental health; and (3) the corresponding literature than needs to be reviewed.

In an effort to achieve the highest possible level of scientific soundness, a number of international experts from a number of countries (Austria, France, Israel, Italy, Germany, the Netherlands, Turkey, Sweden, Switzerland and the United Kingdom) were invited to participate in this review process. Prior to the expert review meeting, experts were provided with a draft of the methods used, the current version of the list of child-specific actions (which were put together in 2006 and are based on the original table presented at the 4th Ministerial Conference in Budapest in 2004), and the literature identified so far that assesses the effectiveness of these actions. This was used as the basis for discussions in the working groups. There three working groups with about 6 experts each on the topics of hazardous chemicals, noise, and radiation.

The whole process of revising and updating the table of actions for RPG IV includes the following specific steps:

1. Developing a grading scheme to evaluate the effectiveness of the specific actions based on scientific literature;
2. Developing the list of specific actions;
3. Carrying out a literature review for evidence to support specific actions;
4. Incorporation of new specific actions identified during the literature review into the table;
5. Grading of evidence for specific actions; and
6. Ranking of the specific actions by the available evidence.

During the meeting the experts came to an agreement on the methods to evaluate the literature and the grading used, reviewed the list of specific actions and proposed changing and incorporating new child-specific actions based on expert opinion provided during the meeting (i.e. points 1 and 4 above). The final outputs of the meeting are a list of specific actions and accompanying evidence as agreed in the specific working groups as well as the agreed methods.

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Advisory Committee for Natural Disaster Reduction

A Conference of European Scientific Good Practice for Disaster Risk Reduction: Communicating Resilience 14th and 15th November 2006, Thames Barrier Installation, London.
HPA Rapporteurs: Virginia Murray, Simon Cathcart, Rebecca Cordery, James Wilson, Juliana Chow

Introduction

The Advisory Committee for Natural Disaster Reduction (ACNDR) conference on 'European Scientific Good Practise for Disaster Risk Reduction: Communicating Resilience' was held on the 14th and 15th of November, 2006, at the Thames Barrier Installation London. The conference was supported by the Environment Agency (UK); Civil Contingencies Secretariat; Health Protection Agency; Society for Earthquake and Civil Engineering Dynamics and the University of Portsmouth.

The conference aims included:

- to share best practice in natural disaster reduction communication
- to help to implement the Hyogo framework 2005 for natural disaster reduction(http://www.unisdr.org/eng/hfa/docs/Hyogo-framework-for-action-english.pdf).

The conference objectives included encouraging European collaboration in disaster risk reduction via the UN International Strategy for Disaster Reduction (ISDR) National Platform framework.

The conference considered international aspects of reducing risks from natural disasters, including: heat waves and cold weather, flooding, volcanic and seismic disaster risks. There was also a consideration of science and policy for disaster risk reduction.

The conference began on the morning of the 14th of November, with a very informative and insightful visit to the Thames Barrier. Andy Batchelor of the Environment Agency welcomed participants to the Thames Barrier, outlining its history, its role in flood defence in London. He also provided an overview of the Environment Agency's flood awareness campaign for UK residents.

Session 1: International Overview

The afternoon session of the 14th of November consisted of short presentations by European partners on the work of their respective agencies. Speakers gave overviews of the structure of their organisations and some spoke on specific disasters (e.g. floods, heatwaves, landslides) or in detail on a particular type of disaster scenario (e.g. forest fires). Themes included:

- issues about where best to operate systems from (local, regional or national)
- cross border issues
- planning using retrospective analysis

Bruce Mann, Director (UK Civil Contingencies Secretariat) provided an overview of the role of the Civil Contingencies Secretariat (http://www.ukresilience.info/ccs/index.shtm) and discussed surveying and assessing risk as part of planning for resilience. One of the questions asked was on encouraging and making use of overseas assistance in planning strategies. He outlined that the use of overseas assistance was generally not considered in the UK at the planning stage but would be seen as an 'added bonus' if it was offered.

A presentation was given on behalf of the German Committee for Disaster Reduction (DKKV) (http://www.dkkv.org/) by Karl-Otto Zentel who gave examples of natural disasters that have occurred (such as flooding on the Rhine, and the 2003 Heatwave); provided an overview of activities of the committee (e.g. post hoc analysis, planning, legislation (flood management), provision of public information). The importance of political support for such activities was outlined as well as the consideration that national platforms and multi-stakeholder involvement were needed.

A presentation was given on behalf of the Swedish Rescue Services Agency (http://www.srv.se/templates/SRV_AreaPage____13672.aspx). An outline was given on the role of the agency – decrease accident risks and natural hazards; along with types of natural hazards that have been experienced in Sweden (including windstorms, flash-floods, landslides and forest fires). The presentation also included tasks being undertaken by the agency, including the setting up of a 'national platform'; activities related to disaster risk reduction; knowledge management and research; a national database of disasters; climate change networks; and ongoing and preventative and mitigation actions for natural disasters (e.g. hazard mapping, river workshops, early warning systems, national resources).

Ulrike Kastrup (Switzerland) gave a presentation on wildfire warnings. Two aspects were considered: (1) technical (detection, monitoring etc.) and (2) social (communication to public – which is less well-developed). Examples were given from in France, Spain, USA, and Australia. She outlined that there were three stages to warnings: (1) short (i.e. act now – leave or shelter); (2) medium (during fire weather); and (3) long (all year round). The approaches taken to issuing warnings on wildfires in Australia was documented, these include: the need for self-preparedness, community involvement and partnerships. The use of media and the relationship of the media with emergency services were also outlined along with the importance of empowering communities in dealing with wildfire.

A presentation by Fleur Alink of the Netherlands (ERC) outlined the history, roles and activities of the ERC, including: communication at local, regional and national levels; production of consistent messages and publications; media analysis; advice and support provided to the press and members of the public. The presentation also outlined outputs of the ERC, which include: call centre/website (http://denkvooruit.crisis.nl/) and an SMS alerting system.

A presentation was given by Vladimir Mikule from Hydroprojekt (Czech Republic) which included a historical perspective on natural disasters, including flooding (River Elba, 1997 and 2002) and discussed cross border involvement (Slovakia, Germany) when dealing with natural disasters (http://www.hydroprojekt.cz/index1.htm).

Walter Ammann gave a presentation on the Swiss National Platform for Natural Hazards (http://www.cenat.ch/) and spoke about examples of natural disasters (e.g. flooding) and other disasters (e.g. those related to terrorist activity).

David Alexander from the University of Florence spoke on natural disasters from the Italian perspective. Several types of natural disaster were discussed along with issues related to managing such disasters. One of the examples given was the issue of building collapses in seismic areas (especially schools) and the high costs required to protect against this. The issues related to dealing with natural disasters included the organisation of emergency response.

A presentation by ISDR outlined why national platforms are valuable for dealing natural disasters. The Hyogo Framework was mentioned along with the international issue of climate change (http://www.unisdr.org/eng/hfa/docs/Hyogo-framework-for-action-english.pdf)

Session 2: Heat waves and cold weather

Three presentations reviewed the health impacts from heatwaves and cold weather. Pascal Empereur-Bissonnet, Department of Environmental Health, National Institute of Public Health Surveillance reported on heat waves and public health response: the French experience. The presentation concentrated on three aspects:

- the health impact of the 2003 heat wave
- the French public health response
- the July 2006 heat wave

In August 2003, France suffered its worst ever recorded heat wave in terms of intensity, duration and geographical extent. The temperature rose rapidly, particularly in and around Paris, and remained high (over 30oC) for almost 10 days. The National Institute of Public Health Surveillance (InVS) have performed a mortality assessment (http://www.invs.sante.fr/) which used data from death certificates and involved a count of the daily number of deaths observed and a subsequent estimate of excess mortality. This provided the following summary statistics:

- 14,800 excess deaths
- More females died compared to males (approximately 9,500 compared to 5300)
- Most excess deaths were in the over 75 years age band (12200 of the 14,800 excess deaths)
- Also important to note that there were an estimated 2400 excess deaths in the 45-74 years age band and 142 deaths in under 44 year olds.
- The ratio of mortality (observed/expected deaths) was greatest for retirement homes and individuals' homes.
- Mortality was greatest in and around Paris (inland northern/central France)

Risk factors associated with increased mortality include:

- Socio-economic status -increased OR (3.6) for workers
- Dependency (i.e. people needing help e.g. ADL or bedridden)
- People with cardiovascular, psychiatric or neurological conditions
- People living in rooms directly below building roofs

Living in a building constructed after 1975 or an old building improved by thermal insulation was found to be protective, as were the use of cooling devices and reducing clothing. The study also involved a search for a shift in mortality in 9 cities across France but there was no demonstrable harvesting effect in the days or weeks following the heat wave. The public health response in France has centred on the development of a national heat wave plan with an integral 'heat health watch warning system' (HHWWS). The plan describes three levels of alert; seasonal watch; warning and action (before and during a heat wave); and maximum mobilization (in the event of aggregating factors e.g. power blackouts).

Preparatory action has included attaining funding for nursing homes which are now required to have one cool room. Communication plans have been developed and messages of prevention. There is now proactive identification of the elderly, at risk population at a local level.

The HHWWS (operated by InVS and Meteo France) includes surveillance of biometeorological indicators and weather forecasts with daily analysis of mortality and morbidity data. This is now active in summertime with the aim of triggering proactive communication with targeted press/media and awareness of the needs of vulnerable groups in affected areas. This system was tested this summer, 2006. This was the second warmest summer on record in France (after 2003). The absolute excess mortality associated with the heat wave has been estimated at 1388 deaths and the question was raised: 'what might have happened if the heat wave plan had not been in place?' In reply, it was stated there may have been approximately 6000 excess deaths.

Sari Kovats, Lecturer, Public and Environmental Health Research Unit, London School of Hygiene and Tropical Medicine presented research into health effects of hot and cold weather. She reiterated that risk factors for effects in the UK included the elderly, those living in residential care and nursing homes, chronic diseases, urban populations, children and physically active adults and women more at risk than men. Risk factors for cold effects are: being elderly, living in homes with low thermal efficiency, rural populations, inappropriate clothing and protection from cold outdoors and possibly women more at risk compared to men. Social isolation has been highlighted as putting people at risk and the importance of plans to access people living alone was noted. Passive warnings are likely to be useless in this group and active contact is probably essential.

The problems with timely surveillance were discussed. Temperature is a good measure and is rapidly available. However, it is known that no system is sensitive enough to pick up slight increases in death rates across the country in under 8 -14 days. There is therefore a need to improve forecast models and to link this to real time health data (mortality data, surveillance for syndromes of symptoms and calls to NHS direct help lines for example). Heat and sun stroke calls are now monitored as part of the UK heat wave plan.

Finally the way forward for health protection was discussed, including: the identification of at risk groups and plans for evacuation as necessary; risk communication to the elderly and their carers as they do not feel the cold; the investigation of guidelines and legislation developed in other European countries (e.g. cool rooms are mandatory in France in nursing homes and there are specific care guidelines in Germany).

Clare Bryden from the Met Office reported on protecting health and reducing harm from heatwaves and cold weather in England. She outlined the development of the 'heatwave plan for England' published by the DH in July 2004. This followed the hottest summer in Europe on record in summer 2003 (highest recorded temperature of 38.5oC) and there were an estimated 2091 excess deaths in England and Wales.

The presentation then moved on to the effects of cold weather. There were an estimated 25 700 excess deaths in the winter of 2005/6 (20 200 in the over 75 year olds). Respiratory and circulatory diseases are responsible for most of the increased mortality. England seems to have disproportionately high deaths due to cold relative to other European and Scandinavian countries but it is thought that simple protective measures could ease this greatly. The Met Office are assisting this by providing Health Forecasts which should trigger anticipatory care for at risk groups (e.g those with COPD and other chronic diseases).

Session 3: Flooding

David Rooke (Environment Agency) presented the UK Flood Risk Assessment which estimated that approximately 2.3 million properties are at risk (approx. 4.4 million people) and that the infrastructure at risk is valued at £230 billion. The UK Flood Map has been available since December 2000. However many of those affected in the autumn 2000 flooding were unaware of it. The Environment Agency has been working on building awareness. 'Restoration to normality' after flooding may take a long time. Some residents affected by Carlisle Flooding (2005) have still not moved back into their homes (by November 2006). An overview of the Environment Agency's flood warning service was presented: members of the public can be given warning messages via mobile telephone, landline, fax, email and SMS messages. Messages can be given in both English and Welsh. Some ethnic radio stations may broadcast in other languages. Options for other actions to minimise risk were discussed. A strategic approach has been developed for different catchments in the UK and there are shoreline management plans.

The risk of flooding in London was discussed and it is considered that the Thames Barrier may still be effective by 2030. The Thames Barrier was designed to cope with increased tilt of the SE of England and sea-level rise. The present Thames Barrier could be refurbished; this would depend on factors such as the increase risk of flooding and the factors contributing to it, such as climate change and sea level rise. Flood defences may be designed for 1/100 year flood, the Thames Barrier was designed for a 1/10000 year flood, other defences may be designed for a 1/15 or 1/20 year flood.

The case study of the future of the Thames Estuary was presented. To implement flood protection, the current cost projection is £4 billion (over 20-50 years). Possible options for future flood defences could include new barriers, or improve existing defences.

Dan Balteanu presented on the Flood Risk Romania, Natech and trans-boundary impacts. The factors influencing risk of flooding in Romania were outlined (neo-tectonic movements, history of industry, possible influence of climate change, management). Romania has 30% of the surface of the River Danube, over 1000 km in 4 sections. The patterns of flooding on the river relate to neotectonic movements and there are several historical management works on the river. The risk of flood flooding may increase due to climate change. In central and eastern Europe there is an increased potential for torrential rain and extreme events, including flooding. Case studies on flooding were presented: NATECH in the Tisza-Danube basin and Ocnele Mari salt mining failure; flash-floods, debris flows and landslides in the Carpathians; 2005 floods in the Romanian Danube basin; 2006, the highest flood in the recorded history of Danube. Flood mitigation was also discussed and requires:

- Synergic measures in the whole Danube basin with trans-boundary plans for hazard mitigation
- Sustainable river basin management
- New criteria for the hytrotechnical works design
- Succession of polders in the flooded enclosures
- Circular dykes around localities
- New legislation based on detailed hazard mapping
- Sectors of wetlands restoration
- Public awareness

Karel Bures presented the exciting development of Mobile Flood Protection Barriers-River Vltava, Prague, (Hydroprojekt). The history of flood protection in Prague was outlined along with importance of flood protection. There have been flood protection systems in Prague since 1920. Flood protection systems in Prague currently include dykes, walls, and portable barriers. A mobile flood barrier scheme has been established at an estimated total cost of ?82m. The scheme was developed in a number of stages. The mobile flood barrier system consists of aluminium barriers connected to steel posts that fit onto stone foundation sills on pavements. The advantages of mobile barrier system include: low weight, ease of transport, ease of assembly. With approximately 30-50 people working, the whole system can be erected in approximately 12 hours.

Gerd Telzlaff presented the lessons learned from the River Elbe Floods (11-13th August 2002). The factors leading to the inundation and flash floods included narrower channels, reduction in flood plain area and high rainfall (406mm/3days and associated low pressure system). Flood warning was obtained from weather forecasts. However it was difficult to manage reservoirs (there is the potential to create artificial flood waves if reservoirs are emptied to quickly). Lessons identified included the need for more reservoirs and better weather forecasts. Of note the mitigation plans from 1895 are similar to those in place in 2002. Mitigation consists of a 5 point programme:

- Give rivers more space, reduce peak levels, reduce damage potential
- Internal coordination
- European Union guidance in preperation
- Re-evaluate role of river traffic
- Immediate plans of action

Session 4: Volcanic and Seismic Disaster Risks

In this session there was an overall review of earthquakes in Europe, followed by a report on EXPLORIS which was an EU funded project on 4 volcanoes including Mt Vesuvius. The final talk was a review of the earthquake risks in Greece, estimating the human and economic lost and reflecting on the lessons learned from past earthquakes. The main points identified were:

- In Europe (and other developed regions of the World), earthquake impacts have been reduced in recent decades owing to better science and engineering to mitigate them. The hazard continues as before but careful building and planning reduces our exposure and, therefore, the risk.

- However, land-use planning still needs to be improved in some earthquake-prone areas, and public awareness needs to be sharpened.

- Buildings constructed before modern codes and regulations were introduced (eg in Greece) require retrofitting to improve their capacity to withstand expected shaking levels, as do those recently damaged in earthquakes, together with historical monuments.

- Earthquakes cannot be predicted but the potential impacts can be, leading to a focus of resources on building more robust environments where they are most needed.

- Further research needs include a focus on border regions where past collaboration has been weak and the vulnerability of communities is less well understood.

- The NE Atlantic and Mediterranean do not have tsunami warning systems although the hazard is well-known from historical times. For example, the 1755 "Lisbon" earthquake killed some 60,000 people, mainly from the tsunami, in Portugal and North Africa. International discussions are in-hand to remedy this situation.

- The principal threat from volcanoes is to the Naples region of Italy in the shadow of Vesuvius where 500,000 people would need to be evacuated. Its eruption in 79AD resulted in the burial of Pompeii, and it has erupted since then. (The last eruption in 1944 was of a low intensity).

- Developing countries are much further behind in providing their citizens with protection from both earthquakes and volcanoes, and they need assistance from developed countries.

Session 5: Science into Policy for Disaster Risk Reduction

Three speakers provided overviews of science into policy by considering how their organisations could contribute in the future to natural disaster risk reduction.

Professor Pat Troop reported on the work of HPA and how it supports natural disaster response, as with any other incident, by:
- Defining the immediate and continuing risks to public health
- Identification of the population at risk
- Providing advice and taking action to protect health
- Public reassurance
- Identification of delayed health effects
- Learning for the future

She also reported on the potential benefits of public health follow-up: being able to contact individuals with new evidence or advice, reporting on long term effects, being able to provide reassurance regarding follow up, identifying true levels of continuing health problems, and by being proactive (thereby reducing alarm) and finally, the ability to provide information for future incident response.

Dr Franziska Matthies on behalf of Dr Bettina Menne for the WHO Regional Office for Europe, presented information on 'Climate Change and Health: Information for and Support of Policy Development for Disaster Risk Reduction in Europe'. She presented information relating to the work on the Hyogo Framework, with the focus on risk management, the European Ministerial Conferences for Environment and Health and on the need for national disaster preparedness (which needs to include health and issues relating to climate change and climate change adaptation).

Dr. Walter Ammann, from the International Disaster Reduction Conference (Davos Switzerland) presented the Swiss national strategy to cope with natural hazards – needs for further research. He included:

- Risk concept and risk management procedures.
- Vulnerability research (structures, infrastructures/ complex systems, social vulnerability, ecological vulnerability).
- Tools to improve the stakeholder dialogue.
- Communication and information platforms, procedures and software tools (internet).
- Role of the media.
- Loss estimate models for different kinds of hazards/ risks including secondary loss estimate models.
- Critical infrastructures.
- Disaster risk finance tools.
- Education and training.

Conclusion

This meeting generated extensive and valuable discussion. The need to collaborate across Europe to improve our ability to plan for and respond to natural hazards was thought to be vital. Areas for research and development were identified and there was thought to be significant opportunities to share initiatives.

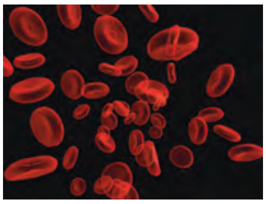
HEALTH Protection *2007*

Health Protection Agency

17-19 September
University of Warwick





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Programme outline *(subject to change)*

Monday 17 September
HCAI symposium "What works and what doesn't" *(organised with the Department of Health, Healthcare Commission, Hospital Infection Society and ICNA)*
Prison health symposium *(organised with Health Protection Scotland and the Scottish Prison Service)*
Chronic effects of environmental factors symposium
Zoonotic infections – current concerns and new developments *(organised with Med-Vet-Net)*
Standards in diagnostics *(organised with NIBSC)*
Turnberg Lecture by Professor John Collinge

Tuesday 18 September
HCAI symposium "What works and what doesn't" *(organised with the Department of Health, Healthcare Commission, Hospital Infection Society and ICNA)*
Sexually transmitted infections symposium
International health symposium *(organised with the Department of Health)*
Modelling and bioinformatics workshops
Attended poster viewing and conducted poster rounds
Gold command experience workshop
Responding to the challenges of point of care testing

Wednesday 19 September
Antimicrobial resistance symposium *(organised with BioMerieux)*
The changing landscape of diagnostic microbiology symposium
The public health response to the polonium-210 incident
Dealing with public health emergencies – good communications and lessons learned
Vaccines
Transmission of variant CJD – what are the public health concerns?
Public engagement and health protection *(organised with NHS Centre for Involvement)*
Microbiology for non-microbiologists course

For further details and to book your place online please visit

www.healthprotectionconference.org.uk

Training Days for 2007

The Chemical Hazards and Poisons Division (CHaPD) considers training in chemical incident response and environmental contamination for public health protection a priority. The 2007 programme is being developed to offer basic and more detailed training, along with the flexibility to support Local and Regional Services initiatives as requested.

Contaminated Land

25th September 2007, Holborn Gate, London

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

The Training Day will provide delegates with the tools and information to provide an appropriate and timely Public Health response to contaminated land investigations.

General aims:

- To understand the role of public health in the management of contaminated land investigations
- Awareness of the appropriate and timely response to contaminated land investigations
- To understand the interaction with other agencies involved in the investigation and management of contaminated land
- To review current issues relating to the management of contaminated land incidents and investigations including:
    - The Toxicology of Soil Guideline Values
    - The Local Authority Perspective on Implementing Part II A
    - Bioaccessibility in Risk Assessment
    - The Food Standards Agency (Allotments)

A maximum of 40 places are available

Booking Information

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 759 2872 or chemicals.training@hpa.org.uk

CHAPD (L) staff are happy participate in local training programmes or if you would like training on other topics, please call Virginia Murray or Karen Hogan to discuss on 0207 759 2872.

Events organised by other HPA centres

If you would like to advertise any other training events, please contact Karen Hogan (chemicals.training@hpa.org.uk).

How to Respond to Chemical Incidents

30th October, Holborn Gate , 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 of public health in the management of chemical incidents
- An awareness of the appropriate and timely response to incidents
- An understanding of the interactions with other agencies involved in incident management

These training days also have specific educational objectives. These are, to be aware of:

- The processes for health response to chemical incidents
- The type of information available from CHaPD, London to help the health response
- The resources available for understanding the principles of public health response
- The training needs of all staff required to respond to chemical incidents

A maximum of 40 places are available

Level 2 Chemical Incident Training

The HPA is developing a chemicals training programme for HPU and LRS-regional HPA staff to achieve 'Level 2' competence for the management of chemical incidents and to meet the requirements of the Health Care Commission relevant to preparedness and response to chemical incidents (core standard 24). We are currently consulting on the programme, and aim to pilot it later this year.

Please see the CHaPD Training Events web page for regular updates: http://www.hpa.org.uk/chemicals/training.htm

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