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Recent advances to address European Union Health Security from cross border chemical health threats

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ABSTRACT

The European Union (EU) Decision (1082/2013/EU) on serious cross border threats to health was adopted by the European Parliament in November 2013, in recognition of the need to strengthen the capacity of Member States to coordinate the public health response to cross border threats, whether from biological, chemical, environmental events or events which have an unknown origin. Although mechanisms have been in place for years for reporting cross border health threats from communicable diseases, this has not been the case for incidents involving chemicals and/or environmental events. A variety of collaborative EU projects have been funded over the past 10 years through the Health Programme to address gaps in knowledge on health security and to improve resilience and response to major incidents involving chemicals. This paper looks at the EU Health Programme that underpins recent research activities to address gaps in resilience, planning, responding to and recovering from a cross border chemical incident. It also looks at how the outputs from the research programme will contribute to improving public health management of transnational incidents that have the potential to overwhelm national capabilities, putting this into context with the new requirements as the Decision on serious cross border threats to health as well as highlighting areas for future development.

1. Introduction

Chemical releases can occur from accidental or deliberate releases and from natural disasters. Chemical incidents may be on a small or large scale, and can give rise to a number of primary or secondary chemical casualties and fatalities (Baker, 2004). The International Federation of the Red Cross estimated that between 1998 and 2007 there were 3200 incidents involving chemical releases with approximately 100,000 people killed and nearly 1.5 million affected (IFRC, 2010). The number of casualties following a release depends on the location and type of incident and can range from a few casualties to thousands (Baker et al., 2013).

In the 1970s and 80s governments focussed their effort on the scientific basis for chemical safety to strengthen national capabilities including safety of production, storage and transport of chemicals. However, high profile chemical incidents such as the Seveso disaster in Italy in 1976 (Bertazzi, 1991), the 1981 toxic oil incident in Spain (Gelpí et al., 2002; WHO, 2004) and the Bhopal Explosion in India in 1984 (Anon, 1984, Shama, 2005; WHO, 2009) led to increased recognition of the public health impact of chemical incidents. More recently deliberate releases as a result of a terrorist action such as the Tokyo sarin attack in 1995 (Okumura et al., 2005), the 9/11 attack in the USA in 2001 (Farley and Weisfuse, 2011) and the terrorist attack in Madrid in March 2004 (Algora-Weber, 2011) have raised further international concern and exposed national weaknesses in dealing with chemical and other threats (Table 1).

Large scale incidents are rare, but if they do occur there is a risk that resources may be stretched or overwhelmed in the affected countries. Expert help may be requested from neighbouring nations to deal with the incident effectively. Such large scale incidents could potentially affect several countries. If there are at least some procedures in common between nations, an international response can be carried out more easily and will therefore be more effective and expedite a return to the new normal. Therefore it is important that European wide co-ordination is established and maintained. European networks and research programmes have a key role to play in the development of generic preparedness planning and interoperability, to mitigate the impact of mass emergencies (Baker et al., 2011). It is prudent to plan for the response to a mass emergency involving toxic chemicals, although such events are rare. Nevertheless, such an eventuality may develop at a rate and reach a magnitude sufficient to impose a major crisis on society (Baker et al., 2011).

A well developed mechanism exists at the European level where humanitarian aid and civil protection assistance can be requested by EU and non-EU countries in response to disasters (EU, 2005). Following

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Table 1
Examples of international chemical, biological and radiation incidents.

Year	Location	Description of incident	Impact	Source
1976	Seveso, Italy	Airborne release of dioxin from industrial plant	No immediate human deaths 3300 animal deaths 80,000 animals slaughtered Chloracne in approximately 200 individuals and led to some of the highest body doses of TCDD ever measured	WHO (2009), Kerger et al. (2011)
1981	Toxic oil syndrome, Spain	Ingestion of an oil fraudulently sold as olive oil caused an outbreak of toxic oil syndrome (TOS), clinically characterised by intense incapacitating myalgias, marked peripheral eosinophilia, and pulmonary infiltrates.	300 deaths 20,000 people affected Led to chronic illness	Gelpí et al. (2002)
1984	Bhopal, India	Methyl isocyante (MIC) leak from a tank	3800 immediate deaths 15,000 to 20,000 premature deaths 500,000 exposed to the gas	WHO (2009), Powles and Battrick (2001)
1995	Tokyo, Japan	Deliberate release of a warfare agent	12 deaths 2500 casualties 500 homes uninhabitable	WHO (2009), Okumura et al. (2005).
2000	Enschede, The Netherlands	Explosion at a fireworks factory	20 deaths, 562 casualties Hundreds of homes destroyed 2000 exacuated	WHO (2009), Roorda et al. (2004)
2001	USA	Amerithrax	5 deaths 11 individuals contracted cutaneous anthrax 31 tested positive for exposure Thousands required antibiotic prophylaxis	Rasko et al. (2011)
2005	Hemel Hempsted, England	Three explosions in an oil storage facility (Buncefield, depot)	No deaths 2000 people evacuated	WHO (2009)
2006	Scotland	Anthrax	1 death (inhalational anthrax) 73 'contacts' required antibiotic prophylaxis	Riley (2007)
2006	London, England	Polonium-210	1 death Thousands of worried well	Croft et al. (2010)
2008	London, England	Anthrax	1 death (inhalational anthrax) <15 contacts required antibiotic prophylaxis	
2009	Hungary	Toxic mud	10 deaths 286 injured persons (121 *required treatment in hospital*) Major environmental and economic impacts	IMPEL (2011)
2009	China	Melamine in milk	6 deaths 50,000 children hospitalised 300,000 infants affected	Parry (2008)

the advent of SARS, avian flu, 9/11 and other events, authorities began to realise that the spectre of hazards that might seriously affect societies are many fold and predicting them is unreliable and further complicated by the need to deal with different threats. It was therefore deemed reasonable that 'generic' or 'all hazards' approaches would improve the overall preparedness and response capacity of authorities (Kamoie, 2005; EU, 2007a). An all hazards approach allows for better planning and preparing for situations where more than one type of agent may potentially be released or where the agent is unknown. This approach is also more likely to facilitate and enable responsible authorities to deal with more complex public health incidents and emergencies potentially involving more than one type of hazard such as the volcanic ash cloud in 2010 (Carlsen et al., 2012; Elliot et al., 2010; Kar-Purkayastha et al., 2012) and the effects of climate change (Euripidou & Murray, 2004). It is also important to bear in mind that there are unique chemical risks associated with most non-chemical disasters, for example when a structure is damaged by flood or an earthquake, chemical substances are also spilled and mixed with other chemicals, which can pose risks to first responders or to people returning to their homes after the event (Clements, 2009). Accidents initiated by a natural hazard or disaster which result in the release of hazardous materials are commonly referred to as Natech or na-tech accidents. This includes releases from fixed chemical installations and spills from oil and gas pipelines (Krausmann et al. 2011).

A chemical incident can be defined as an unexpected uncontrolled release of a chemical from its containment (WHO, 2002), and a public health chemical incident occurs when two or more members of the public are exposed (or threatened to be exposed) to a chemical (WHO, 1999). The majority of chemical incidents involve an acute release (WHO, 2002). The immediate response to an incident (acute response) is usually managed and coordinated by first responders (i.e. police, fire and rescue service and paramedics); depending on the size and the scale of the incident either a local, regional, national or international response may be required to manage the public health impacts and ensure a return to normality. Recovery and remediation following an incident is the process of rebuilding, restoring and rehabilitating the community following an emergency (Cabinet Office, 2013).

In recent years, attention has focused on managing the public health impacts of the acute response phase of a chemical incident, as this is typically the most resource intensive and requires rapid action. The proportion of actual morbidity and mortality associated with a chemical incident is quite low (Fig. 1), whereas managing the impacts of public perception of risk, media interest and a surge in low-risk patients (often referred to as 'the worried well' can require a significant amount of resources (Fig. 1), depending on the size and scale of the incident. Guidance and tools have been developed to reduce the burden on resources, by ensuring that emergency planners and responders are better prepared and able to manage the public health aspects of a chemical incident more effectively; hence reducing the impact on society (Griffiths et al., 2012).

Developing resilience to chemical incidents is a multi-faceted process. Following a CBRN incident adverse public health consequences can be reduced through well trained and exercised plans, pre-existing communication channels and integrated networks between various organisations. Return to a 'new' normal can then be facilitated through the timely response and recovery phases. Once recovery is complete, it is