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Building Environmental Public Health Framework for Chemical Emergencies

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More than 80,000 potentially toxic substances are currently produced, stored, or moved for manufacturing, agriculture, and service industries in an estimated 4.5 million facilities in the U.S. The National Response Center recorded 32,551 chemical incidents in 2012 (National Response Center, 2013). The World Health Organization (WHO) defines a chemical incident as the uncontrolled release of a toxic substance resulting in (potential) harm to public health and the environment (WHO, 2009). Health effects from chemical incidents range from exacerbation of preexisting conditions to acute or chronic effects that affect different systems, depending on the chemical and route of exposure. Accidental releases of chemicals can occur in occupational or nonoccupational settings. An act of terrorism involving an intentional release of toxic industrial chemicals or military chemical weapons likely would also cause chemical exposures. Responding to those emergencies includes addressing the potential health effects of the affected public.

Local, state, and federal public health systems increasingly have become involved in preparedness efforts for chemical incident responses, but efforts have been conducted independently and without a clear consensus or understanding of the public health system's role in such incidents (LaTourrette, Davis, Howell, Sama, & Dausey, 2009). Most emergency preparedness and response planning for chemical incidents focuses on public safety and emergency management roles. Public health departments, however, also have important roles in chemical incident response. These include investigating, tracking, and following up on health effects in exposed persons, as well as issuing guidance about population protective measures and communicating health risks.

A release of chlorine gas caused by an early morning train collision in Graniteville, South Carolina, in 2005 serves as an example that quick involvement of health partners may reduce exposures. Local emergency managers initially issued a shelter-in-place order for a one-mile radius around the collision site until 4:30 p.m. After joint investigations by responders, emergency managers, and local public health officials and a noon declaration of emergency by the state, a mandatory evacuation was issued for the one-mile radius (Centers for Disease Control and Prevention [CDC], 2005). A rapid epidemiology assessment determined that of the 511 persons examined in emergency departments after exposure to chlorine gas, 69 were hospitalized and another 18 were treated at area physician offices (CDC, 2005).

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Chemical incident management spans the phases of preparation, response, recovery, and mitigation. Every phase has two core public health functions: risk assessment and communication (WHO, 2009). Risk assessment involves hazard (or potential hazard) identification, dose-response assessment, and risk characterization. During the preparedness and prevention phases of a chemical incident, public health personnel analyze potential exposures to determine the associated health issues. During the response and recovery phases, the role of public health personnel is to monitor who is being exposed and how exposure is occurring. During incident response, crisis communication conveys actual risk and appropriate risk-reduction measures. Public health employees analyze resiliency of communities to exposures during the mitigation and preparation phases. This resiliency includes the work of local emergency planning committees to ensure safety and control measures to prevent or contain spills and safeguards that limit the availability or quantities of various chemicals. During preparedness and mitigation activities, risk communication pertains to possible incident scenarios and potential protective measures before an incident occurs.

Ensuring preparedness for chemical incidents is a significant challenge; chemicals can be contained in fixed facilities, in transit, or released by human-caused or natural disasters, with each potential scenario requiring unique preparation. Unclear coordination among the planning and response partners also can cause challenges in chemical incident preparedness. Resolving these issues before an emergency avoids ambiguity about the roles of key players during a response. Chemical incidents may present special circumstances (such as unfamiliar health hazards, special medical treatment and supply needs, and environmental health concerns); thus, coordination among organizations that do not normally operate under these conditions likely would enhance preparedness.

Depending on the size of a chemical release, a mix of federal, state, and local agencies can respond. In general terms, the first consideration for a response to a chemical incident is to ensure that the response involves the right partners. This includes first responders and the traditional emergency management community as well as public and environmental health partners, who should be engaged early in the response. Another important consideration is ensuring accurate and complete knowledge of partner agency capabilities; a response is not the best time to discover that critical capabilities are not available. Effective communication between responders before an incident will build these partner relationships. Finally, preparedness means having a plan for chemical identification, response, and evacuation; practicing that plan; and continuously improving that plan in partnership with all potential responders. Training and practicing with other response partners allows agencies to be familiar with the capabilities of those partners. With information available to characterize the risks and vulnerabilities of a particular community, environmental public health employees can prepare pre-scripted messaging before an incident to help reduce confusion during a response. Environmental public health practitioners can participate in training exercises about potential chemical hazards in their communities to expand their knowledge base, build relationships, and learn about the functions of other partners. Chemical preparedness cannot happen in a vacuum.

Biography

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Editor's Note

NEHA strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, we feature a column from the Environmental Health Services Branch (EHSB) of the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.

In this column, EHSB and guest authors from across CDC will highlight a variety of concerns, opportunities, challenges, and successes that we all share in environmental public health. EHSB's objective is to strengthen the role of state, local, tribal, and national environmental health programs and professionals to anticipate, identify, and respond to adverse environmental exposures and the consequences of these exposures for human health.

The conclusions in this article are those of the author(s) and do not necessarily represent the views of CDC.

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Resources for Environmental Public Health Response To Chemical Incidents

- CDC Emergency Preparedness and Response Training for Chemical Emergencies www.bt.cdc.gov/chemical/training.asp
- CDC Emergency Preparedness and Response Surveillance for Chemical Emergencies www.bt.cdc.gov/chemical/surveillance.asp
- CDC Environmental Health Training in Emergency Response www.cdc.gov/nceh/ehs/eLearn/EHTER.htm
- Chemical Agents: Facts About Sheltering in Place www.bt.cdc.gov/planning/shelteringfacts.asp
- CDC Emergency Preparedness and Response Chemical Emergencies http://emergency.cdc.gov/chemical/
- Community Emergency Response Teams www.fema.gov/community-emergency-response-teams