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Assessment of Chemical Exposures: Epidemiologic Investigations After Large-Scale Chemical Releases

Editor's Note: As part of our continuing effort to highlight innovative approaches to improving the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR, based in Atlanta, Georgia, is a federal public health agency of the U.S. Department of Health and Human Services and shares a common office of the Director with the National Center for Environmental Health at the Centers for Disease Control and Prevention (CDC). ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances.

The purpose of this column is to inform readers of ATSDR's activities and initiatives to better understand the relationship between exposure to hazardous substances in the environment and their impact on human health and how to protect public health. We believe that the column will provide a valuable resource to our readership by helping to make known the considerable resources and expertise that ATSDR has available to assist communities, states, and others to assure good environmental health practice for all is served.

The conclusions of this article are those of the author(s) and do not necessarily represent the views of ATSDR, CDC, or the U.S. Department of Health and Human Services.

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When a large-scale chemical incident occurs and large numbers of people are seeking care for chemical exposure at local hospitals, personnel at local or state health departments can be overwhelmed and unsure of how to best proceed. The Assessment of Chemical Exposures (ACE) program at the Agency for Toxic Substances and Disease Registry (ATSDR) is available to help public health agencies responding to acute chemical releases.

For over 20 years, ATSDR has partnered with state health departments to perform surveillance for acute chemical releases. From 1990 to 2009, this program was known as the Hazardous Substance Emergency Events Surveillance. Participating state health departments collected detailed data on acute chemical releases and entered them into the surveillance database. Data were used by the state partners for alerting local health departments and other interested parties, situational awareness, supporting policy, and targeting prevention outreach activities.

In 2010, the Hazardous Substance Emergency Events Surveillance program was expanded to be a more comprehensive approach to acute chemical release surveillance and became the National Toxic Substance Incidents Program (NTSIP; Agency for Toxic Substances and Disease Registry [ATSDR], 2014a). The state-based surveillance continued with the addition of national surveillance and large incident investigations. The national surveillance component uses the Department of Transportation (DOT) Hazmat Intelligence Portal to combine chemical release data, including data from the DOT Hazardous Materials Information System, National Response

Center Incident Reporting Information System, and NTSIP state-based surveillance. Using the available data and what is known from NTSIP states, estimates of the number of acute chemical releases are calculated for states not participating in NTSIP surveillance.

The large incident investigation component of NTSIP is known as the ACE program. ACE investigations provide valuable information to health agencies that have large releases of toxic chemicals that expose people in their jurisdictions. This includes assessing the impact of the release on individuals and the community, obtaining information to direct the public health response, targeting outreach to prevent or mitigate the public health impacts from similar incidents occurring in the future, assessing the need to modify emergency response procedures, and identifying an exposed group that can be followed for long-term health effects.

Three main focus areas of the ACE program are (1) assisting state, tribal, regional, and local health departments to perform epidemiologic assessments after large chemical incidents; (2) maintaining a toolkit of customizable surveys, databases, and other resources that can be used for epidemiologic assessments after chemical incidents and preparedness planning; and (3) instructing public health personnel in performing epidemiologic assessments after chemical incidents at ACE training courses, workshops, and conferences.

The ACE program has provided on-site support after large-scale chemical incidents on average once a year. Incidents have included chlorine releases at a metal recycling facility and poultry processing facility, an ammonia release from a refrigeration facility, a vinyl chloride release from a train derailment, and a multiple chemical release that contaminated a municipal water supply system. Since each situation was different, the approach taken to investigate the exposure and health effects and emergency response varied. Approaches included interviewing responders, interviewing staff at hospitals where patients were treated, workplace surveys, community surveys, and medical chart abstractions. After two incidents, the ACE team partnered with the National Institute for Occupational Safety and Health (NIOSH) on the investigation. The ACE team provides support for data management and analysis. The final report is generally an article in the

Centers for Disease Control and Prevention's (CDC's) *Morbidity and Mortality Weekly Report* or a peer-reviewed journal, which is a collaboration between the inviting agency and the ACE team.

Since the goal of each investigation has varied, outcomes have varied, including prevention outreach, policy changes, and follow-up for long term health effects. Examples include the following:

- After the metal recycling facility chlorine release investigation (Centers for Disease Control and Prevention, 2011), the ACE team worked with the state health department to develop a chemical release alert warning of the dangers posed by closed containers being sold for recycling, what to do if one is encountered, and to evacuate upwind in the event of a chemical release; this alert, which was translated into Spanish, was sent to all the recycling facilities in the state and distributed through an industry organization.
- During the investigation of a poultry processing facility incident, the ACE team noted that the health department, whose staff would have been very valuable during the response, was not notified that the incident had occurred. This was because the threshold for alerting the health department was too high. When the ACE team pointed out the excessively high threshold, the state health department worked with the state department of emergency management to modify the procedure for notification of the state health department to include any chemical, biological, radiological, nuclear, or explosive event. Two weeks after the new procedures went into effect, two ammonia releases occurred on the same day and the health department was notified and able to assist.
- The investigation after the ammonia release provides an example of long-term follow-up that was arranged for persons exposed during the release. The majority of the persons exposed during this incident were not employees of the refrigeration facility where the release occurred; they were working at a Deepwater Horizon gulf oil spill cleanup site located downwind of the refrigeration facility. The ACE team arranged for the National Institute for Environmental Health Sciences to include them in the Gulf Long-Term Follow-Up

Study along with a separate questionnaire on the health effects experienced as a result of the ammonia exposure.

The ACE Toolkit (ATSDR, 2014b) contains surveys that are readily customizable to the unique situation that occurred during a chemical incident, including individual surveys with sections for adults (including responders) and children, household surveys, the ATSDR Rapid Response Registry, a hospital survey, and a medical chart abstraction form. Information can be collected on animals to supplement the data obtained about people; the individual survey contains a section for collecting data on household pets and a veterinary chart abstraction form is available. Consent forms are available for use with the surveys. Many of the surveys and consent forms have been translated into Spanish. Epi Info™7 databases are available for the surveys, and an ACE data management guide accompanies them. Training materials are also in the toolkit, including an interviewer training manual and the ACE workbook used during the ACE training courses. The ACE Toolkit is available for use by any health agency. The ACE team is available to provide technical assistance over the phone and through e-mail or on site if needed. The team can include specialized personnel such as an industrial hygienist or medical toxicologist to supplement the skill sets of staff in the inviting agency. The team can deploy within two days of receiving a request for assistance, at no charge to the inviting agency.

Staff members from the ACE team lead courses on performing epidemiologic assessments after chemical incidents as part of disaster epidemiology and environmental health emergency courses. The ACE session in CDC's Environmental Health Training in Emergency Response course introduces the epidemiological perspective on environmental disasters to environmental health practitioners. ACE is one of three tracks in the regional disaster epidemiology training courses being offered by the Council of State and Territorial Epidemiologists, CDC's National Center for Environmental Health, NIOSH, and ATSDR. An online ACE course is in the final stages of development.

When faced with responding to a large-scale chemical incident where large numbers of people are exposed and experience health effects, state and local health agencies can call

on the ACE team (ATSDR, 2014c) to provide expertise, personnel, and tools to assess the situation. The ACE Toolkit's customizable surveys are quickly adaptable for each situation, making for timely information collection. The ACE program provides state and local health agencies with the assistance they require to assess the exposure and health effects experienced as a result of a chemical release. 🐼

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Did You Know?

The U.S. Environmental Protection Agency is seeking comment on potential revisions to its Risk Management Program regulations and related programs (<http://go.usa.gov/5VmB>) to improve chemical facility safety and security; enhance public health and safety; and aid local fire, police, and emergency response personnel to prepare for and respond to chemical emergencies.

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