



NEWSLETTER



LETTER FROM THE EDITOR

APRIL 2022

Dear Community of Practice Members,

Welcome to the first Poison Center & Public Health Collaboration Community of Practice (PCPHCoP) Newsletter of 2022! It is our goal to bring community members content that enriches knowledge and understanding of the roles and responsibilities of both poison control centers (PCs) and public health personnel, and their intersections.

The featured topic for this PCPHCoP newsletter is chemical incidents. The United States faces threats of both large- and small-scale chemical incidents from chemical material accidents involving transportation, chemical installments, and industrial facilities, as well as intentional acts of terrorism [1]. In the United States, up to 100,000 industrial chemicals are used every day, and approximately 15,000 potentially consequential releases of toxic substances occur each year [2, 3]. Chemical incidents often unfold rapidly, and serious exposure symptoms may develop just as quickly.

First responders and healthcare professionals must triage and care for the victims of a chemical incident; thus, they need to be prepared to respond appropriately. Having easily accessible and readily available experts in toxicology, like PC staff, is important during such an incident. PCs expert personnel and surveillance capabilities play a pivotal role in the success of a chemical incident response.

If there is a topic you would like to hear more about in future newsletters, please let us know. You can email us at PCPHCoP@cdc.gov.

Sincerely,
Cailee Hill, M.P.H.
Community of Practice Facilitator
ssx2@cdc.gov

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CHEMICAL INCIDENTS

What is a Chemical Incident?

A chemical incident is an unexpected, uncontrolled release of a toxic substance from its containment system that has the potential to harm humans and the environment [4]. The substance may appear as a vapor, aerosol, liquid, or solid. A public health chemical incident occurs when “two or more members of the public are exposed (or threatened to be exposed) to a chemical” substance that causes or has the potential to cause negative health outcomes [4].

Chemical incidents can occur as a result of natural disasters, accidents, or intentional releases. The incidents can evolve over varying timescales, from acute to chronic chemical contamination.



Acute Incident: Most chemical incidents are acute. When the incident is acute, the chemical is released suddenly and quickly, and the exposure dose is likely to rise rapidly. An acute incident is the release of any toxic substance lasting less than 72 hours. For example, a technical malfunction at an oil reservoir resulting in the release of hydrogen sulfide is an acute incident [5].

Chronic Incident: Chronic incidents occur when a chemical is slowly being released [4]. The exposure dose does not rise rapidly but may lead to long-term health effects. Chemicals chronically emitted into the environment may also have public health impacts through contamination of water sources, agriculture, and wildlife.

The water system contamination at the Marine Corps Base Camp Lejeune is a prime historical example of a chronic chemical incident. Trichloroethylene (TCE) and perchloroethylene (PCE) contaminated the base camp’s water for over 30 years,

Chemical Incidents Can Include:

- Chemical spills from a fixed site or transportation source
- Release of chemicals into water or agricultural systems
- Industrial explosions at factories that store or use chemicals
- Intentional release of chemicals



THE EFFECTS OF CHEMICAL INCIDENTS

Who is Affected by Chemical Incidents?

Chemical incidents can affect a variety of stakeholders in the community. Many people, including workers in facilities storing or using toxic chemicals, nearby residents, transportation carriers, and first responders may be at risk of exposure and subsequent health effects.

Examples of the Public Health Effects of Chemical Incidents:

- The effects of an explosion or fire: external and internal burns and smoke inhalation
- The health effects of the toxic chemical(s) released [6]
- The effects on mental health: stress and anxiety arising from fear of death or illness [4]

Examples of Societal and Economic Costs [4]:

- Loss of livelihoods
- Closures of healthcare facilities, schools, factories, etc.
- Litigation and compensation
- Resources to help the affected community recover

Toxic chemical exposure may lead to the following:

- **Local** effects at the site of chemical contact, such as skin or eye irritation or bronchoconstriction from respiratory irritants.
- **Systemic** effects, such as necrosis of the liver from inhalation of carbon tetrachloride and central nervous system (CNS) depression from inhaling solvents.

The time between exposure and the onset of symptoms can range from minutes to years:

- Eye and respiratory irritation can occur within minutes or hours of exposure
- Cancer may take months or years to appear

Hazardous chemicals are categorized by the type of chemical or according to the potential severity of their effects. The categories used by CDC are represented in the table below:

Category	Description	Example Chemicals
Biotoxins	Poisons that come from plants or animals	<ul style="list-style-type: none"> • Abrin • Brevetoxin • Nicotine • Ricin • Tetrodotoxin • Trichothecene...
Blister Agents/Vesicants	Chemicals that severely blister the eyes, respiratory tract, and skin on contact	<ul style="list-style-type: none"> • Mustards • Lewisites/chloroarsine • Phosgene oxime (CX)
Blood Agents	Poisons that affect the body by being absorbed into the blood	<ul style="list-style-type: none"> • Arsinic acid (SA) • Carbon Monoxide • Cyanide • Sodium monofluoroacetate
Caustics (Acids)	Chemicals that burn or corrode people's skin, eyes, and mucus membranes on contact	<ul style="list-style-type: none"> • Hydrofluoric acid • Hydrogen chloride
Choking/Lung/Pulmonary Agents	Chemicals that cause severe irritation or swelling of the respiratory tract	<ul style="list-style-type: none"> • Ammonia • Bromine (CA) • Chlorine • Hydrogen chloride • Phosphorus • Sulfuryl fluoride...
Metals	Agents that consist of metallic poisons	<ul style="list-style-type: none"> • Arsenic • Barium • Mercury • Thallium
Nerve Agents	Highly poisonous chemicals that work by preventing the nervous system from working properly	<ul style="list-style-type: none"> • G agents (Sarin, Soman, Tabun) • V agents (VX)
Organic Solvents	Agents that damage the tissues of living things by dissolving fats and oils	<ul style="list-style-type: none"> • Benzene
Long-acting Anticoagulants	Poisons that prevent blood from clotting properly, which can lead to uncontrolled bleeding	<ul style="list-style-type: none"> • Super warfarin
Incapacitating Agents	Drugs that make people unable to think clearly or that cause an altered state of consciousness (possibly unconsciousness)	<ul style="list-style-type: none"> • BZ gas • Fentanyl and other opioids
Riot Control Agents/Tear Gas	Highly irritating agents normally used by law enforcement for crowd control or by individuals for protection	<ul style="list-style-type: none"> • Bromobenzylcyanide (CA) • Chloroacetophenone (CN) • Chlorobenzylidenemalononitrile (CS) • Chloropirin (PS) • Dibenzoxazepine (CR)
Toxic Alcohols	Poisonous alcohols that can damage the heart, kidneys, and nervous system	<ul style="list-style-type: none"> • Ethylene glycol
Vomiting Agents	Chemicals that cause nausea and vomiting	<ul style="list-style-type: none"> • Adamsite (DM)

Anhydrous Ammonia Chemical Release—Lake County, Illinois April 2019 [8]

On April 25, 2019, a farm tractor was transporting two 2-ton ammonia tanks on a road in Lake County, Illinois, when the tanks malfunctioned, resulting in the release of at least 500 gallons of anhydrous ammonia. The release created a large, low-lying plume of white gas which lingered in the area, surrounding nearby homes.

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Response

Immediate

- 129 fire personnel, 30 law enforcement officers, and a number of dispatchers and 9-1-1 operators responded.
- Victims were rescued from cars and nearby homes.
- A shelter in place order was issued to people living within a one-mile radius of the release.
- The fire department sprayed water to dilute the plume until tanks emptied.
- The local fire department, the National Transportation Safety Board, and the U.S. Environmental Protection Agency investigated the incident.



[LINK: MMWR Report on Incident](#)

10 days after release

- A team from the Agency for Toxic Substances and Disease Registry (ATSDR) and Centers for Disease Control and Prevention (CDC) arrived to assist the Lake County Health Department and Illinois Department of Public Health with the Assessment of Chemical Exposures (ACE) investigation.
- The investigation included the following: Environmental evaluation of the size of the release, abstraction of medical records to characterize the health effects, and surveys of first responders, households in the four census blocks adjacent to the release, and hospital emergency department personnel who treated patients.

ATSDR is a federal public health agency that protects communities from harmful health effects related to exposure to hazardous substances.

Health Outcomes

- The main exposure symptoms were shortness of breath, cough, upper airway pain, headache, dizziness, and chest tightness.
- 83 patients were evaluated at emergency departments; 14 were hospitalized. Eight of the hospitalized were admitted to the intensive care unit. Seven required intubation and mechanical ventilation.
- No deaths occurred.

ACE provides resources to state and local health departments to perform a rapid epidemiologic assessment after a chemical emergency.

Communication Challenges

- Responders who initially arrived on scene were unaware the incident required personal protective equipment.
- Most hospitals reported receiving insufficient information about the chemical, type of exposure, and inbound patients from the first responders.
- Hospitals relayed the incomplete information to the Poison Center (PC), and therefore received inadequate decontamination recommendations, leading to secondary exposures.

PC Review

After the ACE investigation, findings were shared with the local PC. As a result, they reviewed communication flow protocols and reexamined ammonia guidelines to help further improve decontamination recommendations.

Identifying, Assessing, and Managing Health Risks

During a chemical incident, first responders and emergency department professionals need immediate access to experts in toxicology and chemical exposures. The expertise of PC staff members on toxic exposure risk identification, assessment, and management, are critical during the response to a chemical incident [1].

PCs provide immediate, expert knowledge of the health risks by doing the following:

- Assessing and triaging exposed patients for appropriate care, such as on-site management or further evaluation by a healthcare professional
- Providing information about expected symptoms and recommendations for clinical management, including use of antidotes
- Providing information on use of personal protective equipment (PPE) and decontamination procedures

Surveillance and Monitoring

The National Poison Data System (NPDS) has more than 74 million case records and a product database with over 447,000 products. De-identified case data from the nation's 55 poison control centers are uploaded to the NPDS roughly every eight minutes. This creates a near real-time national exposure and information database which allows for quick data analyses [9, 10]. The CDC and American Association of Poison Control Centers (AAPCC) monitor NPDS for anomalies and possible outbreaks.

NPDS may be used in conjunction with additional surveillance data, such as emergency Department (ED) visits, to detect poisoning outbreaks, monitor trends, and track specific exposures. Poison control centers can also share detailed surveillance data and situational awareness about the exposure event and medical effects with outside organizations, such as local and state health departments [1]. This can provide health departments with the knowledge needed to design and implement appropriate public health interventions.

National Poison Data System

Education and Prevention

PCs educate healthcare professionals on the most current treatments and management guidelines, allowing them to be better prepared when a chemical incident occurs.

PCs also provide public outreach and education, not only on prevention and preparation for future poison incidents, but also during a chemical incident. These efforts aid in mitigating public risk while also reducing the cost of unnecessary healthcare visits, as well as the stress a chemical incident can have on the affected community.

Conclusions:

PCs provide immediate accurate, unbiased information and guidance to manage chemical incident risks. They are one of the most commonly used resources by emergency medical service (EMS) providers because of their timely information, availability, and ease of contact [1]. As production of and use of chemicals continues to increase, poison control centers' involvement in the risk assessments of future chemical incidents will be crucial to mitigate negative public health outcomes. There are always opportunities for increased collaboration between poison control centers and public health personnel.

Think about it: *In the future, how can we increase collaboration between poison control centers, public health departments, first responders, and healthcare providers during chemical incidents?*

ANNOUNCEMENTS:

The next quarterly PCPHCoP webinar on the recent **synthetic cannabinoid-associated coagulopathy outbreak** in Florida, will be held April 20, 2022, from 3 p.m. – 4 p.m. EDT.

If anyone wants to be added to the CoP email distribution list, they can email their request to PCPHCoP@cdc.gov.

ADDITIONAL RESOURCES:

ATSDR Emergency Resources and Contact Information:

- 24-hour support at (770) 488-7100
- Other [Emergency Response \(cdc.gov\)](#) resources including the [ACE program](#)

AAPCC Resources and Contact Information:

- [AAPCC Annual Reports](#)
- [Getting Poison Center Help](#)



American Association of
Poison Control Centers



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