

## Knockdown Gases: Dangers, Indicators, and Response

Knockdown gases may pose a serious threat to public safety. First responders may encounter knockdown gases, including hydrogen cyanide, hydrogen sulfide, and phosphine because of an intentional or accidental release. The development of knockdown gases for premeditated, nefarious purposes, including terrorism, may occur because of the availability of precursors and instructions, ease of manufacture, and potential lethality.

- **INTENTIONAL RELEASE:** In August 2019, a woman committed suicide in a hotel in San Jose, California, by mixing household chemicals, producing a toxic gas with a "rotten egg" odor. In addition, the resultant gas forced the evacuation of several floors in the hotel and eight people were transported to the hospital.
- **ACCIDENTAL RELEASE:** In January 2017, three utility workers in Key Largo, Florida, died after being overcome by noxious fumes upon entering a confined space to perform their work duties. A firefighter, who attempted to rescue without the use of a self-contained breathing apparatus, was hospitalized, and three sheriff deputies were treated due to exposure. The gas, with its odor being described as a "rotten egg," was thought to have been the result of a sewage backup.

**INDICATORS OF ACQUISITION AND PRODUCTION:** With increased awareness of knockdown gases, their usage and potential lethality, public safety officers and members of the public may be well positioned to report attempts to acquire, produce, and employ a knockdown gas. In addition, first responders may unwittingly encounter clandestine efforts to develop knockdown gases when responding to calls for service, highlighting the importance of understanding related indicators and inherent dangers. Generally, knockdown gases are unavailable to the public; however, the precursors needed to produce the gases may be

**SCOPE:** This product highlights the importance of recognizing potential indicators of knockdown gases and provides response considerations for first responders.

**KNOCKDOWN GASES** are a type of toxic industrial chemical that when inhaled can cause immediate loss of consciousness and can be fatal. Knockdown gases include hydrogen cyanide, hydrogen sulfide, and phosphine. These gases have legitimate usages, but may be used for nefarious purposes. Knockdown gases primarily present an inhalation-exposure risk and are not generally encountered outside of gaseous form. Hydrogen cyanide and hydrogen sulfide are recognizable to first responders due to their frequent usage in chemical suicides.

**WARNING:** A self-contained breathing apparatus must be worn in any suspected chemical release. Particulate respirators, such as N95, should NOT be used for unknown gases. Please follow departmental guidelines.

**NOTE:** Terrorist tactics are constantly evolving, asymmetrical, and often do not fit traditional response protocols and scripts for 911 operators and dispatchers. Call centers are encouraged to conduct training that enriches critical thinking skills as well as joint CT training and exercises to better understand response roles, missions, and capabilities.



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acquired with relative ease. Precursors may be available through laboratory, scientific product suppliers, or other commercial outlets. The availability of precursors, combined with their common usages, highlights the importance of performing outreach to private sector partners, including encouraging them to challenge and report unusual or suspicious inquiries to authorities.

- Purchase of abnormally large quantities of precursor chemicals, such as cleansers and fumigants
- Missing or stolen precursor chemicals
- Combined purchase of precursor chemicals, protective equipment, and tools, particularly by someone exhibiting noteworthy behavioral cues or lack of familiarity
- Efforts to hide and track precursor purchases, such as purchases that are spread across multiple stores in a chain
- Evidence of common household chemicals or personal protective equipment used in a manner inconsistent with legitimate purposes
- Suspicious amount of containers and consumables (rubber gloves, respirators) discarded in garbage

**INDICATORS OF EXPOSURE:** The lethality of a knockdown gas depends on several factors, including the method of production, its dissemination, and the location of the incident. If heavier than air, the gas travels along the ground and collects in low-lying or underground areas, such as basements. In contrast, lighter-than-air gases will rise to top floors and attics. Depending on the concentration of gas, ventilation, and size of the space, first responders may encounter patients with varying degrees of exposure exhibiting a variety of signs and symptoms. Public safety personnel should have a baseline knowledge of chemical exposures and the associated signs and symptoms to accurately detect and treat potential victims. Those conscious, who present symptoms, may recall a chemical smell or more reliable telltale indicators.

- Multiple patients with varying degrees of similar symptoms: respiratory irritation, coughing, nausea, vomiting, headaches, disorientation, tremors, suffocation, and unresponsiveness
- Mass casualties with no obvious reason or visible trauma
- Suspicious or unexplained packages, containers, or devices at the scene
- Chemical containers at the scene
- Containers, such as buckets or jugs, filled with unknown mixtures at the scene
- Residue around containers or on surfaces of an enclosed area

**SUICIDES:** Victims of suicide typically provide signage of the potential dangers of the chemicals used; however, that may not always be the case. First responders must have a knowledge of the characteristics of a purposeful incident. For example, in April 2008, a 14-year-old girl overseas committed suicide by mixing chemicals in the bathroom of her apartment. The resulting fumes from the chemical reaction also sickened approximately 90 people within the building, resulting in ten being hospitalized. The girl had affixed a warning sign that read, "Gas being emitted."

**CAUTION:** Chemical odors are not a reliable indicator for detecting or determining the concentration levels of a hazardous gas. Breathing any toxic industrial chemical, even in low concentrations, can damage the olfactory nerves, rendering victims or first responders unable to smell the gas while it is attacking the body. An odor might be due to a single chemical or mixture of chemicals. Chemicals vary in their ability to produce odors, and people vary in their ability to smell odors.



- Presence of a crude or homemade dispersal device or reports of a package, container, or device that dispersed a mist or vapor

### CONSIDERATIONS

- If a knockdown gas incident is suspected, first responders should follow their agency's HAZMAT protocols and notify the appropriate HAZMAT team
- Public safety entities, including 911 call and dispatch centers, should familiarize themselves with the hazardous material release policies, procedures, and resources within their area of responsibility
- Notify local law enforcement and FBI Field Office of available information, such as chemical agent information, patient signs and symptoms, and number of casualties
- Confined spaces, public transportation, or poorly ventilated areas may pose highest risk for casualties
- Knockdown gases may be flammable or explosive in certain concentrations. Deliberate ventilation may change the percentage of a gas in the air, potentially bringing it into the proper flammable or explosive mixture
- Move victims to an area/zone with fresh air as soon as possible to mitigate effects and injuries. This may require establishing a contaminated triage zone where victims can receive preliminary treatment by personnel in protective clothing before decontamination and transport
- Isolated gas exposure without gross contamination—for example, liquid on skin or clothes—rarely require decontamination
- Coordinate and train with dispatchers, local hospitals, and health care facilities on their capabilities in recognizing and treating chemical exposures
- If the knockdown gas is water soluble, it may be possible to dissipate the vapors with a hose-fog stream
- Runoff water may be contaminated and should be contained
- It may be possible for the deceased to “off gas,” potentially creating a hazard for coroners, medical examiners, and other medical and public safety personnel

### RESOURCES:

- “Chemical Attack Fact Sheet: Warfare Agents, Industrial Chemicals, and Toxins”: <https://www.dhs.gov/publication/chemical-attack-fact-sheet>
- “Hazardous Materials Fact Sheet”: [https://www.fema.gov/media-library-data/20130726-1622-20490-9118/hazardousmaterialsfactsheet\\_final.pdf](https://www.fema.gov/media-library-data/20130726-1622-20490-9118/hazardousmaterialsfactsheet_final.pdf)
- NIOSH Pocket Guide to Chemical Hazards: <https://www.cdc.gov/niosh/npg/default.html>
- FBI WMD COORDINATOR at your local field office: <https://www.fbi.gov/contact-us/field>
- 1-855-TELL FBI (1-855-835-5324) will direct callers to specially trained WMD operators. For non-emergency use.
- DHS's WMD training center for emergency response providers: <https://cdp.dhs.gov/> or 1-866-213-9553
- “Managing the Emergency Consequences of Terrorist Incidents: Interim Planning Guide for State and Local Governments,” FEMA, July 2002: <http://www.fema.gov/pdf/plan/managingemerconseq.pdf>





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