The Emerging Threat of Chemical Suicides

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What is a Chemical Suicide?

- New suicide technique
  - publicized on the Internet
- Uses a mixture of easily-obtained compounds
  - makeshift confined space
  - evolve gases at extremely toxic and/or explosive concentrations
- Most US cases involve young adults creating hydrogen sulfide (H_2S) in vehicles

Potential Dangers

- Creates an inhalation and dermal hazard to bystanders or those alerting the EMS system
- First responders maybe unaware of the potential danger
- Surrounding neighborhoods may be affected, potentially evacuated until the scene is stabilized and decontaminated

Prevalence

- Japan first reported a trend of poisonous gas suicides
  - 208 people took their lives by mixing household chemicals in 3 month period in 2008
- First US incident in 2008 (Pasadena, CA)
  - cases since reported in Idaho, Utah, Texas, Georgia, North Carolina, South Carolina, Florida, Connecticut, Washington, California
- Number of incidents will likely rise as more individuals learn about the process

Source: CDC, Morbidity and Mortality Weekly Report, Chemical Suicides in Automobiles --- Six States, 2006—2010, September 9, 2011, 60(35);1189-1192.

Recent Incident

19-year old victim at Cal Poly – San Luis Obispo
Friday, March 16, 2012

Photo Credit: San Luis Obispo Tribune

Recent Incident, *continued*

- 19-year-old Cal Poly freshman found dead in a car filled with poisonous gas in campus parking lot, Friday, March 16th - - the last day of winter quarter exams
- At about 3pm, a construction worker going to his vehicle saw a handmade sign in a car window warning people to stay away because of deadly gas
- When the worker peered inside he saw someone unresponsive and called University police

"We backed up from that point with the hazardous gases that may be present with the owner and the signs," University Police Department (UPD) Chief Bill Watton said on scene.

- - Photo and quote: San Luis Obispo Tribune

Recent Incident, *continued*

- City Fire, County Environmental Health, and County HazMat
  - confirmed the presence of H_2S
  - spent hours removing gas from the vehicle
- Parking lot and adjacent streets closed for several hours
- Students were told about the potential for hazardous chemicals and that they could not have access to their cars

Photo credit: CalPoly SLO Daily Mustang

Chemical Threat

$$CaS + 2\ HCl \rightarrow CaCl_2 + H_2S$$

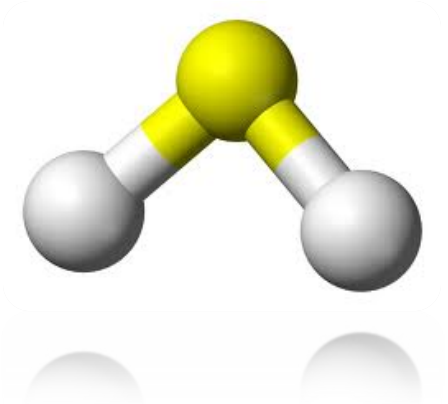
- Reaction of metal sulfide with strong acid evolves hydrogen sulfide gas
- Most popular metal sulfide is calcium polysulfide, an active ingredient in “lime sulfur” herbicides (28-30 % by weight)
- Popular sources of acids are toilet bowl cleaners (7-20% HCl)

Chemical Sources

Acid Sources	Sulfur Sources
Toilet Bowl Cleaner (9.5-25% HCl)	Artist oil paints (0–15% Zn sulfide)
Germicidal Acid Bowl Cleaner (20.5% phosphoric acid)	Dandruff shampoos (1.0% Se sulfide)
Shower, Tub, and Tile Cleaner (7% urea-mono HCl acid)	Pesticides (5–30% Ca polysulfides)
Tile, stone, concrete cleaner (1-30% HCl)	Spackling paste (1–2% Zn sulfide)
Pool cleaners (muriatic acid, ~17% HCl)	Some latex paints (6.6% Zn sulfide)
	Garden fungicides, lime sulfur (5-90% sulfur)

Effects of H_2S Exposure

- Colorless gas, heavier than air, with strong odor of rotten eggs detectable as low as 0.5 ppb
- Inhalation of high concentrations of can produce extremely rapid unconsciousness and death



Effects of H_2S Exposure, *continued*

- CNS injury is immediate and significant
- A few breaths at high concentrations can cause immediate loss of consciousness, coma, respiratory paralysis, seizures, death
- Death often results from respiratory arrest
- Toxic mechanism: Inhibition of cytochrome oxidase resulting in a lack of O_2 utilization

H_2S Concentrations of Note

IDLH
= **100 ppm**

Max 1hr conc without serious effects
= **170 to 300 ppm**

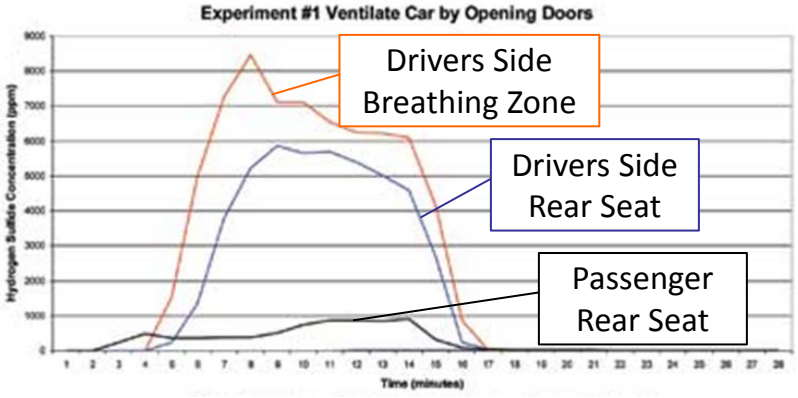
May be dangerous in 30-60 min
= **500 to 700 ppm**

Rapid unconsciousness, cessation of respiration, and death
= **700 to 1000 ppm**

Unconsciousness, cessation of respiration, and death *in a few minutes*
= 1000 to 2000 ppm

Closed vehicle experiment

- Reaction of 1qt (28%) lime sulfur and 1qt (20%) HCl
- Driver's breathing zone peak concentration = 8000 ppm within 2 mins
- H_2S concentration avg = 6000 ppm/10 min
- Within 3 min of opening car doors vehicle concentrations dropped to < 5 ppm



Source: T.O. Murdock, Tips for Safety Responding to Chemical-Assisted Suicides in Vehicles, Fire Engineering, Vol 164: 11, 11/1/2011, www.fireengineering.com, accessed April 6, 2012.

H_2S not the only threat

The following chemicals have been reported in other chemical-assisted suicides:

ammonium hydroxide
aluminum sulfide
calcium hypochlorite
calcium sulfide
germanium oxide
hydrochloric acid
potassium ferrocyanide
sodium hypochlorite
sulfur
sulfuric acid
trichloroethylene

Source: CDC, Morbidity and Mortality Weekly Report (MMWR), Chemical Suicides in Automobiles --- Six States, 2006—2010, September 9, 2011, 60(35);1189-1192.

H_2S not the only threat, *continued*

Recent case of victim swallowing malathion:

- After arrival in ambulance, fumes pouring out of man prompted hospital officials to move him out of ER (temporarily shut down)
- Three paramedics treated for exposure to chemical fumes from victim
- Workers decontaminated the ambulance and ER equipment (gurneys, privacy screens)
- Surfaces and ambient air tested before return to service

Photo credit: Sun Sentinel, Florida

Responder and Community Impacts

- CDC reported injuries to four responding law enforcement officers
- None wore personal protective equipment; however, two had HazMat training
- Four recent events resulted in evacuation orders affecting 85 persons; 32 persons were decontaminated

Preventing Further Injury

- Situational awareness starts with the initial call to EMS/dispatcher
  - Windshield survey of scene
  - Odd odor, color, vapors?
  - Posted warning signs?
  - Unresponsive person?
  - Taped windows, doors, vents?
  - Mixing bucket, empty containers?

- Warn law enforcement or first on-scene *before arrival or action*

Photo credit: St. Lucie County Fire Department, Florida

Protective Steps

1. Establish zones of control and evacuation/shelter-in-place orders
2. Proper personnel protective equipment (SCBA, Level A/B) before breaching “enclosed space”
3. Decrease toxic/explosive concentrations
   - Some toxic gases form explosive mixtures with air
   - Ventilate source after analysis of potential hazards
   - Water spray can reduce vapors or divert a plume drift
4. Air monitoring until scene is rendered safe

Protective Steps, *continued*

5. Victim transport – Decontamination prior to leaving
   - Potential for victim and clothing to 'off-gas' trapped vapors
   - EMS and hospital must be notified in advance in order to avoid contamination of personnel/equipment
6. Decontamination
   - Responders, entry teams
   - Vehicle prior to transport/impounding
   - Surrounding scene; control and isolate run-off; collect contaminated soils

Potential Criminal Uses

Zinc or Aluminum phosphide:

- Highly toxic, low cost rodenticide, pellets
- Upon exposure to moisture liberates phosphine gas (garlic smell)
- Suicide cases have contaminated ER/EMS
- Potential chemical threat
  - Release/ 'off gas' in enclosed space
  - Respiratory toxicity
  - Potential for widespread contamination, chaos

Source: R G Bogle et al., Aluminum phosphide poisoning. Emerg Med J 2006;23:e3 (http://www.emjonline.com/cgi/content/full/23/1/e3).

Resources

ATSDR, Medical Management Guideline for Hydrogen Sulfide
www.atsdr.cdc.gov/MMG/MMG.asp?id=385&tid=67

NIOSH documentation for Immediately Dangerous to Life or Health (IDLH) Concentrations – Hydrogen Sulfide
www.cdc.gov/niosh/idlh/7783064.HTML

Central Florida Hazardous Materials Fusion Center
www.hazmatfc.com/incidentReports/statsTrends/Documents/Hydrogen%20Sulfide%20Suicide%20Incidents.pdf

National Hazardous Materials Fusion Center
www.hazmatfc.com/incidentreports/statstrends/Pages/Home.aspx

Suicide Prevention Resource Center
www.sprc.org

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