TABLE 5

POTENTIAL EFFECTS OF HYDROGEN SULFIDE EXPOSURE

Parts per Million	Effects and Symptoms	Time
10	(Permissible exposure level)	8 hours
50 to 100	Mild eye irritation; marked respiratory irritation	1 hour
200 to 300	Marked eye irritation; marked respiratory irritation	1 hour
500 to 700	Unconsciousness; death	1/2 to 1 hour
1,000+	Unconsciousness; death	Within minutes

ing deaths in the United States.11 It is a relatively abundant, colorless, odorless and tasteless gas that has about the same vapor density (VD=.96) as that of air. In addition, CO is undetectable by the human senses, even at toxic or lethal concentrations.

The gas is typically produced by the incomplete combustion of organic materials, such as gasoline, natural gas, oil, propane, coal and wood. It can also be formed from microbial decomposition of organic material in sewers, silos and fermentation tanks.4

When CO is inhaled, it binds to hemoglobin in the blood-at the binding site normally used by oxygen. Because it has more than 200 times the affinity

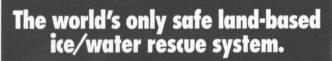
for hemoglobin than does oxygen, CO rapidly displaces oxygen from hemoglobin. 12 This results in cellular hypoxia.

The signs and symptoms related to CO poisoning are mostly related to the central nervous system and the myocardium, including changes in level of consciousness, altered behavior and headache (see Table 4). The classic sign of CO poisoning, cherry-red skin, may be present—but it occurs only rarely. 13

Hydrogen sulfide-Like CO, hydrogen sulfide (H₂S) is a colorless gas. But unlike CO, it is flammable and slightly heavier than air (VD=1.2), and it has the characteristic odor of rotten eggs. It is naturally produced from decaying organic matter containing sulfur (typically, petroleum and natural gas).

H₂S is extremely toxic. At high concentrations, it causes "knockdown" and death after only one or two breaths. Interestingly, for people exposed to the

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gas, the smell of rotten eggs disappears at near-fatal concentration because olfactory paralysis occurs, thus giving the perception that H₂S is no longer present. Because of the mistaken impression that H₂S is no longer present, workers or rescuers may remain in a confined space and be exposed to harmful or even lethal concentrations.⁷

H₂S affects respiration at the cellular level, resulting in widespread hypoxia; it can also cause hypoxia by directly inhibiting the respiratory centers of the brain. H₂S acts as a direct irritant in the eyes, mucous membranes and respiratory tract. Like CO, the signs and symptoms resulting from H₂S poisoning are dose-related (see Table 5).

Editor's Note: Part II of this article, which will appear in the November / December issue of Rescue, will address specific rescue procedures and victim management for confined space incidents.

References

- Ellis JN: "Plan confined-space fall protection before and beyond required rescue." Occupational Health and Safety. February 1992.
- Grant HD: "Rescue and the EMS professional." Emergency Medical Services. October 1990.
- Campbell CW: "All about confined spaces." Professional Safety. February 1990.
- National Institute for Occupational Safety and Health: Alert—Request for Assistance in Preventing Occupation Fatalities in Confined Spaces. Ohio: Centers for Disease Control, 1986.
- "OSHA permit-required confined spaces; notice of proposed rulemaking, Proposed Rule 29 CFR 1910.146." Federal Register: May 25, 1989.
- Guthrie D: "Confined spaces not a dead end." Safety and Health. May 1990.
- Dabney BJ, et al: "Evaluation and treatment of patients exposed to systemic asphyxiants." Emergency Care Quarterly. October 1990.
- Rekus JF: "Avoid confined space hazards with comprehensive entry program." Occupational Safety and Health. September 1988.
- National Institute for Occupational Safety and Health: Criteria for a recommended standard... Working in confined spaces. Ohio: Centers for Disease Control, 1979.

- McCallister DR: "Complying with standard, team effort can prevent confined space accidents." Occupational Safety and Health. March 1992.
- Ellenhorn MJ, Barceloux DG: Medical Toxicology—Diagnosis and Treatment of Human Poisoning. New York: Elsevier, 1988.
- Guyton AC: Textbook of Medical Physiology. Eighth Ed. Philadelphia: W.B. Saunders Co., 1991
- Bronston PK, et al: "Carbon monoxide poisoning: a review." Topics in Emergency Medicine. January 1987.

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