

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

continued on page 37

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gas, the smell of rotten eggs disappears at near-fatal concentration because olfactory paralysis occurs, thus giving the perception that H_2S is no longer present. Because of the mistaken impression that H_2S is no longer present, workers or rescuers may remain in a confined space and be exposed to harmful or even lethal concentrations.⁷

H_2S affects respiration at the cellular level, resulting in widespread hypoxia; it can also cause hypoxia by directly inhibiting the respiratory centers of the brain. H_2S acts as a direct irritant in the eyes, mucous membranes and respiratory tract. Like CO, the signs and symptoms resulting from H_2S 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.

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