FACT SHEET

Carbon Monoxide in the Workplace

Carbon monoxide (CO) is a colorless, odorless, toxic gas. It is a byproduct of incomplete combustion of coal, oil or wood, and it is present in vehicle exhaust and tobacco smoke.

Exposure Risk

One of the most common sources of CO in the workplace is the internal combustion engine. In addition to work with or around vehicles and engines, work environments with heightened exposure risk include boiler rooms, blast furnaces and coke ovens; breweries; warehouses; petroleum refineries; pulp, paper and steel producers; and marine terminals.

According to the Occupational Safety and Health Administration (OSHA), at-risk occupations include welders, forklift operators, and public safety personnel (fire, police and emergency first responders). People who work in confined spaces also have increased exposure risk.

Carbon monoxide is often referred to as a "silent killer." It is a leading cause of poisoning-related deaths and illnesses worldwide. In the U.S., more than 400 people die annually from unintentional, non-fire-related CO poisoning. CO exposure is also linked to 20,000 emergency room visits and more than 4,000 hospitalizations a year.

Poisoning can occur over time in response to low-level releases of CO or immediately due to a concentrated exposure. CO mixes well with air, and it may react vigorously with oxygen, acetylene, chlorine, fluorine and nitrous oxide. It easily penetrates walls and ceilings.

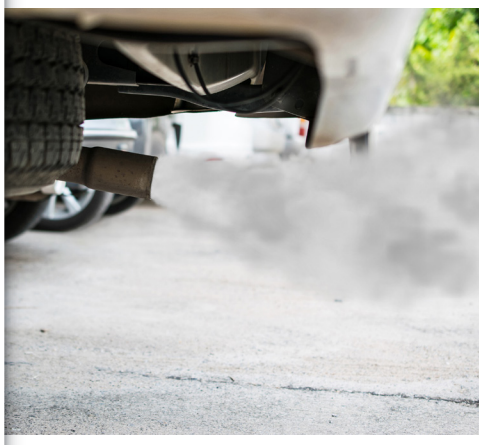
Signs and Symptoms

Exposure to carbon monoxide deprives the heart, lungs and other vital organs and tissues of oxygen. When CO is inhaled, it combines with hemoglobin (an iron-protein component of red blood cells) to produce carboxyhemoglobin (COHb), significantly diminishing oxygen-carrying capacity.

Exposure may not immediately be suspected. CO poisoning symptoms are similar to the flu and may include headache, dizziness, weakness, fatigue, nausea and vomiting. Initial symptoms also may include chest tightness. Significant exposure can cause loss of consciousness and suffocation.

Did You Know?

Similar to a smoke detector, battery-operated carbon monoxide detectors are designed to measure accumulation of CO over time and sound an alarm when levels markedly increase, allowing time to safely ventilate the area with fresh air or evacuate.



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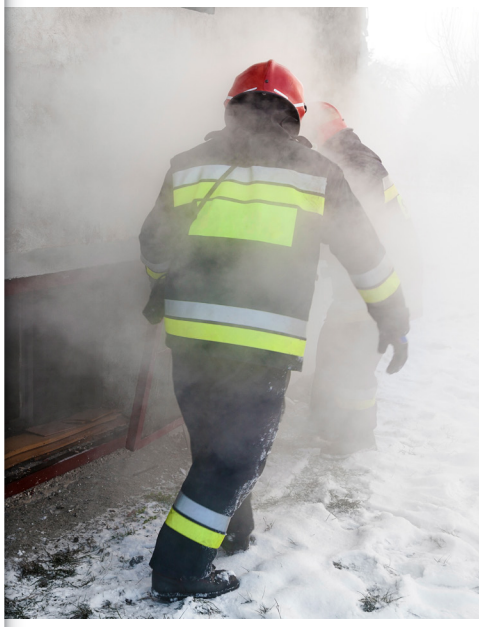
Reactions to CO exposure vary depending on variables such as age and general health and fitness levels. Infants, pregnant women and their fetuses, the elderly and people with physical conditions that limit the body's ability to use oxygen (e.g., emphysema, asthma, heart disease) can be more severely affected than healthy adults. People who live, work and recreate at high elevations also may be more vulnerable to CO exposure effects.



Response and Treatment

Hypoxia (severe oxygen deficiency) may cause reversible neurological effects or result in irreversible damage to the brain, heart and other vital organs and tissues. A swift medical response is essential. If CO exposure or poisoning is suspected:

- Call 911 or workplace emergency medical responders.
- If conscious, the exposed person should leave the area, avoid overexertion and get fresh air. If unconscious, the person should be transferred to an open area with fresh air.
- An emergency responder may administer 100 percent oxygen using a tight-fitting mask if the person is breathing.
- If the person has stopped breathing, administer cardiopulmonary resuscitation.

Do not enter an area you believe to be contaminated unless you have appropriate protective equipment and have been trained to perform recovery operations.

Treatment depends on the severity of exposure. A blood test is performed to confirm the diagnosis. Mild exposure typically is treated with oxygen and monitoring of carbon monoxide levels. In severe cases, hyperbaric oxygen therapy is recommended to escalate replacement of CO with oxygen in the blood.

Prevention

Awareness is key. Employers are encouraged to educate workers about the sources and conditions that may result in CO poisoning, symptoms and exposure controls. To reduce CO exposure risk in the workplace, OSHA recommends the following:

- Test air regularly in areas where CO may be present, including confined spaces. (Refer to Permit-Required Confined Space, Title 29, CFR 1910.146)
- Use a ventilation system to remove CO from work areas.
- Maintain equipment and appliances that produce CO.
- Consider switching from gasoline-powered equipment to equipment powered by electricity, batteries or compressed air if it can be safely used. Do not use gasoline-powered engines or tools in poorly ventilated areas.
- Install CO detectors with audible alarms.

Resources:

1. *Carbon Monoxide Permissible Exposure Limits*
2. *NIOSH Pocket Guides to Chemical Hazards - Carbon Monxide*