State of Alaska Epidemiology Bulletin

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Exposure to Carbon Monoxide at Two Facilities — Anchorage, December 2016

Introduction

Carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is highly toxic to humans. When inhaled, CO impairs the blood's oxygen carrying capacity by preferentially binding to hemoglobin in red blood cells to form carboxyhemoglobin (COHb).[1] This prevents normal oxygen binding and distribution throughout the body. Symptoms of CO poisoning can range from mild headaches and fatigue to loss of consciousness and death.

CO is ubiquitous in our environment. However, exogenous CO is produced during incomplete combustion when carbon-containing fuels, like those used in furnaces and boilers, are burned inefficiently.[1] On December 13, 2016, the Alaska Section of Epidemiology (SOE) became aware of CO poisoning events in two separate Anchorage workplaces. This *Bulletin* describes the subsequent SOE response.

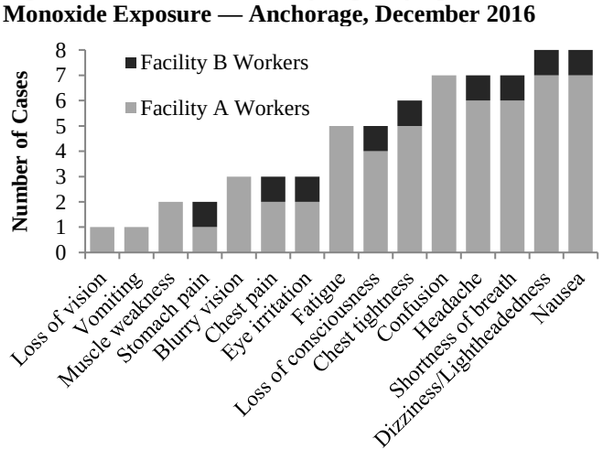
Methods

On December 14, 2016, SOE staff members initiated an investigation. Investigators interviewed persons who were hospitalized due to confirmed or suspected CO poisoning and reviewed their medical records. Investigators also interviewed facility managers and performed onsite walk-throughs at both facilities (Facility A and Facility B). At Facility B, SOE staff accompanied Alaska Occupational Safety and Health (AKOSH) on their onsite walk-through.[2]

Investigation

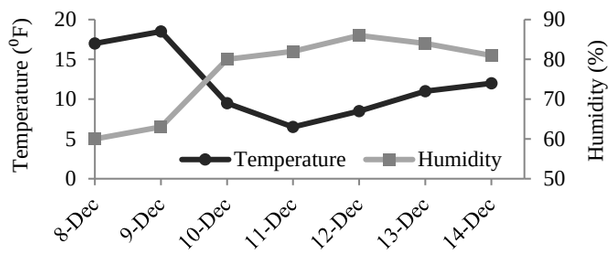
The investigation identified eight persons who received medical care following CO exposure: seven patients from Facility A and one from Facility B. The owner of Facility A reported that 30–35 employees were working at the facility on the day of exposure. The patient from Facility B told investigators that they were the only one present on their floor when the CO exposure occurred. All eight patients had elevated COHb levels (as high as 13-times the normal level for non-smokers) and presented with signs and symptoms of CO poisoning (Figure 1). It is possible that additional individuals experienced symptoms related to CO exposure, but did not seek medical attention. All patients who were medically evaluated reported symptom onset between 6:30AM and 9:00AM. Three patients were transferred to an out-of-state hospital for further care. No patients died.

Figure 1. Number of Cases by Signs/Symptoms of Carbon Monoxide Exposure — Anchorage, December 2016



Anchorage experienced freezing temperatures just over 0^0F in the early morning of December 12, 2016. In the days leading up to the event, temperatures had consistently been dropping, while humidity levels were rising (Figure 2). AKOSH determined that due to these conditions, ice covered the wire mesh on the air intake vents in Facility A and Facility B boiler rooms. When the vents froze over, the amount of oxygen entering the boiler rooms decreased substantially, causing incomplete combustion or "dirty burn" and increased CO production. Boilers have a safety system that shuts down the unit if they are in oxygen-poor conditions. At both facilities, this safety mechanism did not work. AKOSH hypothesized that the boilers were getting just enough oxygen to keep them running, while producing harmful levels of CO. In Facility A, a vent from the boiler room leading to the main workspace allowed CO to disperse throughout the building. In Facility B, the CO in the boiler room might have permeated through the walls and entered directly into Patient 1B's office or, alternatively, into the HVAC system connected to the office.

Figure 2. Mid-Day Temperature and Humidity Averages — Anchorage, December 8–14, 2016



Discussion

This investigation is an unfortunate reminder to business owners and the general public of the potential for harmful CO exposure during cold weather conditions. The freezing fog created ideal conditions for rime ice to accumulate on the mesh wiring of the outside facing air intake vents connecting the indoor and outdoor environment,[3] leading to poor airflow into both facilities.

Facilities A and B have both removed the mesh wire barrier on their ventilation ducts and have installed CO detectors in the appropriate places. While the owner at Facility A noted that a CO detector was present at time of exposure, its alarm did not go off. Therefore, a new detector has been placed under the guidance of AKOSH.

Recommendations

1. Business and home owners should service heating systems, water heaters, and any other gas, oil, or coal burning appliances every year, and install CO detectors and check their batteries every 6 months.[4]
2. Air intake ventilation ducts must be kept clear. When the temperatures are below freezing and freezing fog is in the air, air intake ventilation ducts should be monitored to prevent blockage due to ice accumulation.
3. Anyone who experiences signs or symptoms of CO poisoning should go to a place where there is fresh air and seek medical attention immediately.[2]
4. Employers should educate staff on methods to reduce the risk of CO exposure and on how to recognize the signs of CO poisoning.[1,4]

References

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