

## **Carbon Dioxide Fact Sheet**

### **What is carbon dioxide?**

- Carbon dioxide (CO<sub>2</sub>), is a colorless, odorless, non-flammable gas at room temperature and is required for plant and animal life.
- Carbon dioxide is produced naturally in the body and during the burning of fossil fuels.
- Decaying vegetation and rotting carbon containing wastes also produce carbon dioxide.
- Carbon dioxide can exist as a liquid or solid depending on the temperature and pressure. Its solid form is called dry ice.

### **What are the uses of carbon dioxide?**

- Carbon dioxide is used in fire extinguishers, as a coolant in the form of dry ice, and to produce artificial fog that is sometimes used in theatre productions.
- Carbon dioxide is also used to carbonate sodas and seltzer water.

### **Is carbon dioxide present in the environment?**

- Carbon dioxide naturally makes up a very small part of the earth's atmosphere.
- The average concentration of carbon dioxide in outdoor air is approximately 0.03% or 300 parts per million (ppm).
- Carbon dioxide is released into the atmosphere when coal, oil, wood and other fossil fuels are burned.
- Carbon dioxide is also released into the atmosphere when vegetation and landfill wastes decay.
- Large quantities of carbon dioxide can be released into the environment during the eruption of volcanoes.
- Carbon dioxide is heavier than air and tends to accumulate near the ground surface.

### **How are people exposed to carbon dioxide?**

- The primary way people are exposed to carbon dioxide is by breathing atmospheric air containing the gas.
- People can also be exposed to carbon dioxide in occupied buildings.
- The typically concentration of carbon dioxide in occupied buildings is between 300 ppm to 400 ppm or 0.03% to 0.04%. A concentration of more than 800 ppm in indoor air indicates inadequate fresh air supply.
- People can also be exposed to carbon dioxide by handling or breathing vapor from dry ice.

### **How does carbon dioxide enter and leave the body?**

- Carbon dioxide in the atmosphere enters the body through the lungs and is then distributed to the blood.
- Carbon dioxide leaves the blood and is exhaled back into air from the lungs.
- Carbon dioxide made in the body when cells convert nutrients into energy is also exhaled into air from the lungs.

### **How harmful is exposure to carbon dioxide?**

- Exposure to gaseous carbon dioxide at low concentrations appears to have little harmful effects.
- Exposure to carbon dioxide at high concentrations can affect the lungs, skin, and cardiovascular systems.
- Exposure to 2 to 3% (20,000 – 30,000 ppm) carbon dioxide in air may cause shortness of breath on exertion.
- Exposure to 3 to 5% (30,000 – 50,000 ppm) carbon dioxide in air may cause rapid breathing and headache.
- Exposure to 5% (50,000 ppm) carbon dioxide in air may cause heavy breathing, sweating, and a fast pulse.
- Exposure to 7.5% (75,000 ppm) carbon dioxide in air may cause headaches, sweating, dizziness, shortness of breath, drowsiness, ringing in the ears, muscular weakness, and loss of mental abilities.
- Exposure to 10% (100,000 ppm) carbon dioxide in air may cause respiratory distress and loss of consciousness possible after 10 to 15 minutes.
- Exposure to 15% (150,000 ppm) carbon dioxide in air may be lethal. Exposures above this level are not tolerable.
- Exposure to 25+% (250,000+ ppm) carbon dioxide in air will cause convulsions. Rapid loss of consciousness will occur after a few breaths. Death will occur if this level is maintained.
- Direct contact of skin to frozen carbon dioxide (dry ice) may cause frostbite.

### **Is there a medical test to show whether I've been exposed to carbon dioxide?**

- There are tests that measure the amount of carbon dioxide in blood.
- Normal blood carbon dioxide levels range from 24-30 milliequivalents per liter (mEq/L) (USA) or 24-30 millimoles per liter (mmol/L) (International).
- Past exposures to carbon dioxide are difficult to detect since it is rapidly removed from the body.



### **What is the treatment for carbon dioxide poisoning?**

- There is no antidote for carbon dioxide toxicity.
- Carbon dioxide poisoning is treated by terminating exposure and provision of medical care in a hospital setting.

### **Are there recommendations to protect public health?**

- The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) for carbon dioxide in air of 5,000 parts per million (ppm) or 9000 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ) over an 8-hour work day, which is equivalent to 0.5% by volume of air.
- The Occupational Safety and Health Administration (OSHA) has set a short term exposure limit (STEL) for carbon dioxide in air of 30,000 ppm or 54,000  $\text{mg}/\text{m}^3$  for 15 minutes.
- The American Society of Heating and Air-Conditioning Engineers recommend that indoor carbon dioxide should not exceed 1000 ppm.

### **What can I do to prevent exposure to carbon dioxide?**

- Identify and limit sources of potentially harmful exposures.

### **What should I do if I believe I am ill as a result of exposure to carbon dioxide?**

- A person should be removed immediately from the source of exposure and ventilation provided.
- Emergency medical care should be sought in cases of suspected carbon dioxide poisoning.

### **Where can I get more information?**

For more information, contact:

The Pennsylvania Department of Health, Division of Environmental Health Epidemiology, P.O. Box 90, Harrisburg, Pennsylvania, 17108. Telephone number: 717-787-1708.

### **References**

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- (7) Striker S. Physiological responses to elevated carbon dioxide levels in buildings. Indoor Building Environment 1997;6:301-308.