Chlorine

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CAS number 7782-50-5

Chlorine is greenish-yellow gas with pungent, irritating odor. It shipped as liquefied compressed gas.

It is nonflammable gas, but a strong oxidizer. Chlorine reacts explosively or forms explosive compounds with many common substances such as acetylene, ether, turpentine, ammonia, fuel gas, hydrogen and finely divided metals [CDC].

Usage and exposure

Chlorine is used in many industries. It's used in the pulp and paper industries, pool chemical products, cleaning products, mining products, bleach and plastics manufacturing.

Some examples of workers at risk of being exposed to chlorine include the following:

- Workers in water treatment and sewage facilities,
- Agricultural workers who clean livestock facilities, such as dairy farms,
- Workers who clean pools,
- Janitorial workers who use cleaning products,
- Factory workers in bleach and plastic manufacturing.

The level of exposure depends upon the dose, duration, and work being done. [CDC NIOSH].

Chlorine gas exposures occur through industrial leaks, especially in textile and pulp bleaching and in the production of plastics and resins. Other releases occur primarily in transportation accidents, water-purification mishaps, swimming pool disinfectant accidents, household cleaning product misadventures [LaDou J].

Chlorine gas was used as chemical weapon in World War I [LaDou J].

Routs of exposure:

Inhalation, skin and/or eye contact**.**

Target organ:

Respiratory system, eyes, skin.

Health hazards

Exposure to low levels of chlorine can result in nose, throat, and eye irritation, rhinorrhea and lacrimation. At higher levels, breathing chlorine gas may result in changes in breathing rate, coughing, and damage to the lungs:

pulmonary edema, pneumonitis and hypoxemia. It may cause substernal pain; nausea, vomiting, head ache, dizziness; syncope; dermatitis, frostbite [CDC], [CDC NIOSH].

Chlorine gas is primarily a respiratory irritant. At low concentrations, chlorine gas has an odor similar to household bleach. As the concentrations increase from the level of detection by smell, so do the symptoms in the exposed individual. Depending on the level of exposure to chlorine, the effects may become more severe for several days after the incident.

Chlorine Exposure Thresholds, Limits , and Guidelines (ppm)

02-04 ppm - Odor threshold.

< 0.5 ppm - No known acute or chronic effect.

1 ppm- Mild mucous membrane irritation, tolerated up to 1 hour.

3 ppm- The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

10 ppm -The airborne concentration that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere. Values are based on a 30-minute exposure.

40 - 60 ppm - Toxic pneumonitis (inflammation of the lungs) and pulmonary edema (accumulation of fluid in the lungs).

430 ppm - Lethal over 30 minutes.

1000 ppm - Fatal within minutes [The Chlorine Institute].

References:

- CDC. Chlorine. https://www.cdc.gov/niosh/npg/npgd0115.html
- CDC. NIOSH. Workplace Safety and Health Topics. Chlorine. Overview. https://www.cdc.gov/niosh/topics/chlorine/default.html
- LaDou J.: Current Occupational and Environmental Medicine, 5th ed., McGraw Hill Education, 2014 p: 563
- The Chlorine Institute. https://www.chlorineinstitute.org/stewardship/chlorine/health-hazards/