

This fact sheet answers the most frequently asked health questions (FAQs) about chlorine. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: People working in facilities that use chlorine to manufacture other chemicals have the highest risk of being exposed to chlorine. Chlorine gas can cause irritation of the eyes, skin, and respiratory tract. Exposure to high levels can result in corrosive damage to the eyes, skin, and respiratory tissues, and could lead to pulmonary edema and even death in extreme cases. Chlorine gas has been found in at least 60 of the 1,591 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chlorine?

At room temperature, chlorine is a yellow-green gas that is heavier than air and has a strong irritating odor. It can be converted to a liquid under pressure or cold temperatures.

Chlorine is mainly used as a bleach in the manufacture of paper and cloth and to make a wide variety of products.

What happens to chlorine when it enters the environment?

- When released to air, chlorine will react with water to form hypochlorous acid and hydrochloric acid, which are removed from the atmosphere by rainfall.
- Chlorine is slightly soluble in water. It reacts with water to form hypochlorous acid and hydrochloric acid. The hypochlorous acid breaks down rapidly. The hydrochloric acid also breaks down; its breakdown products will lower the pH of the water (makes it more acidic).
- Since chlorine is a gas it is rarely found in soil. If released to soil, chlorine will react with moisture forming hypochlorous acid and hydrochloric acid. These compounds can react with other substances found in soil.
- Chlorine does not accumulate in the food chain.

How might I be exposed to chlorine?

- The general population is probably not exposed to chlorine gas, but may be exposed to products which are made from chlorine like sodium hypochlorite which is used as a disinfectant in public drinking water and swimming pools and as a common household bleach.
- Chlorine gas is used to synthesize other chemicals and to make bleaches and disinfectants. Therefore workers employed in occupations where these products are made may inhale chlorine gas or get it on their skin.

How can chlorine affect my health?

Chlorine gas is irritating and corrosive to the respiratory tract, eyes, and skin. The effects depend on how much you are exposed to and for how long. Exposure to low concentrations of chlorine gas (1 to 10 ppm) may cause sore throat, coughing, and eye and skin irritation. Exposure to higher levels could cause burning of the eyes and skin, rapid breathing, narrowing of the bronchi, wheezing, blue coloring of the skin, accumulation of fluid in the lungs, and pain in the lung region. Exposure to even higher levels can produce severe eye and skin burns, lung collapse, and death.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Some people may develop an inflammatory reaction to chlorine. This condition is called reactive airways dysfunction syndrome (RADS), a type of asthma caused by some irritating or corrosive substances.

If you were to come into skin contact with liquified chlorine, you could experience frostbite.

If you swallow a product that contains sodium hypochlorite, corrosive chlorine gas could be produced in your stomach and cause serious corrosive injury.

We do not know if exposure to chlorine can result in reproductive effects.

How likely is chlorine to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified chlorine as to its carcinogenicity. There is no additional information to determine whether exposure to chlorine might cause cancer.

How can chlorine affect children?

Children can be affected by exposure to chlorine in the same ways as adults. We do not know whether children differ from adults in their susceptibility to chlorine. In general, children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways.

We do not know if exposure to chlorine can result in birth defects or other developmental effects.

How can families reduce the risk of exposure to chlorine?

- Most families will not be exposed to high levels of chlorine gas.
- Household products containing substances such as sodium hypochlorite (which may release chlorine gas) should be stored in safe locations, out of the reach of children.

Is there a medical test to show whether I've been exposed to chlorine?

Specific tests for the presence of chlorine in the blood or urine are not generally useful. If a severe exposure has occurred, blood and urine analyses and other tests may show whether damage has occurred to the lungs and gastrointestinal tract. Some of these tests can be performed in a doctor's office. Some testing may require hospital facilities.

Has the federal government made recommendations to protect human health?

The EPA has set a limit for drinking water of 4 milligrams of chlorine per liter of water (4 mg/L) and also recommends that levels of chlorine in lakes and streams be limited to 10 mg/L to prevent possible human health effects from drinking water or eating fish contaminated with this chemical.

The Occupational Safety and Health Administration (OSHA) set a ceiling limit of 1 part of chlorine per million parts of workplace air (1 ppm). The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a time-weighted average (TWA) threshold limit value (TLV) of 0.5 ppm of chlorine for an 8-hour per day, 40-hour work week, and a short-term exposure level (STEL) of 1 ppm of chlorine.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

