

This fact sheet answers the most frequently asked health questions (FAQs) about perchlorates. For more information, call the ATSDR Information Center at 1-800-232-4636. 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 these substances 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: Solid perchlorates can be very reactive chemicals that are used mainly in fireworks, explosives, and rocket motors. Consumption of food and water containing perchlorates are the most relevant routes of exposure for the general population. Efforts are being made to determine the relative contribution of perchlorate from food and water. High levels of perchlorates can affect the thyroid gland, which in turn can alter the function of many organs in the body. The fetus and young children can be especially susceptible. Perchlorates have been found in at least 49 of the 1,581 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are perchlorates?

Perchlorates are colorless salts that have no odor. There are five perchlorate salts that are manufactured in large amounts: magnesium perchlorate, potassium perchlorate, ammonium perchlorate, sodium perchlorate, and lithium perchlorate. Perchlorate salts are solids that dissolve easily in water.

One place where perchlorates occur naturally is in western Texas and in saltpeter deposits in Chile, where the saltpeter is used to make fertilizer. Perchlorates can also form naturally in the atmosphere, leading to trace levels of perchlorate in precipitation. Perchlorates can be very reactive chemicals that are used mainly in explosives, fireworks, road flares, and rocket motors. The solid booster rocket of the space shuttle is almost 70% ammonium perchlorate.

Perchlorates are also used for making other chemicals. Many years ago, perchlorates were used as a medication to treat an overactive thyroid gland.

What happens to perchlorates when they enter the environment?

- Perchlorates entered the environment where rockets were made, tested, and taken apart.
- Perchlorates also enter the environment from fireworks, road safety flares, and through the use and disposal of consumer products such as bleach where perchlorate may be contained as an impurity. There is also evidence that there are natural sources of perchlorates in the environment.

- Factories that make or use perchlorates may also release them to soil and water.
- Perchlorates will not stay in soil and will wash away with rain water.
- Perchlorates will eventually end up in ground water.
- We do not know exactly how long perchlorates will last in water and soil, but the information available indicates that it is a very long time.
- Efforts to clean up the contamination of soil and water have been and continue to be made.
- Perchlorates have been found in many foods and in some drinking water supplies.

How might I be exposed to perchlorates?

- Eating food, milk, or drinking water contaminated with perchlorates. Recent studies have shown widespread exposure to low levels of perchlorate by the general population. Efforts are being made to determine the relative contribution of perchlorate from food and water.
- Living near factories that make fireworks, flares, or other explosive devices.
- Exposure before and after fireworks shows, or exposure during use of certain cleaning products and pool chemicals.
- Chewing tobacco may expose you to perchlorates because a variety of tobacco products contain perchlorates.
- Living near a waste site or a rocket manufacturing or testing facility that contains high levels of perchlorate in the soil or groundwater may expose you to higher levels.

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

How can perchlorates affect my health?

The health effects of perchlorate salts are due to the perchlorate itself and not to the other component (i.e., magnesium, ammonium, potassium, etc.). Perchlorate affects the ability of the thyroid gland to take up iodine. Iodine is needed to make hormones that regulate many body functions after they are released into the blood. Perchlorate's inhibition of iodine uptake must be great enough to affect the thyroid before it is considered harmful. Healthy volunteers who took about 35 milligrams (35 mg) of perchlorate every day for 14 days or 3 mg for 6 months showed no signs of abnormal functioning of their thyroid gland or any other health problem. Studies of workers exposed for years to approximately the same amount of perchlorates found no evidence of alterations in the worker's thyroids, livers, kidneys, or blood. However, there is concern that people exposed to higher amounts of perchlorate for a long time may develop a low level of thyroid activity; the name of this medical condition is hypothyroidism. Low levels of thyroid hormones in the blood may lead to adverse effects on the skin, cardiovascular system, pulmonary system, kidneys, gastrointestinal tract, liver, blood, neuromuscular system, nervous system, skeleton, male and female reproductive system, and numerous endocrine organs. Studies in animals also have shown that the thyroid gland is the main target of toxicity for perchlorate. Perchlorate did not affect reproduction in a study in rats.

Other chemicals such as thiocyanate (in food and cigarette smoke) and nitrate (in some food), are known to inhibit iodide uptake.

How likely are perchlorates to cause cancer?

There are no studies of exposure to perchlorates and cancer in humans. Long-term exposure to perchlorates induced thyroid cancer in rats and mice, but there are reasons to believe that humans are less likely than rodents to develop this type of cancer. The National Academy of Sciences (NAS) concluded that it is unlikely that perchlorates pose a risk of thyroid cancer in humans. Perchlorates have not been classified for carcinogenic effects by the Department of Health and Human Services (DHHS) or the International Agency for Research on Cancer (IARC). The EPA determined that perchlorate is not likely to be carcinogenic to humans, at least at doses below those necessary to alter thyroid hormone homeostasis.

How can perchlorates affect children?

The most sensitive population is fetuses of pregnant women who might have hypothyroidism or iodide deficiency

Infants and developing children may be more likely to be affected by perchlorates than adults because thyroid hormones are essential for normal growth and development.

Perchlorate has been found in breast milk. Studies of thyroid function of babies and young children whose mothers were exposed to perchlorate in their drinking water have not provided convincing evidence of thyroid abnormalities associated with perchlorate.

Studies in animals have shown that perchlorate can alter the thyroid gland in the newborn animals.

How can families reduce the risk of exposure to perchlorates?

- Although perchlorate is present in food, milk and drinking water, it is very unlikely that it will be present in the air of the average home or apartment.
- Use bottled water if you have concerns about the presence of perchlorates in your tap water.
- You may also contact local drinking water authorities and follow their advice.
- Prevent children from playing in dirt or eating dirt if you live near a waste site that has perchlorates.

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

Perchlorate can be measured in the blood, urine, and breast milk with special tests. In a CDC study, perchlorate was found in urine of all the people who were sampled across the country. Because perchlorate leaves the body fairly rapidly, perchlorate in urine only indicates recent exposure, but as perchlorate is present in some foods and in some drinking water supplies, exposure to perchlorate may be frequent for some people.

Has the federal government made recommendations to protect human health?

EPA adopted a Reference Dose (RfD) for perchlorate in 2005, and issued guidance regarding the cleanup of perchlorate at Superfund sites in 2006. EPA is currently evaluating whether there is a meaningful opportunity to reduce health risk through national drinking water regulation for perchlorate.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Perchlorates. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW 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.

