

This fact sheet answers the most frequently asked health questions (FAQs) about boron. For more information, call the CDC 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 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:** Exposure to boron occurs in the workplace or from using certain consumer products. Breathing moderate levels of boron irritates the nose, throat, and eyes. Ingestion of large amounts of boron can result in damage to the testes, intestines, liver, kidney, and brain. Boron has been found in at least 164 of 1,689 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

## What is boron?

Boron is a compound that occurs in nature. It is often found combined with other substances to form compounds called borates. Common borate compounds include boric acid, salts of borates, and boron oxide.

Borates are used mostly to produce glass. They are also used in fire retardants, leather tanning industries, cosmetics, photographic materials, soaps and cleaners, and for high-energy fuel. Some pesticides used for cockroach control and some wood preservatives also contain borates.

## What happens to boron when it enters the environment?

- Boron is released to the environment from natural sources such as oceans, volcanoes, and geothermal steam.
- Boron is also released from industries that use it.
- Boron cannot be destroyed in the environment. It can only change its form or become attached or separated from particles in soil, sediment, and water.

## How might I be exposed to boron?

- You can be exposed to boron in food, mainly vegetables and fruits.
- Boron is widely distributed in surface water and groundwater.
- The general public is not likely to be exposed to air contaminated with boron.

- Working in borax mining and refining plants and at sites where boric acid is manufactured.
- Using consumer products that contain it, such as cosmetics and laundry products.

## How can boron affect my health?

People working in dusty workplaces where borates are mined and processed have reported irritation of the nose, throat, and eyes. The irritation does not persist for long periods after leaving the dusty area.

Exposure to large amounts of boron (about 30 g of boric acid) over short periods of time can affect the stomach, intestines, liver, kidney, and brain and can eventually lead to death.

Studies in animals indicate that the male reproductive organs, especially the testes, are affected if large amounts of boron are ingested for short or long periods of time. The doses that produced these effects in animals are more than 1,800 times higher than the average daily intake of boron in food by adults in the U.S. population.

## How likely is boron to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the EPA have not classified boron as to its human carcinogenicity.

One animal study found no evidence of cancer after lifetime exposure to boric acid in food. No human studies are available.

## How can boron affect children?

It is likely that children would show the same health effects as adults. We do not know whether children differ in their susceptibility to the effects of boron.

We do not know whether boron causes birth defects in people. Low birth weights, birth defects, and developmental delays have occurred in newborn animals whose mothers were orally exposed to high doses of boron (as boric acid) during pregnancy. The doses that produced these effects in pregnant animals are more than 800 times higher than the average daily intake of boron in food by adult women in the U.S. population

## How can families reduce the risks of exposure to boron?

- Pesticides containing boron compounds should be used according to their directions and should be kept away from children.
- Always store household chemicals in their original labeled containers out of reach of young children to prevent accidental poisonings. Never store household chemicals in containers children would find attractive to eat or drink from, such as old soda bottles.
- Children living near waste sites containing boron and boron compounds are likely to be exposed to higher than normal environmental levels of boron through breathing in boron-containing dust, touching soil, and eating contaminated soil. Children should be encouraged to wash their hands frequently, especially before eating.

## Is there a medical test to determine whether I've been exposed to boron?

Blood and urine can be examined to determine whether excessive exposure to boron has occurred.

These tests can show you were exposed to boron, but cannot predict the kind of health effects that might occur.

## Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to boron in drinking water at concentrations of 4 ppm for 1 day or 0.9 ppm for 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 1 ppm boron is not expected to cause any adverse effects.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 15 mg/m<sup>3</sup> for boron oxide in air for an 8-hour workday, 40-hour workweek.

## References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Boron (Draft for Public Comment). 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 Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

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.