Selenium

What is selenium?

Selenium is a metal commonly found in rocks and soil. In the environment, selenium is not often found in the pure form. Much of the selenium in rocks is combined with sulfide minerals or with silver, copper, lead, and nickel minerals. Selenium and oxygen combine to form several compounds. Selenium sulfide is a bright red-yellow powder used in anti-dandruff shampoo. Industrially produced hydrogen selenide is a colorless gas with a disagreeable odor. It is probably the only selenium compound that might pose a health concern in the workplace. Selenium dioxide is an industrially produced compound that dissolves in water to form selenious acid. Selenious acid can be found in gun blueing (a solution used to clean the metal parts of a gun).

What happens to selenium when it enters the environment?

- Small selenium particles in the air settle to the ground or are taken out of the air in rain.
- Soluble selenium compounds in agricultural fields can leave the field in irrigation drainage water.
- Selenium can collect in animals that live in water containing high levels of it.

How might I be exposed to selenium?

- By breathing air that contains selenium
- By eating food, drinking water, or taking dietary supplements that contain it

How can selenium affect my health?

People exposed to very high levels of selenium in have reported dizziness, fatigue, irritation, collection of fluid in the lungs, and severe bronchitis. The exact levels at which these effects occur are not known. Upon contact with skin, selenium compounds have caused rashes, swelling, and pain.

In the United States, selenium in most diets is usually enough to meet the daily requirement of this essential metal. In regions of China where soil levels of selenium are very low, diets lacking selenium have resulted in heart problems and muscle pain.

Selenium compounds can be harmful at daily dietary levels 5–10 times higher than the daily requirement. Accidentally swallowing a large amount of selenium (for example, a very large quantity of selenium supplement pills) could be life-threatening without immediate medical treatment.

If too much selenium is eaten over long periods of time, brittle hair and deformed nails can develop. People may also lose feeling and control in the arms and legs.

Very high amounts of selenium resulted in reproductive effects in rats and monkeys. It is not known if reproductive effects would occur in humans exposed to similar levels.

Exposure to high levels of selenium compounds caused malformations in birds, but selenium has not been shown to cause birth defects in humans or in other mammals.

How likely is selenium to cause cancer?

The **Department of Health and Human Services (DHHS)** has determined that selenium sulfide is reasonably anticipated to be a carcinogen. This compound has produced liver tumors in rats and mice and lung tumors in mice fed daily at very high levels.

Selenium sulfide is very different from the selenium compounds found in foods and in the environment. Selenium sulfide has not caused cancer in animals when it is placed on the skin, and the use of anti-dandruff shampoos containing selenium sulfide is considered safe.

The **EPA** believes that other selenium compounds are not classifiable with regard to their carcinogenicity. Studies of laboratory animals and people show that most selenium compounds probably do not cause cancer. In fact, studies of cancer in humans suggest that lower-than-normal selenium levels in the diet might increase the risk of cancer and studies in animals have shown that selenium has anticarcinogenic effects.

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

Selenium can be measured in blood, urine, and nails of exposed individuals. However, since selenium is essential and normally present in foods, low levels are always found in body tissues and urine.
Tests are most useful for people who have recently been exposed to high levels. Urine is used to determine short-term exposure. Nail clippings can be used to determine longer-term exposure. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The **EPA** maximum contaminant level (MCL) for selenium in drinking water is 50 parts of selenium per billion parts of water (50 ppb). The **Occupational Safety and Health Administration (OSHA)** exposure limit for selenium compounds in workplace air is 0.2 milligrams of selenium per cubic meter of air (0.2 mg/m^3) for an 8-hour day over a 40-hour workweek.

Glossary

Anticarcinogenic:
: The ability to prevent cancer

Carcinogen:
: A substance with the ability to cause cancer

CAS:
: Chemical Abstracts Service

Source of Information

This ToxFAQs information is taken from the 1996 Toxicological Profile for Selenium produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.
Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information?

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.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Phone: 1-800-447-1544
Fax: 404-639-6359