

US EPA ARCHIVE DOCUMENT

Cadmium

CAS Number: 7440-43-9

What is cadmium?

Cadmium, in its purest form, is a soft silver-white metal that is found naturally in the earth's crust. However, the most common forms of cadmium found in the environment exist in combinations with other elements. For example, cadmium oxide (a mixture of cadmium and oxygen), cadmium chloride (a combination of cadmium and chlorine), and cadmium sulfide (a mixture of cadmium and sulfur) are commonly found in the environment. Cadmium doesn't have a distinct taste or smell.

What is cadmium used for?

Most cadmium used in this country is obtained as a by-product (formed while making something else) from smelting (melting) zinc, lead, or copper ores. The cadmium by-product is mostly used in metal plating and to make pigments, batteries, and plastics.

How can cadmium enter and leave your body?

Cadmium can get into your blood stream by eating and drinking cadmium-contaminated food or water and by breathing cadmium-contaminated air.

How can you be exposed to cadmium?

You can be exposed to cadmium in the work place by breathing cadmium-contaminated air. If you work for a battery manufacturer or work in metal soldering or welding, then workplace exposure to cadmium may be greater.

Exposure can also occur by eating foods containing low levels of cadmium. For most of

us, the most common source of exposure to cadmium is mainly through eating food, especially shellfish, liver, and kidney meats. Plants absorb or "take up" cadmium from soil, and the fish we eat "take up" cadmium from the water they live in. However, this type of exposure is not of greatest concern.

Cigarette smoke is another source of exposure. Traces of cadmium can be found in tobacco plants. Most people who smoke have about twice as much cadmium in their bodies as nonsmokers.

Breathing cadmium-contaminated air from industry sectors that burn fossil fuels like coal or oil, or that burn municipal wastes is another source of exposure and is the largest source of cadmium releases. Cadmium may also be released to the air from zinc, lead or copper smelters. If you work in or near these major sources of cadmium releases, then your exposure to cadmium may be higher than the average person.

What are the health effects of exposure to cadmium?

Exposure to cadmium can cause a number of harmful health effects. Eating food or drinking water with high levels of cadmium can severely irritate or bother your stomach and cause vomiting and diarrhea. Breathing high doses of cadmium can irritate and damage the lungs and can cause death.

However, the greatest concern is from exposure to lower doses of cadmium over a long period of time. The lower and long-term exposure to cadmium through air or through diet can cause kidney damage. Although the damage is not life-threatening, it can lead to the formation of kidney stones and affect the

skeleton, which can be painful and debilitating. Lung damage has also been observed.

The results of some animal studies show that animals given cadmium-contaminated food and water show high blood pressure, iron-poor blood, liver disease, nerve damage or brain damage. These effects have not been observed in humans.

The U.S. Department of Health and Human Services determined that cadmium and certain cadmium compounds are probable or suspected carcinogens (substances that cause cancer).

What levels of exposure have resulted in harmful health effects?

In general, the amount of cadmium that will cause health problems will vary depending on: (1) the type of exposure (eating or breathing), (2) the duration of the exposure (short- or long-term), and (3) the form of cadmium (pure cadmium or some combination).

Studies show that humans can experience lung irritation after breathing as little as 1.0 milligrams per cubic meter of air (mg/m^3) of cadmium-contaminated air for a short period of time (less than or equal to 14 days).

Breathing $0.01 \text{ mg}/\text{m}^3$ of cadmium-contaminated air over the long-term (greater than 14 days) has resulted in chronic lung disease and kidney disease in humans.

Humans that eat or drink cadmium-contaminated food and water for a short period of time (less than 14 days) in amounts of 0.05 milligrams per kilogram of body weight per day ($\text{mg}/\text{kg}/\text{day}$) can experience stomach irritation. Long-term exposure (greater than 14 days) in amounts of $0.005 \text{ mg}/\text{kg}/\text{day}$ cause relatively little risk of injury to the kidney or other tissues.

Exposure to cadmium through food is typical for most people but is not a major health concern. This is because the cadmium

present in the body from our diet is about $0.0004 \text{ mg}/\text{kg}/\text{day}$. This figure is about ten times lower than the level of cadmium that causes kidney damage from eating contaminated food.

Where can you get more information?

Contact your state health or environmental department, or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road N.E., E-29
Atlanta, Georgia 30333

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). *Public Health Statement for Cadmium*. Atlanta, GA: U.S. Department of Health and Human Services, 1989.
2. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Cadmium*. Atlanta, GA: U.S. Department of Health and Human Services, 1993.
3. Reigart, Routt J. and Roberts, James R. *Medical University of South Carolina. Recognition and Management of Pesticide Poisonings*. Fifth ed. Washington, D.C.: U.S. Environmental Protection Agency, Office of Pesticide Programs, 1999.