

# toxics release inventory

## Chemical Profile

Environment Division

## Arsenic

### What is arsenic?

Arsenic (As) is a gray, brittle, semi-metal that tarnishes in air. It is a natural component of the earth's crust and occurs in small amounts in bodies of water, underwater sediments, and soils. It is commonly found in combination with sulfur and iron in minerals such as pyrite.

Arsenic is used mainly to preserve wood and to control insects and weeds.

### How is arsenic released by electric utilities?

Trace amounts of arsenic are present in coal and oil. When electric utilities burn these fuels at their power plants, arsenic is released in very small amounts. Calcium arsenate is likely to be the arsenic compound most frequently released. Most of this arsenic is carried by particles of ash. It is mainly on the surface of the particles.

Coal-burning power plants are equipped with devices to capture ash particles before they reach the air. Particle control devices typically capture more than 99% of the ash, so very little ash enters the air. Arsenic-carrying ash captured by these devices is usually sent to ash ponds or land disposal sites.

Arsenic from power plants is about 1 to 2% of all the arsenic, from both natural sources and human activities, released into the air each year in the United States. The U.S. Environmental Protection Agency (EPA) estimates that

each year U.S. power plants release about 60 tons of arsenic into the air—56 tons from burning coal and 4 tons from burning oil.

### Is arsenic also released by other sources?

Natural arsenic occurs commonly and comes mainly from the soil. Estimates are that the amount of natural arsenic released into the air as dust from the soil is about equal to the amount of arsenic released by all human activities.

An estimated 75% of all arsenic released by human activities comes from metal production, such as copper smelting.

### What happens to arsenic after it is released by electric utilities?

Ash particles carrying arsenic settle to the ground after they are released into the air from power plants. Arsenic compounds that dissolve in water are carried to the ground by rain and snow. Other arsenic compounds that don't dissolve reach the ground through gravity and air turbulence.

Ash pond wastewater discharged into public waterways may contain small amounts of dissolved arsenic, but these amounts are regulated by local permits.

### How might people be exposed to arsenic?

Arsenic is common in the environment and people are exposed to small

amounts of arsenic in their diet—for example, by eating shellfish. They may breathe smoke or particles from wood containing arsenic preservatives, and workers may breathe airborne arsenic on the job if they fail to wear protective masks.

### What are the potential effects of arsenic on human health?

Very small amounts of arsenic in people's diets may be necessary for good health. But the kind of arsenic in the diet is important. Organic arsenic compounds (those containing carbon) are much less toxic than inorganic arsenic compounds (those containing no carbon). For example, eating organic arsenic compounds that accumulate in fish and shellfish is unlikely to harm human health.

Eating or drinking large amounts of inorganic arsenic can be toxic, even fatal. Exposure to large amounts of inorganic arsenic can cause stillbirths and birth defects, and can damage blood vessels, skin, nerves, and the heart. According to EPA and the U.S. Department of Health and Human Services, inorganic arsenic—even in very small amounts—is a cancer-causing agent. For example, eating or drinking inorganic arsenic may increase the risk of skin cancer and tumors of the bladder, kidney, liver, and lung.

Breathing inorganic arsenic may increase the risk of lung cancer, accord-

ing to studies of workers exposed to dust from copper-smelter operations. Copper-smelter dust may irritate the lungs. This irritation may be one of the critical reasons why copper-smelter workers appear to have an increased risk of lung cancer. Lung irritation appears less likely from breathing power plant ash because it contains a less-toxic form of inorganic arsenic.

### **How likely is it that utility releases pose a risk to human health?**

It is unlikely that arsenic from power plants poses a significant risk to human health. EPA has evaluated the potential health risks of breathing arsenic for people who live near power plants that burn coal and oil. EPA estimates that a person living all his life near one of these plants would have one chance in a million (or less) of developing cancer as a result of his exposure to power plant arsenic. According to EPA, only four plants out of nearly 600 in the United States posed cancer risks from arsenic exposure just slightly greater than these.

Researchers are investigating several important issues about the possible health effects of arsenic in power plant ash. One issue is which form of inorganic arsenic to use in estimating health effects. Inorganic arsenic produced by copper smelting is about ten times more toxic than inorganic arsenic in power plant ash. By basing its current estimate of arsenic health effects on the more toxic form of inorganic arsenic in copper-smelter dust, EPA has set a standard that may be much more conservative than needed to protect human health in the community. Also, EPA may have substantially overestimated the ability of arsenic to cause cancer when people breathe it. Although research is underway on these issues, we don't have all the answers yet.

### **How is arsenic regulated?**

EPA regulates public exposure to arsenic in drinking water and has published an estimate of the cancer risks related to drinking different amounts of arsenic. EPA also has published water quality standards to protect freshwater life, such as fish, from exposure to inorganic arsenic. Under the National Pollutant Discharge Elimination System, federal and state regulators determine how much arsenic each power plant may release in wastewater discharges. The Occupational Safety and Health Administration has set limits on the amount of arsenic in workplace air.

### **Where can I get more information about arsenic?**

The Agency for Toxic Substances and Disease Registry (ATSDR) has a fact sheet with answers to frequently asked health questions about arsenic. It is available through the ATSDR Information Center at 1-800-447-1544 or on the Internet at <http://atsdr1.atsdr.cdc.gov:8080/tfacts2.html>

EPA also has a fact sheet that is available on the Internet at <http://www.epa.gov/ttnuatw1/hlthef/arsenic.html>