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*Persistent, Bioaccumulative and Toxic Chemicals*

## Copper and Copper Compounds

### What are PBT chemicals?

Persistent, bioaccumulative and toxic (PBT) chemicals do not readily break down in the environment, are not easily metabolized, may accumulate in human or ecological food-chains through consumption or uptake and may be hazardous to human health or the environment. A PBT chemical, once released to the environment, may present increasing long-term toxic effects to human health and the environment, even if the release was of a small amount. The U.S. Environmental Protection Agency (U.S. EPA) has created a priority in its hazardous waste minimization program to reduce the presence of PBT chemicals, promote pollution prevention and avoid the transfer of PBT chemicals across environmental media.

Copper is a high priority PBT chemical.

### What is the adverse effect of copper?

Copper is necessary for good health. However, very large single or daily intakes of copper can harm human health. Long-term exposure to copper dust can irritate the nose, mouth, eyes and cause headaches, dizziness, nausea and diarrhea. Drinking water that contains higher than normal levels of copper may cause vomiting, diarrhea, stomach cramps and nausea.

Chronic high intakes of copper can cause liver and kidney damage and even death.

**Copper** is a reddish metal that occurs naturally in rock, soil, water, sediment and air. Copper also occurs naturally in plants and animals. It is an essential element for all known living organisms. Copper can be easily molded or shaped and is used in many industrial settings. Copper does not degrade, and is not destroyed by combustion. It cycles between the soil, the atmosphere, surface waters and ground water. High levels of copper can cause liver and kidney damage. Copper usage and pollution should be reduced wherever possible.

In 1999, Ohio's hazardous waste program regulated facilities reported generating 66 million pounds of copper and copper compounds in waste.

### Where is copper found?

Copper is a reddish metal that occurs naturally in rock, soil, water, sediment and air. Copper also occurs naturally in plants and animals.

Copper as a consumer product is most commonly seen in the U.S. as pennies, electrical wiring and some water pipes. It is also found in many mixtures of metals, called alloys, such as brass and bronze. Many compounds of copper exist, including naturally occurring minerals and man-made chemicals.

Copper is extensively mined and processed in the U.S. It is primarily used as the metal or alloy in the manufacture of wire, sheet metal, pipe and other metal products. Copper compounds are most commonly used in agriculture to treat plant diseases like mildew, for water treatment and as preservatives for wood, leather and fabrics.

Copper is common in the environment. One may be exposed to copper by breathing air, drinking water, eating

food and by skin contact with soil, water and other copper-containing substances. Most copper compounds found in air, water, sediment, soil and rock are so strongly attached to dust and dirt or imbedded in minerals that they cannot easily affect people's health. Some copper in the environment is less tightly bound to particles and may be taken up by plants and animals. Soluble copper compounds that are most commonly used in agriculture are more likely to threaten human health.

The average concentration of copper in lakes and rivers is four parts copper per billion parts of water (ppb). The average copper concentration in ground water is similar to that in lakes and rivers. However, monitoring data indicate that some ground water contains higher levels of copper. This copper is generally strongly attached to particles in the water. Lakes and reservoirs recently treated with copper compounds to control algae or receive cooling water from a power plant may have high concentrations of dissolved copper. Once in natural water, much of this copper soon attaches to

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particles or converts to forms that cannot easily enter the body.

Soil generally contains between two and 250 parts per million (ppm) copper, although concentrations close to 7,000 ppm have been found near copper production facilities. High concentrations of copper may be found in soil because dust from these industries settles out of the air, or waste from mining and other copper industries are disposed of on the soil. Another common source of copper in soil is sludge from sewage treatment plants. This copper generally stays strongly attached to the surface layer of soil. Exposure to this copper may happen by skin contact. Children may also be exposed to this copper by eating the dirt. Many hazardous waste sites contain high levels of copper and evidence suggests that most copper at these sites is strongly attached to soil.

Some of the most common sources of exposure to copper include:

- **Food** - Food naturally contains copper. An average person eats and drinks about 1 milligram of copper each day. Copper is necessary in your diet for good health. The U.S. Recommended Dietary Allowance is 0.6 - 2 milligrams a day.
- **Air** - The levels of copper in air that can result in harmful health effects in people are not known. Exposure to low levels of copper in air (0.1 ppm) affects the lungs of animals.
- **Water** - People can usually taste copper in the drinking water before experiencing adverse effects. If too much copper was drunk at one time (approximately 30 ppm or greater), one may vomit, have diarrhea and experience stomach cramps. High levels of copper in drinking water or food have been shown to damage the livers and kidneys in animals.

- **Occupation** - Some industries most likely to expose workers to copper include: welding, agriculture, water treatment and electroplating. Some garden products contain copper to control certain plant diseases and are also a potential source of exposure.

### Who is at risk?

Workers may be exposed to copper in the workplace. A person who works in or lives near copper mines or processing facilities may be exposed to copper by breathing copper-containing dust or by skin contact. Individuals who grind or weld copper metal may breathe high levels of copper dust and fumes.

A person may be exposed to high levels of soluble copper in the drinking water. The average concentration of copper in tap water ranges from 20 to 75 ppb. However, many households have copper concentrations of more than 1,000 ppb (more than 1 milligram per liter of water). This is because copper is picked up from copper pipes and brass faucets when the water sits in the pipes overnight. After the water is allowed to run for a while, the concentration of copper in the water decreases.

### How can people reduce risk of copper exposure?

Copper level in the body can be measured in the urine and blood. High levels of copper in these fluids can show that you have been exposed to high levels of copper. Samples of your blood plasma or urine can be properly collected in a doctor's office and sent to a laboratory that has special equipment to measure copper levels. However, it is not known if such a measurement can predict the extent of exposure or potential health effects.

To reduce the risk of occupational exposure, ask why copper is used on the job. Also inquire about how it can be removed or replaced.

Run the cold-water tap for about 30 seconds before using it for drinking or cooking, if cold water hasn't been used for six hours or more.

Discourage children from eating dirt. Make sure children wash their hands before meals and at bedtime. Discourage hand-to-mouth activity in children.


### Sources

Agency for Toxic Substances and Disease Registry  
[www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)

TOXNET, National Library of Medicine, National Institutes of Health  
[www.toxnet.nlm.nih.gov](http://www.toxnet.nlm.nih.gov)

The Office of Pollution Prevention was created to encourage multimedia pollution prevention activities in Ohio to reduce risk to public health, safety, welfare and the environment. Pollution prevention stresses source reduction and, as a second choice, environmentally-sound recycling while avoiding cross media transfers. The office develops information related to pollution prevention, increases awareness of pollution prevention opportunities, and can offer technical assistance to business, government, and the public.

For more information, visit the Office of Pollution Prevention's Web site at  
[www.epa.state.oh.us/opp](http://www.epa.state.oh.us/opp)

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