

Oregon Department of Human Services

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TECHNICAL BULLETIN

HEALTH EFFECTS INFORMATION

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ENVIRONMENTAL TOXICOLOGY SECTION
Office of Environmental Public Health
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COPPER

For More Information Contact:

**Environmental Toxicology Section
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**Drinking Water Section
(971) 673-0405**

SYNONYMS:

Cu (chemical symbol), copperas, cupric- or cuprous-salts

USES:

Copper is a naturally occurring metal found widely dispersed over the earth as a constituent of soils, rocks and geological formations. Since the very earliest civilizations, copper has been extracted from rocks and soils and used widely by humans. Due to its moldability and its relative softness, it lends itself well to construction of ornaments, utensils, tools, weapons and playthings. It is also useful in many combined forms with other chemicals and elements. Due to its ability to kill or control algae and small organisms it is widely used as a pesticide against insects, molds, algae and fungi. Because of its wide presence in soils, it is a constituent of most food products and is considered an essential dietary mineral for humans and animals.

CHEMICAL AND PHYSICAL PROPERTIES:

Copper in its metallic form is a shiny red-brown metal that is soft enough to be easily molded, beaten or shaped into almost any shape, ranging from thin foil to wires, tubes, bars, vessels or very heavy parts and tools. After prolonged exposure to air the shiny exposed surface turns to a dull red-brown (oxidized) color. Copper also reacts readily with many other elements and chemicals, and is useful in dissolved liquid forms, as a component in metal alloys (brass, bronze) and in a host of combined chemical forms such as copper salts.

- Metallic copper is relatively insoluble in water and can be used to hold and transport food and water products that are neither very acidic or alkaline. Acidic and alkaline materials may dissolve and erode copper sufficiently to pose drinking water or food hazards.
- Copper salts and other combined forms vary a great deal in their behavior. Some are extremely soluble in water and pose serious human and environmental hazards if released in quantity.
- Dissolved copper generally imparts a blue or blue-green color to the material it is dissolved in. If drinking water contains dissolved copper it will frequently cause blue or green staining of tiles, sinks, and other fixtures.

- Dissolved copper in the range of 1 to 5 milligrams per liter imparts a sharp or bitter taste to food or water.
- Copper and copper compounds are generally very resistant to evaporation and pose air hazards only if converted to vapor at very high combustion temperatures or if suspended in air in very fine mist or particles.

WHERE DOES IT COME FROM? WHAT IS ITS ENVIRONMENTAL SOURCE?

Copper is naturally dispersed over the entire earth and can be found at low levels in most soils and most waters. It is found in higher concentrations in areas where copper ores are present in soil and rock formations. Hazardous levels of copper in the environment are generally due to releases of concentrated copper during mining, industrial use, deliberate application of copper-containing compounds, disposal of copper-containing materials and accidental spills of copper materials. In drinking water, elevated levels of copper are usually due to dissolution of copper pipes, fixtures and treatment equipment, or the deliberate application of copper compounds for algae control in source water or reservoirs. Occasionally, materials containing excessive copper may enter drinking water lines by cross-connections to industrial water lines and fire fighting systems. Excessive levels of copper in Oregon water are nearly always due to copper piping and bronze or brass fittings in plumbing.

WHAT HAPPENS TO IT? WHAT IS ITS ENVIRONMENTAL FATE?

Copper is not destroyed or degraded in the environment. In air and in water it is usually diluted by mixing action and it can be carried by air and water. Copper gradually reacts chemically in the environment and tends to return to less soluble and more stable forms in soils and in sediments under water.

DRINKING WATER STANDARDS:

There is no health-based drinking water standard for copper because its offensive characteristics become apparent at concentrations much lower than any known toxic effects. Copper in water can cause staining of fixtures, hair and fabrics at levels between 0.5 and 4.0 ppm. It also imparts a bitter taste to water at 1-5 ppm. The US Environmental Protection Agency has adopted an action level of 1.3 ppm for public water systems to avoid these economic and aesthetic effects. Systems having copper at greater levels than this action level are required to provide corrosion control treatment.

Copper levels greater than 1 ppm may cause stomach irritation and vomiting. Persons recover quickly from these acute exposures and there are no confirmed long-term health effects from accidental or occasional exposures to drinking water containing copper at levels above the action level.

Habitual or frequent use of water having more than 1.3 ppm copper can lead to chronic injury. Infants or children exposed to levels of copper above the action level for weeks or months may suffer liver and kidney injury.

HOW CAN IT BE REMOVED FROM DRINKING WATER?

The most important avoidance techniques involve keeping copper from entering drinking water, rather than treatment for removal. This can be accomplished by:

- Avoiding the use of first-draw water for drinking or as an ingredient in food or beverages,
- Removing or limiting copper or copper-containing pipes, fittings, fixtures and equipment that is in contact with drinking water,
- Providing corrosion control to avoid aggressive water,
- Careful control or elimination of any uses of copper compounds by water suppliers in the control of algae.

Treatment equipment is available that will reduce copper in drinking water such as coagulation/filtration, ion exchange resins, lime precipitation and osmosis.

Persons are encouraged to contact the Department of Human Services Drinking Water Section 971-673-0405 for advice and assistance before buying or installing treatment equipment for copper removal or acidity/alkalinity adjustments.