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# Copper Exposure Sources

*Copper is an essential mineral your body needs, but only in small amounts. Too much copper can potentially harm your liver, kidneys, brain, and other organs and tissues.[1,2] To manage your exposure to copper, know the top sources in your water, food, and the environment.*

Your body requires copper to create energy from the food you eat. You also need copper for healthy bones, blood vessels, and nerves. Copper is involved in brain health, immune system function, and gene expression, too.[1,3]

Though copper plays many vital roles in your body, it is possible to get too much of the mineral.[4] You could get copper toxicity from one very large exposure or a gradual buildup of smaller but excessive amounts of copper over time.[5] An underlying disease (such as liver disease or certain cancers) or genetic condition could also interfere with your body's ability to prevent copper overload.[2]

## *Copper Toxicity Across the Globe*

The prevalence of copper toxicity varies in different regions. For example, copper toxicity is relatively uncommon in Western countries but is more common in South Asian countries, especially in rural areas.[2]

High copper levels in water, food, or the environment due to farming, mining, or manufacturing may increase toxicity risk in some regions. Though our main source of copper exposure is generally from consuming it in food or water, copper can also be inhaled or absorbed through the skin.[5]

People with limited access to healthy food are at greater risk of copper toxicity.[6] This might be partly due to shortfalls of other nutrients, including zinc. Zinc competes with copper for absorption in your gut and helps keep copper levels in balance.[7]

## *Water Sources of Copper*

Copper is a common contaminant in drinking water. Copper can leach from copper plumbing, especially if the water is highly acidic.[8] Acidic water can result from industrial pollution. Copper can also leach from pipes and faucets made from brass or bronze (copper is a component of these metals).[5]

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### TOP FOOD SOURCES OF COPPER[1,15-17]*

- Amaranth
- Buckwheat
- Chickweed (wild greens)
- Chocolate (cocoa and dark chocolate)
- Clams
- Crab
- Figs
- Legumes
- Liver
- Lobster
- Mushrooms
- Nuts (especially cashews)
- Oats
- Oysters
- Peanuts
- Potatoes
- Seaweed (kelp, spirulina)
- Seeds (sunflower, sesame, chia, etc.)
- Shrimp
- Soybeans
- Teff
- Tempeh
- Tofu
- Tomato puree
- Turkey giblets
- Wheat bran
- Whole wheat pasta

*Containing 20% or more of the Daily Value of copper per serving

The copper plumbing in new or recently renovated homes or buildings may be a bigger culprit in copper leaching into water than older plumbing. This is because older plumbing can build up a protective mineral layer that helps prevent copper from contaminating water.[9]

According to the World Health Organization (WHO), 119 countries and territories have regulations or guidelines for copper limits in drinking water.[10] Some local water regulatory agencies publish annual drinking water quality reports for cities and help supply water test kits (generally for a fee). If your water is from a private well, check online to see if your county or region offers free well-water testing.[11] If not, you can pay for copper testing from a certified water testing lab.

In some regions, those in charge of public water systems must periodically check copper levels in a sampling of households.[12] When water has high levels of copper, you might notice that it tastes metallic or bitter.[13] Water may also turn blue/green when copper levels are too high.[9] You may see blue-green stains on porcelain sinks or bathtubs as well. This is because copper that is exposed to air and water changes from its usual reddish-brown color to blue-green. Similarly, a symptom of copper toxicity in people is blue-green discharge in diarrhea or vomit.[2]

If the copper levels in your water are high, consult a qualified water quality professional for advice. You may be able to use a water filter, distiller, or reverse osmosis system to remove copper from the water you drink and use for cooking.[14]

Alternatively, if water has been sitting in pipes for several hours (such as overnight), you can let it run a minute before use. That may help flush out copper-contaminated water. This method requires diligence, and its effectiveness varies.[9] So, it isn't an ideal long-term solution.

### *Dietary Sources of Copper*

Copper is found in a wide variety of plant- and animal-based foods, but some foods are especially rich in copper (see "Top Food Sources of Copper," *left*). Foods with the highest copper levels include shellfish, organ meats, whole grains, pseudo-grains (grain-like seeds, such as amaranth), legumes, nuts, seeds, and chocolate.[1,15]

Some of the copper in foods comes from crops taking up the mineral from what is naturally present in the soil. In other cases, the copper content of soil is high due to farmers' use of copper-containing pesticides, fertilizers, and feed additives. Some of this copper ends up in your food.[18]

If you take certain dietary supplements, you may get copper in them. Besides supplements containing only copper, you may also find copper in multivitamin-mineral, prenatal, and other combination supplements. Bee pollen dietary supplements are naturally rich in copper.[19]

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*Copper Dietary Reference Intakes (per day)*[1]

Birth to 6 months: 200 micrograms (mcg)†

7 to 12 months: 220 mcg†

1 to 3 years: 340 mcg

4 to 8 years: 440 mcg

9 to 13 years: 700 mcg

14 to 18 years: 890 mcg

19 or older: 900 mcg

Pregnancy: 1,000 mcg

Lactation: 1,300 mcg

†Values are Adequate Intakes (AI); all others are U.S. Recommended Dietary Allowances (RDAs).

*Copper Tolerable Upper Intake Levels (per day)*[1]

Birth to 6 months: ND‡

7 to 12 months: ND

1 to 3 years: 1,000 mcg

4 to 8 years: 3,000 mcg

9 to 13 years: 5,000 mcg

14 to 18 years: 8,000 mcg

19 or older: 10,000 mcg

Pregnancy or lactation, age 18 or under: 8,000 mcg

Pregnancy or lactation, ages 19 to 50: 10,000 mcg

‡ND = Not determinable due to lack of data on adverse effects in this age group and concern about an inability to handle excess amounts.

### *Environmental Sources of Copper*

Pollution from copper mining and metal processing can add to your copper exposure.[4,20] Copper is used in countless items, such as automobiles, airplanes, building materials, computers, electrical appliances, cookware, jewelry, coins, and brass musical instruments. Among the top copper-producing countries are Chile, Peru, China, and the United States.[21]

The risk of copper exposure is especially high if you work in a copper-related industry. Workers can be exposed to copper by breathing it or skin contact.[22] Some regulatory groups, such as the U.S. Occupational Safety and Health Administration (OSHA), set limits on the levels of copper fumes, dust, and mists allowed in work areas when employees are present.[23]

The following industrial processes could increase workers' copper exposure:[5]

- Applying copper-containing preservatives to wood
- Building construction (such as working with electrical wiring or plumbing)
- Electroplating (applying metal coatings)
- Metal extraction, refining, preparation, and pouring
- Painting (such as with copper conductive paint or antifouling paint for the bottom of boats)
- Smelting (extracting copper by heating and melting ore)
- Welding metallic parts (heating to enable metals to join)

### *Other Sources of Copper*

Here are some other ways you might be exposed to copper. Though any single source of exposure may not be significant and doesn't necessarily need to be avoided, it can be helpful to consider all potential sources.

- **Birth control pills.** These tend to raise copper levels in the body.[24] This is due to the close association between estrogen and copper levels.
- **Copper intrauterine devices (IUDs).** These release copper, which has a contraceptive effect.[5] Studies haven't shown a link between IUDs and copper toxicity in healthy women, but more research is needed.[7,25]
- **Copper cookware.** If you cook acidic foods in worn or uncoated copper cookware, the copper can readily leach into the food.[26] Avoid corroded, rusted, or worn copper kitchenware.
- **Copper face masks.** Copper is used in some face masks for protection against germs. However, depending on how well the copper is bound to the mask, some copper may be released and could be inhaled.[27,28]
- **Dental materials.** Copper is used in some dental fillings, crowns, implants, metal retainers, braces, and dentures. Cements and adhesives used during dental work may also contain copper.[29-31]

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### *Wilson's Disease*

In this rare inherited disorder, your body has trouble getting rid of extra copper. So, copper may build up and damage the liver, kidneys, brain, eyes, and other organs.[2,29]

This copper excess can result in symptoms such as yellow-tinted skin, personality changes, movement disorders, and brownish-yellow rings around the colored part of the eyes. Removing copper buildup and limiting copper exposure are generally part of the medical treatment.[40]

Wilson's disease has been found in all races and ethnic groups. It is estimated to occur in 1 out of every 30,000 to 50,000 individuals in the United States, Europe, and Asia. Prevalence estimates are higher in some regions, including the Middle East and India.[41]

- **Electronic waste.** Copper is commonly used in electrical wiring and circuit boards. Broken down, discarded electronics like televisions and computer equipment can contaminate the soil, dust, food, air, and water with copper. This is especially true in regions with improper recycling.[32,33]
- **Fabric and leather.** Fabric may be coated or treated with copper to help block UV rays or give it antimicrobial properties.[34,35] Copper is also used to produce leather, such as for shoes and coats.[36]
- **Hobbies.** Jewelry makers sometimes work with copper wire and other copper pieces. Some hobbyists use metallic spray paints that contain copper. Always follow safety instructions for such products.
- **Nature.** Forest fires, volcanoes, and decaying plants release copper. Copper also travels in the air via windblown dust.[15] Children may be exposed to copper in dust by hand-to-mouth contact.
- **Stress.** Too much physical or mental stress may lower your zinc levels.[37] When zinc becomes deficient, copper tends to increase in the body.[38]
- **Swimming pools and lakes.** Copper sulfate products are sometimes used to prevent and kill algae growth in swimming pools, ponds, and lakes.[8]
- **Topical creams.** Copper-containing creams are used in burn treatment due to the antiseptic properties of copper.[2] In addition, anti-wrinkle facial creams containing copper peptides have become popular.[39] You absorb some of the copper from such creams.[7]

## *Maintaining Copper Balance*

Keep in mind that your body has methods for maintaining copper at a healthy level. When you take in excess copper, your body absorbs less. Your body also has ways to get rid of extra copper, primarily via your stools.[1]

Still, it is possible to overwhelm your body's natural systems for regulating copper levels. Talk with your healthcare practitioner if you think you have increased copper exposure, as a gradual buildup can lead to toxicity. They may advise adding zinc-containing foods or a zinc supplement to help balance copper in your body.[38] You may also need to omit high copper sources, such as copper supplements. Some cases of copper toxicity may require medicine to bind excess copper or other immediate medical treatment.

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