

What is copper sulfate?

Copper sulfate is an inorganic compound that combines sulfur with copper. It can kill [bacteria](#), algae, roots, [plants](#), [snails](#), and [fungi](#). The toxicity of copper sulfate depends on the copper content. Copper is an essential mineral. It can be found in the environment, foods, and water. Copper sulfate has been registered for use in pesticide products in the United States since 1956.

What are some products that contain copper sulfate?

[Products](#) containing copper sulfate can be liquids, dusts, or crystals. There are several dozen active products containing copper sulfate on the market in the United States. Some of these have been approved for use in organic agriculture.

Always [follow label instructions](#) and take steps to avoid exposure. If any exposures occur, be sure to follow the First Aid instructions on the product label carefully. For additional treatment advice, contact the Poison Control Center at 1-800-222-1222. If you wish to discuss a pesticide problem, please call 1-800-858-7378.



How does copper sulfate work?

Copper in copper sulfate binds to proteins in fungi and algae. This damages the cells causing them to leak and die. In snails, copper disrupts the normal function of the skin cells and enzymes.



How might I be exposed to copper sulfate?

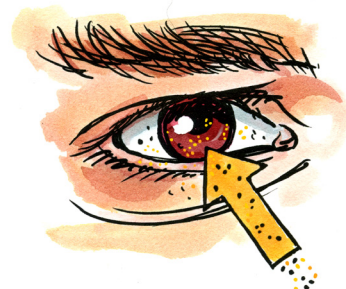
You can be exposed if you are applying copper sulfate and you get it on your skin, breathe it in, or accidentally eat or drink a product. This can also happen if you get some on your hands and eat or smoke without washing your hands first. You can [limit your exposure](#) and [reduce risk](#) by following all label instructions carefully.

NPIC General Fact Sheets are designed to provide scientific information to the general public. This document is intended to promote informed decision-making. Please refer to the Technical Fact Sheet for more information.

What are some signs and symptoms from a brief exposure to copper sulfate?

Copper sulfate can cause severe eye irritation. Eating large amounts of copper sulfate can lead to nausea, vomiting, and damage to body tissues, blood cells, the liver, and kidneys. With extreme exposures, shock and death can occur.

Copper sulfate affects animals in a similar way. Signs of poisoning in animals include lack of appetite, vomiting, dehydration, shock, and death. Diarrhea and vomit may have a green to blue color. See the fact sheet on [Pets and Pesticide Use](#).



What happens to copper sulfate when it enters the body?

Copper is an essential element and it is required to support proper health. The human body adjusts its internal environment to maintain copper equilibrium. Copper sulfate is absorbed into the body if eaten or inhaled. It then rapidly enters the bloodstream. Once inside, copper moves throughout the body. It then binds to proteins and enters different organs.

Excess copper is excreted and not often stored in the body. Copper can be collected in the liver but it can also be found in stomach secretions, bone, brain, hair, heart, intestine, kidneys, muscle, nails, skin, and spleen. Copper is mainly excreted in the feces. Small amounts can also be eliminated in hair and nails. In one study, researchers found it takes 13 to 33 days for half of a large copper dose to be eliminated from the body.

Is copper sulfate likely to contribute to the development of cancer?

Whether copper sulfate causes cancer in animals is uncertain. The U.S. Environmental Protection Agency (U.S. EPA) has not published a cancer rating for copper sulfate. This is due to a lack of evidence linking copper or copper salts to cancer development in animals that can normally regulate copper in their bodies.

One study looked at long-term work-related exposures to copper sulfate. They found an increased risk of kidney cancer. Another study found that decreasing copper can inhibit cancer growth. Animal studies have produced conflicting results.

Has anyone studied non-cancer effects from long-term exposure to copper sulfate?

Studies in humans of long-term non-cancer effects to copper sulfate were not identified. However, Wilson's disease may provide insight into potential health effects over long periods of time. Wilson's disease is a rare genetic disorder in which the body retains too much copper. The effects include infertility, higher miscarriage rates, loss of menses and hormonal imbalances in women. In men, the testes don't function properly. Exposure to copper sulfate does not cause Wilson's disease.

In one study, mice were fed very large amounts of copper sulfate before and during pregnancy. Some baby mice died during gestation or did not develop normally.

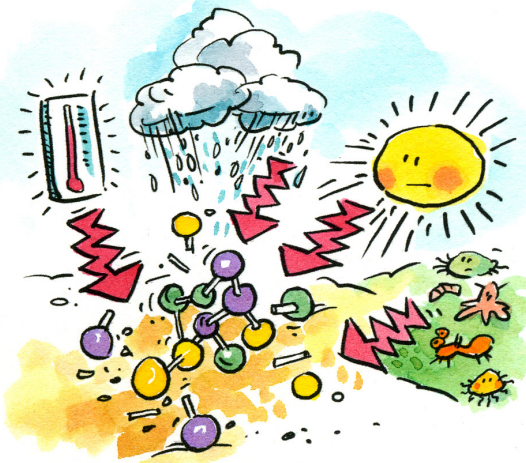
Are children more sensitive to copper sulfate than adults ?

[Children may be especially sensitive to pesticides](#) compared to adults. However, there are currently no data to conclude that children have increased sensitivity specifically to copper sulfate.

What happens to copper sulfate in the environment ?

Copper naturally occurs in the [environment](#). Copper in soil may originate from natural sources, pesticides, or other sources. These may include mining, industry, architectural material, and motor vehicles. Copper accumulates mainly at the surface of soils, where it binds tightly and persists.

Copper sulfate is highly soluble in water and it can bind to sediments. Copper is regulated by plants because it is an essential mineral. Too much copper can be toxic to plants as it inhibits photosynthesis.



Can copper sulfate affect birds, fish, or other wildlife ?

The U.S. EPA considers copper to be practically nontoxic to bees and moderately toxic to birds. Studies with several aquatic species have found copper to be highly to very highly toxic to fish and aquatic life. Trout, koi and juvenile fish of several species are known to be particularly sensitive to copper.

Fish kills have been reported after copper sulfate applications for algae control in ponds and lakes. Oxygen depletion and increased debris have been cited as the cause of most fish deaths. This is sometimes due to the sudden death and decay of algae and plants after an application. Even small concentrations of copper can be harmful to fish and water organisms. Always follow label instructions to protect the environment.

Where can I get more information ?

For more detailed information call the National Pesticide Information Center, between 8:00 AM and 12:00 PM Pacific Time (11:00 AM to 3:00 PM Eastern Time), Monday - Friday, at 1-800-858-7378 or visit us on the web at <http://npic.orst.edu>. NPIC provides objective, science-based answers to questions about pesticides.

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NPIC is a cooperative agreement between Oregon State University and the U.S. Environmental Protection Agency (U.S. EPA, cooperative agreement # X8-83458501). The information in this publication does not in any way replace or supersede the restrictions, precautions, directions, or other information on the pesticide label or any other regulatory requirements, nor does it necessarily reflect the position of the U.S. EPA.