



**US Environmental Protection Agency  
Office of Pesticide Programs**

**Copper Facts**

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# Coppers Facts

## **Pesticide Reregistration**

All pesticides sold or distributed in the United States must be registered by the Environmental Protection Agency (EPA or the Agency), based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides that were first registered before November 1, 1984 be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. To implement provisions of the Food Quality Protection Act (FQPA) of 1996, EPA considered the special sensitivity of infants and children to pesticides, as well as aggregate exposure of the public to pesticide residues from all sources, and the cumulative effects of pesticides and other compounds with common mechanisms of toxicity. The Agency develops any mitigation measures or regulatory controls needed to effectively reduce each pesticide's risks. EPA then registers pesticides that meet the safety standard of the FQPA and can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA explains the basis for its decision in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for copper-containing pesticides, hereon referred to as copper, in cases 0636, 0649, 4025, and 4026.

## **Regulatory History**

The first registration for a copper-containing pesticide for agricultural uses was issued in 1956. Currently, 16 copper active ingredients have active food use registrations subject to tolerance reassessment and reregistration review. EPA issued Registration Standards for copper sulfate in March 1986, *Guidance for the Reregistration of Pesticide Products Containing Copper Sulfate as the Active Ingredient*, and for the Group II copper compounds, *Guidance for the Reregistration of Pesticide Products Containing Group II Copper Compounds as the Active Ingredient* in April 1987.

Generic Data Call-In (GDCI) notices were issued in 1987 to the registrants for various copper compounds to submit data in support of reregistration. These comprehensive DCIs required various ecological fate and effects studies. Additional DCIs were issued in 1993, which required various product chemistry studies, avian toxicity studies and residue studies. These

DCIs were issued so that data required by 40 CFR Part 158 would be available to the Agency before risk assessments for reregistration were performed.

## Uses

### Agricultural Crops

Copper is registered for use on virtually all food/feed crops, including orchard, row, field, and aquatic crops. Crops include, but are not limited to: root and tubers, leafy vegetables (including brassica), bulb vegetables, fruiting vegetables, citrus, stone fruit, pome fruit, legumes, cucurbits, berries, cereals and tree nuts. Copper is also registered for use on various ornamental crops, such as flowering/non-flowering plants and trees.

### Aquatic Applications of Copper Pesticides

Copper is registered for use on numerous aquatic use sites. Below is a description of algacide, herbicide, molluscicide, and macro-invertebrate use.

Algacide Applications. Copper applications for algae control include: aquaculture facilities, drainage systems (canal, ditch and lateral), ponds (farm, industrial and recreational), fountains, lakes, reservoirs (crop and non-crop irrigation, potable), sewage lagoons, stocking (tank, water trough and ponds) and irrigation canals.

Herbicide Applications. Copper applications for aquatic weed control include: aquaculture facilities, drainage systems (canal, ditch and lateral), ponds (farm, industrial and recreational), lakes, reservoirs (crop and non-crop irrigation, potable), sewage lagoons, sewer systems, stocking (tank, water trough and ponds) and irrigation canals.

Molluscicide and Macro-Invertebrate Applications. Copper is registered for use to control freshwater snails that may be a vector for harmful trematodes. Copper is also used to control leeches, and tadpole shrimp in rice fields.

### Antimicrobial Applications

Copper is registered for use as a wood preservative, mildewcide, water treatment, bactericide, and as an anti-foulant in many products including paint, glue, building materials and construction materials.

### Non-crop Uses

Copper is registered for use in various residential applications, including home gardens and lawns. Copper products are also used for in established turf applications to manage moss.

## **Health Effects**

### Dietary Exposure

Copper pesticides are formulated into various forms of copper, i.e., different salts and complexed forms, which ultimately dissociates into the cupric ion, the active component of concern. It is one of the micronutrients essential to human health. Copper is ubiquitous in the environment and naturally occurs in many food sources such as nuts, organ meats and grains. Copper may also be found in drinking water, commonly due to the use of copper plumbing fixtures and water pipes. The EPA's Office of Water regulates contaminants in water, with 1.3 parts per million set as the Maximum Contaminant Level Goal for copper.

Current available literature and studies do not indicate any systemic toxicity associated with dietary exposures to copper. However, some genetic disorders such as Wilson's Disease, Occipital Horn Syndrome, Tyrolean Infantile Cirrhosis, Indian Childhood Cirrhosis, Idiopathic Copper Toxicosis, can disrupt the metabolism of copper in the human body. Generally, current available data and literature studies indicate that there is a greater risk from the deficiency of copper intake than from excess intake. Given the role copper plays as an essential element to the human body, its ubiquitous nature in food and drinking water, and the lack of systemic toxicity resulting from copper, acute and chronic dietary endpoints were not selected. Thus, a quantitative toxicity assessment was not conducted for dietary, dermal, oral or inhalation exposures.

### Aggregate Risk

Aggregate risk refers to the combined risk from dietary (food and drinking water) and residential or other non-occupational exposures. Aggregate risk can result from one-time (acute), short-term or chronic exposures. Because of the lack of systemic toxicity, expected copper exposures at concentrations from combined pesticide sources do not pose any health risks of concern.

### Occupational and Residential Exposure

Some copper species and formulations containing copper compounds may cause acute dermal and eye irritation in exposed individuals. Workers can be exposed to copper pesticides through mixing, loading and/or applying the pesticide (handlers) or re-entering treated sites. Exposure may also occur to residential handlers from home-use products.

## **Ecological Risks**

### Aquatic Organisms

Copper is highly toxic to most aquatic species. The main cause of copper toxicity to fish and aquatic invertebrates is through rapid binding of copper to the gill membranes, which causes damage and interferes with osmoregulatory processes. The amount of cupric ion in the environment, and its toxicity to aquatic animals through gill damage, is dependent on a number

of water quality parameters including pH, alkalinity, and dissolved organic carbon. To assess copper exposures to aquatic animals in freshwater bodies, the EPA's Office of Pesticides Program worked with the Office of Water in utilizing the Biotic-Ligand Model to estimate site-specific copper levels to which aquatic animals may be exposed. Both acute and chronic risk quotients (RQs) were exceeded for almost all test species assessed. As expected of copper as an algaecide, copper is very toxic to algae. In algae, it causes increased permeability of the cell membrane and leakage of the cell contents. However, the assessment does not indicate a risk of concern to freshwater vascular plants or estuarine/marine plants.

### Terrestrial Organisms

The screening-level ecological risk assessment suggests potential acute and chronic risks of concern to terrestrial animals exposed to copper resulting from use as an agricultural pesticide. There is some uncertainty in the finding of risk to birds and mammals because, although copper is toxic at high concentrations, it is also an important essential trace element for terrestrial animals. Many terrestrial animals have the ability to cope with some amount of excess copper exposure by storing it in the liver and bone marrow. As indicated by the laboratory toxicity studies, exposure to high levels of copper in the diet can overwhelm the ability of birds and mammals to maintain homeostasis. However, animals which are repeatedly exposed to levels of copper which do not cause permanent harm may undergo enzymatic adaptation which allows them to cope with greater levels of exposure. RQs based on limited toxicity data for terrestrial plants do not exceed the acute level of concern (LOC) from exposure through spray drift. Available data from a honey bee acute toxicity study indicated that copper is practically nontoxic to honey bees.

### **Risk Mitigation**

#### Human Health

There are no human health risks of concern for dietary (food and drinking water) exposures to the pesticidal uses of copper. However, some of the various copper compounds and formulations may cause some dermal or eye irritation. To minimize potential irritation effects from exposures to copper-containing pesticides in residential settings, precautionary language will be added to labels. Based on acute toxicity studies conducted with each copper compound and product, the appropriate Personal Protective Equipment (PPE), per the criteria outlined in the Worker Protection Standard, are required based on the respective copper compound(s) in each product. Workers that handle copper-containing pesticides within agricultural settings will minimize exposures by using the appropriate PPE. The Agency is also updating the Restricted Entry Interval for the respective copper compound, depending on the available acute toxicity data for that copper specie.

#### Ecological Risk

To reduce ecological exposures, registrants have agreed to amend their labels, including the reduction of application rates, defining application intervals, and determining seasonal maximum application rates. Label language restricting spray applications of copper pesticides

under certain weather conditions, and advisory language describing steps users can take to minimize spray drift, will be added to the labels for copper pesticides. In addition, advisory language will be added to copper pesticide product labels to inform users of surface water quality conditions which can lead to greater bioavailability and toxicity of copper to non-target aquatic organisms.

### **Data Requirements**

The generic data base supporting the reregistration of coppers has been reviewed and determined to be substantially complete. However, one data gap, the UV/VIS Absorption study (Guideline 830.7050), remains. This study will be included in the generic DCI for this RED, which the Agency intends to issue at a future date. In addition, registrants are required to submit updated product labels and Confidential Statements of Formula.

### **Regulatory Conclusion**

The Agency has determined that copper-containing products of cases 0636, 0649, 4025, and 4026, are eligible for reregistration provided that the risk mitigation measures are adopted and labels are amended to reflect these measures.

### **For More Information**

Electronic copies of the Coppers RED and all supporting documents are available in the public docket EPA-HQ-OPP-2005-0558 located on-line in the Federal docket system at <http://www.regulations.gov>.

For more information about EPA's pesticide reregistration program, the Coppers RED, or reregistration of individual products containing copper-containing pesticides, please contact the Special Review and Reregistration Division (7508P), Office of Pesticide Programs, U.S. EPA, Washington, D.C. 20460, telephone 703-308-8000.

For information about the health affects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticide Information Center. Call toll-free 1-800-858-7378, from 6:30 am to 4:30 pm Pacific Time, or 9:30 am to 7:30 pm Eastern Standard Time, seven days a week. The NPIC internet address is <http://npic.orst.edu>.