

**“Environmental and  
Health Risk Evaluation of  
Copper Naphthenate and  
Copper Naphthenate  
Treated Wood”**

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This document provides an overview of the health risks associated with copper naphthenate and copper naphthenate treated wood.

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*ENVIRONMENTAL AND HEALTH RISK EVALUATION OF COPPER  
NAPHTHENATE AND COPPER NAPHTHENATE TREATED WOOD*

Copper naphthenate has been used for over 50 years in the United States in various wood treating applications. Copper naphthenate is a copper carboxylate made with naphthenic acid, which occurs naturally in petroleum. Commercial copper naphthenate is normally supplied as a 6% or an 8% copper concentrate which is diluted with a petroleum hydrocarbon to provide a 1-2% copper treating solution. Copper naphthenate is an EPA registered general use wood and fabric preservative that can be used with a high degree of safety. It is not considered a hazardous waste, it is non-corrosive, non-conductive, non-blooming, and it has low mammalian (e.g. human) toxicity.<sup>1</sup>

Commercial pressure treaters dilute copper naphthenate with wood treating oil to obtain a 1-2% treating solution.<sup>2</sup> The exposure potential to the treating oil carrier from evaporation should be negligible with a low vapor pressure (less than 1 mmHg) and evaporation rate (0.02 compared to butyl acetate at 1.0).<sup>3</sup>

Copper naphthenate-treated wood has a low order of toxicity, and when it is discarded the treated wood is not a hazardous waste. Copper naphthenate products can be purchased at retail outlets and have a variety of uses as wood and textile preservatives. Copper naphthenate has been used safely in greenhouse applications.<sup>4</sup> It is recommended for the treatment of beehives because it has not harmed bees or significantly affected the quality of honey produced.<sup>5</sup> Copper naphthenate is approved as an over the counter topical treatment for treating horses and ponies for thrush at concentrations of 37.5%.<sup>6</sup> Livestock exposed to copper naphthenate-treated shelters and water troughs exhibited no adverse health effects.<sup>7</sup>

The properties of copper and naphthenic acid provide insight into the overall risk profile of copper naphthenate. Elemental copper is an essential element for all known living organisms, including humans and other animals. Copper is normally kept in balance in the human body. Copper compounds are most commonly used in agriculture to treat plant diseases, like mildew, or for water treatment and as preservatives for wood, leather, and fabrics. Food naturally contains copper. You eat and drink about 1 milligram (1/1000 of a gram) of copper every day. Copper is necessary in your diet for good health.<sup>8</sup> There is evidence that feeding extra copper and zinc may be beneficial to better bone quality in horses. Feeding 25 parts per million copper and 75 parts per million zinc may aid in preventing developmental orthopedic disease.<sup>9</sup> 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 your health.<sup>10</sup>

Soil generally contains between 2 and 250 ppm copper. The Environmental Protection Agency (EPA) has determined that drinking water should not contain more than 1.3 ppm of copper.<sup>11</sup> Intentionally "high intakes" of copper can cause liver and kidney damage and even death. Copper is generally cleared from the body and is not known to cause cancer. There is no data indicating that copper can cause birth defects in humans.<sup>12</sup>

Naphthenic acid is a natural mixture of organic acids from petroleum refining. Studies indicate that naphthenic acid can probably cause irritation to the eyes and respiratory tract, and central nervous system depression at high concentrations. Contact with skin can cause slight to moderate irritation and possible severe dermatitis or irritation with prolonged or repeated contact.<sup>13</sup>

The acute oral toxicity of naphthenic acid is between 3 and 7 g/kg according to rodent studies. This correlates to a slightly toxic material. The dermal LD<sub>50</sub> for naphthenic acid is greater than 3.2 g/kg, which correlates to a moderately toxic material. Accumulation of naphthenic acid in the body is unlikely as it is probably excreted unchanged or broken down quickly in the body. Naphthenic acid does not have an established occupational airborne exposure limitation.<sup>14</sup> Although toxic to fish, bacteria, and fungi, naphthenic acid is relatively non—toxic to birds and mammals.<sup>15</sup>

Copper naphthenate is not a restricted use pesticide. It is a general-use wood preservative. The EPA label for copper naphthenate products bears a “Warning” signal word, representing the moderately hazardous nature of the product.

Copper naphthenate is essentially insoluble in water and its leachability from wood is very low. Because it has a very low vapor pressure, evaporation from wood is inconsequential.<sup>16</sup> There is practically no inhalation hazard from vapor. Any vapor inhalation hazard would be from the solvent carrier.<sup>17</sup>

The overall potential health effects of copper naphthenate to humans are extremely low. The oral toxicity or LD<sub>50</sub> (rats, lethal dose in 50% of the population tested) of an 8% copper naphthenate formulation according to laboratory testing is greater than 5 grams/kg. This means that it is slightly toxic if ingested. There are no occupational threshold limit values (airborne exposure limit) established for copper naphthenate. Exposure may cause minor inflammation to the skin and systemic toxicity resulting from absorption through the skin is unlikely. No fetotoxic or teratogenic potential has been indicated in animal studies.<sup>18</sup>

The diesel-like odor or musty smell of the naphthenic acid may be noticeable for a short period of time, although chemical concentrations in ambient settings should be negligible. Products formulated or repackaged from copper naphthenate must be labeled for “Exterior Use Only”.

## **Conclusion**

Based on the information reviewed, it appears that copper naphthenate is one of the safer and more environmentally acceptable pesticide products in the marketplace today. No consequential short or long-term health effects are expected to occur from properly treated copper naphthenate wood in accordance with EPA labeled directions.

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## Background Information on Evaluator

Education: Associates Degree in Chemical Engineering Technology, State Technical Institute at Memphis; Bachelor of Technology, Concentration in Environmental Technology and Urban Systems, from Florida International University; and Master of Public Administration, Concentration in Health Care.

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