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Home & Environment

Avoiding Arsenic Exposure from Treated Lumber Around the Home

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Chromated copper arsenate (CCA) was a pesticide commonly used in pressure-treated lumber until it was voluntarily withdrawn from the residential market in 2004. CCA-treated lumber contains arsenic, which may pose serious health risks. Taking certain precautions can greatly reduce these risks.

This publication looks at the risks posed by CCA-treated lumber and how to minimize them.

CCA-Treated Wood Very Common

Pesticides have been used in pressure-treated lumber since the 1940s to prevent damage caused by insects and fungus. CCA-treated lumber was voluntarily withdrawn from residential applications in 2004, but is still allowed for other applications such as utility poles and bridge timbers.

Research suggests that CCA-treated lumber accounted for up to 75 percent of the treated-lumber market from the 1970s to 2004 (Micklewright, 1998; Shalat et al., 2006). During that time, CCA-treated wood was used in a number of residential applications including playgrounds, decks, picnic tables, landscaping timber, and fencing (Khan et al., 2006). Many of these applications remain in use. For example, the U.S. Environmental Protection Agency (EPA) estimated that as late as 2004, one in seven U.S. playgrounds contained CCA-treated wood (Hamula et al., 2006).

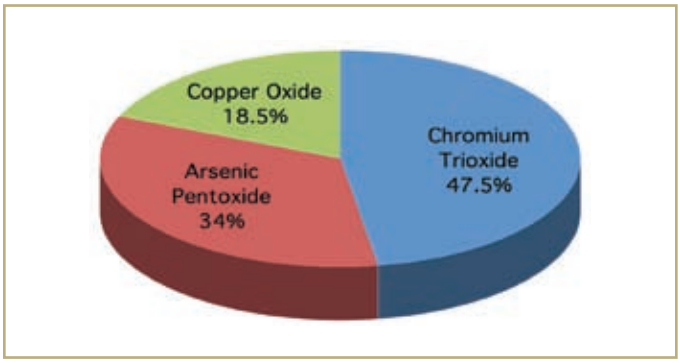

Figure 1. Composition of CCA
This graph shows the relative proportions of chemicals making up the dominant form of CCA used in North America (adapted from Hingston et al, 2001).

The Effects of Arsenic Exposure

The harmful effects of this pesticide-treated wood are related to the toxicity of the metals present (arsenic, chromium, and copper) as well as how easily these metals can be removed from wood (Figure 1).

Arsenic is the most toxic of the three metals in CCA-treated wood and is the greatest concern. Chromium and copper also can be toxic at high enough levels — copper and chromium are actually nutrients that all people need in low doses (Table 1) (Alloway, 1995).

Table 1. Arsenic, Chromium, and Copper Levels
This table provides the average levels of arsenic, chromium, and copper found in soil and plants, as well as the human recommended dietary allowances (RDA) for each metal.

	Soil (ppm)[1]	Plants (ppm)[1]	Human RDA[2] (micrograms per day)
Arsenic	1-40	<3	0
Chromium	84	<1	20-35
Copper	1-150	5-20	900

ppm = parts per million
[1]Data from (Alloway, 1995)
[2]Data from the National Academy of Sciences

Low levels of arsenic in the body can lower red and white blood cell counts, cause abnormal heart rhythms, impair nerve function, and damage blood vessels (ASTDR, 2005). The Department of Health and Human Services lists it as a carcinogen. Children face additional risks from arsenic. Exposure to the metal while they are still developing could impair mental development, resulting in lower IQ scores.

Sources of Arsenic Exposure

Arsenic is readily absorbed by the digestive and respiratory systems (Farmer and Johnson, 1990; Jensen et al, 1991). The main risk for exposure to arsenic in CCA-treated wood is through ingestion. In the home, this can happen either by dust created by sawing, sanding, or working with CCA-treated wood or by the ingestion of residue left on the hands after direct physical contact.

Arsenic levels of up to 3.5 micrograms have been observed on the hands of children using playgrounds constructed with CCA-treated wood (Kwon et al., 2004). This is a concern because children are more likely to put their hands in their mouths and, due to their small size, face a greater risk of toxic effects from lower doses. Although 3.5 micrograms may sound small, it is roughly equivalent to the maximum daily oral dose considered safe (called the RfD) by the EPA for a 3-year-old of average weight (RfD = 0.14 micrograms of arsenic per pound of body weight per day). If, on a daily basis, frequent playground activity is coupled with consistent use of a CCA-treated deck, picnic table, or fencing, a child could end up regularly ingesting unsafe levels of arsenic.

The metals in CCA-treated wood, especially arsenic, may also be slowly released into the soil by exposure to water. The average concentration of arsenic in CCA-treated wood is 1,500 to 3,300 ppm (about 0.02 to 0.05 ounces of arsenic per pound of wood), compared to the concentration naturally found in the soil of 1 to 40 ppm (about 0.03 to 1.3 ounces per ton of soil). One study found that an average CCA-treated deck can leach about 0.1 ounce of arsenic each year. At that rate, of the 28,000 tons of arsenic used in CCA-treated wood, about 4,600 tons had already entered the environment by 2000, and another 11,000 tons will be leached in the next 40 years (Khan et al., 2006). Ingesting large amounts of soil that have accumulated arsenic from the treated wood could potentially be toxic, especially soils containing high clay or organic matter.

Reducing Your Exposure Risk

There is no easy way to know whether the wood used in your outdoor deck or neighborhood playground was treated with CCA. But if the structure was built between 1970 and 2004, it is very probable that it contains CCA-treated lumber, so you should take appropriate precautions to reduce your risk of arsenic exposure.

Children may be at greater risk of exposure to the arsenic in CCA-treated wood because they are more likely to put their hands in their mouths than adults.

You can reduce the risk of exposure from CCA-treated products in many ways:

- Remove your shoes before entering your home after playing on or using structures that are known or suspected to contain CCA.
- Discourage children from putting their hands in their mouths during play and wash hands and clothes after using CCA-treated equipment.
- Apply a sealant to the wood every year or two to create a barrier between you and the CCA. The EPA discourages painting CCA-treated wood because paint can wear, creating flakes that could be contaminated with CCA. Plus, the regular maintenance paint requires could create CCA-contaminated dust.
- Wear a dust mask and thoroughly wash your hands, clothes, and the work area after cutting or building with CCA-treated wood.
- Avoid growing food crops near CCA-treated wood.
- Do not burn CCA-treated wood because the ash will contain concentrated levels of arsenic.

Table 2. Alternatives to Wood Products

This table provides a brief description, advantages, and disadvantages of various alternatives to using wood.

Material	Description	Advantages	Disadvantages
Composites	Solid material made of wood fibers and recycled grocery bags and/or recycled milk jugs	• Doesn't warp, split, chip, or rot • Variety of colors available • Never needs sealing or staining • Moisture resistant	• More expensive • Less aesthetic than wood • Not for structural use (structural support, subframes) • Susceptible to mildew, mold, stains • Color fades in sun
Virgin vinyl	• Hollow building material, a molecularly bonded blend of 100% virgin, hi-polymer resin • Some are made with additives to prevent sun damage and enhance strength	• Doesn't warp, split, chip, or rot • Variety of colors available • Never needs sealing or staining	• More expensive • Less aesthetic than wood • Not for structural use (structural support, sub-frames)
High density polyethylene (HDPE)	Thermoplastic	• Weather resistant • Can be cut or drilled cleanly • Does not split or chip • Good low-temperature impact resistance • Excellent chemical resistance	• Susceptible to stress cracking • High mould shrinkage • Poor UV resistance • Not for structural use (structural support, sub-frames)
Rubber lumber	Composed of 50% plastic and 50% old tires	• Durable • Impervious to water • Insect resistant • UV resistant • Variety of colors available	• Color not guaranteed to last • Not for structural use (structural support, sub-frames)

Adapted from www.epa.gov/oppad001/reregistration/cca/pressuretreatedwood_alternatives.htm

Alternatives to CCA

Since 2004, manufacturers have introduced a number of pesticides for treating wood that do not contain arsenic. Two common pesticides used today are alkaline copper quat (ACQ) and copper azole (CA) (Lebow, 2004).

A number of products are available that you can substitute for wood, including wood composites or other plastic or rubber-containing wood alternatives (Table 2).

Find Out More

Contact these agencies for more information about CCA or arsenic.

In Indiana

Indiana Department of Environmental Management
(800) 451-6027 (ext. 4-0887)

Indiana State Department of Health
(317) 233-7162

In the United States

Agency for Toxic Substances and Disease Registry
(888) 422-8737

National Pesticide Information Center
(800) 858-7378

EPA CCA Information
www.epa.gov/oppad001/reregistration/cca

Other Home & Environment Publications

Visit the Home & Environment Web site for science-based information about homes and the home environment: www.ces.purdue.edu/HENV/index.htm.

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