

Ed Smith School

"Wood-  
Preserved" Rained?

June 19, 1992

Dear Mrs. Howard,

Attached is an article regarding danger of skin absorption of arsenic, chromium and copper from skin contact (touch) of pressure treated lumber. (I have outlined pertinent sections of the article).

Please investigate whether our beautiful Ed Smith playground was constructed with such pressure treated wood. If so it would seem responsible to find the whereabouts all to seal or paint the wood surfaces and prevent and protect our children from toxic skin exposure.

Sincerely,

Virginia Schechter





## LETTERS

### THE TREATED WOOD HITS THE FAN!

HELP! Four seasons ago (in the fall) my husband and I built our raised beds with pressure-treated landscape timbers. I was assured at that time that the chemical would leach out of the timber over the winter and my beds would be safe come spring. I've been planting our veggies in those beds every since.

Now I read in the April issue ("Framing Your Garden") that these beds may be unsafe. What should I do? Are my beds safe or should I rip them out? What about my soil—is it unsafe?

Teena Esposito  
Trevor, Wisconsin

In 1991, our family established a new garden site on our property. We live on top of a steep hill so we needed to build a retaining wall on the one side.

Fortunately (or unfortunately, depending on how you look at it), my father is a contractor and built it to last my lifetime. We used treated 4X4s (boy, do I wish your article had come out last year). So much for my "organic" garden.

Is it possible to dig around the inside perimeter of the garden and install a barrier of some type or do you have another solution to my problem?

Kathy Petron  
Northfield, Ohio

After reading the article about treated wood, I realized in horror that my entire new greenhouse is framed with this stuff. What can I do short of tearing down my greenhouse? (By the way, the plans we got from the hardware store recommended using treated wood.)

Donna Peterson  
Mesilla Park, New Mexico

I was dismayed after reading the article regarding the use of treated lumber around raised beds. I have invested a considerable amount of money in constructing the frames of 10 such beds made of CCA-treated lumber. I quickly called the lumberyard and was informed that they use a weak 2 percent solution by the EPA as not harmful to humans and animals. I was told that the chemical bonds to the wood and does not leach into the soil.

Please advise me if this is indeed as safe as they say. Or should I just turn these beds into flower beds? What about vegetables that don't come into direct contact with the soil such as tomatoes and peppers? I am willing to make

changes in my garden because the health of my family is more important than the money invested in the wood.

Joan D. Rogers  
Ferrum, Virginia

I am involved in clinical research relating to the effects of heavy metals and trace elements on children's neurological development, and I was most interested in your article about treated wood. I would appreciate a list of references that may have supported your recommendations. I can't thank you enough for providing this interesting information.

Jeffrey Seidman, M.D.  
Consultant Pediatrician  
Scarborough, Ontario

Most "pressure-treated" lumber available today is saturated with CCA—chromated copper arsenate. This combination "preserves" wood because it is toxic to wood-destroying fungi and insects. All three chemicals—copper, chromium and arsenic—are also highly toxic to plants and humans. And yes, all three can be taken up by plants. This alone is more than enough for us to state without reservation that CCA-treated wood does not belong in organic gardens. No substance containing chemical pesticides, "EPA-approved" or not, belongs in an organic, healthy garden.

However, thanks to the extremely slick public relations work and legal maneuvering of the companies that manufacture treated wood (many of whom, after being flooded with calls following our April story, wrote to say that we were confusing their "safe" arsenic with "bad" arsenic), most people have no idea that treated wood contains such toxic chemicals. In fact, one recent industry study (Wood & Fiber Science, 1990) found that awareness of the chemical content of this wood "by retail customers is quite low."

Our research editor Cheryl Long has reviewed a stack of scientific articles (over a foot high and still growing) and there is a lot of evidence showing that chromium, copper and arsenic are all very nasty to people, plants and other living things. Unfortunately, very little research has been performed to find out exactly how much of this stuff leaches out into a treated-wood framed garden, or how much is absorbed by vegetables grown in contact with the lumber.

By the way, even the manufacturers themselves don't claim that no leaching occurs. Instead, they say that not enough of these toxins leach out to be a problem.

One manufacturer who wrote us (The Hickson Corp.) hedges by saying that "virtu-

ally no preservative leaches into soil, water or air." Another company, Osmose, admits in their letter (which accuses us of "doing our readers a disservice"): "This is not to say that a small amount may not leach out of the wood."

A scientist working for a British company (called—believe it or not—Rentokil, Ltd.) explained at a 1985 symposium on forest-products research that "opinion is still divided over the...laboratory leaching data both in terms of performance in service and environmental hazard...The work by Henry and Jeroski indicates that as much as 50 percent of the arsenic in Type B treated timber should be lost by leaching."

And all "CCA-treated wood" is not the same. From one manufacturer's letter to us: "We would caution consumers not to use the 'salt' variety of chromated copper arsenate treatments, as the salts will leach out of the wood." (They go on to assure us that their brand won't leach.)

From the EPA's fact sheet on CCA: "Arsenicals are acutely toxic to humans by ingestion...Both arsenic and chromium have been classified as human carcinogens, demonstrating positive oncogenic effects based on sufficient human epidemiological evidence. The weight of evidence also indicates that arsenicals and chromium are mutagens. Environmental fate data to support the registration of wood preservatives containing arsenic and chromium are lacking."

A British study of contaminated soil at a site where treated wood was made found that carrots grown in the soil (which contained 200 ppm—parts per million—of arsenic) "produced crops containing nearly twice the current recommended limit for arsenic in food." (This study points out another good reason to avoid CCA wood—the considerable hazard to the unfortunate workers who make the stuff and the terrible damage to the environment that occurs during the treatment process.)

And then there's the disposal problem—CCA wood produces highly toxic fumes and ash when burned, so it can only be disposed of by burial in our overflowing landfills. But CCA wood has been so heavily promoted, that 444 million cubic feet were sold in 1988 in the United States alone! A lot of it will almost certainly be burned by people unaware of its toxicity. A report in the Journal of the American Medical Association tells of a family that suffered serious health problems after they burned CCA-treated wood scraps in their woodstove.

Possible contamination of food? There's no "possible" about it; CCA wood is already

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strictly prohibited for use in beehives because research has shown that making hives out of treated wood "resulted in an increased arsenic content of bees...and was associated with winter losses of colonies." (Journal of Agriculture and Food Chemistry, 1984.)

Plants? "Arsenic toxicity in plants...consists of leaf wilting followed by root discoloration and death of leaf tips and margins...The concentration of soluble arsenic in soils which is necessary to cause injury varies from 1 ppm for cowpeas to 9 ppm for peas and beans." (Soil Science of America Proceedings, 1971.) Another study reported a 20 percent reduction in tomato yields at only one-half ppm.

"All three elements (arsenic, copper and chromium) are recognized toxicants at trace levels and all are listed as EPA 'priority pollutants.'" (Archives of Environmental Contamination and Toxicology, 1992.) It has long been acknowledged that treated wood placed in water leaches enough toxins to harm marine organisms in the area. And not just salt water either. "Henshaw (1979) found that 3 to 8 percent of the metals (in treated wood) leached in a few days from wood samples in deionized fresh water."

"In spite of the huge volume of CCA-

treated lumber being used, the published literature contains very little information about the extent to which the wood preservative chemicals migrate out of the treated wood, or about the nature and extent of the...residues which might be present on the surface of structures built of preserved wood...Several groups of investigators have shown that the extent and rate of leaching is influenced by the composition and acidity of the treating solution, the drying conditions of the wood after treatment, and the composition of the treated wood...The levels of arsenic, chromium and copper in wipe samples indicate that the treated wood has dislodgeable surface residues which could lead to some user exposure and to leaching of the preservative components from the wood."

(Presentation to the American Chemical Society by researchers from Health and Welfare Canada and Geological Survey of Canada; 1990.)

Let's hope that good science will eventually win out over the PR efforts of those who profit from the ever-expanding use of CCA wood. Maybe there is a place in the world for some uses of this highly toxic building material, but these companies have gone too far now that they are actively promoting this

stuff for raised garden beds, picnic tables and playground equipment. Can you say "peddle poison to make a profit"?

Playground equipment! Unfortunately, the free plans at the lumber yard don't reveal that you'll be building Arsenicland for your kids:

A 1991 study (Riedel, Galarneau, Harrison, Gregoire and Bertrand) performed for Canada's office of Health and Welfare found that the soil under playground equipment made from treated wood had arsenic concentrations up to 24 times higher than areas just 10 meters away. They used plain old cloth to wipe 10 of the structures and got measurable amounts of arsenic every time. Chromium and copper showed up, too.

The U.S. Consumer Products Safety Commission has picked up arsenic from playground equipment using similar "wipe tests." Nobody can even guess how much poison kids ingest if they chomp down on the wood (as children often do) or when they eat the dirt underneath (if you're not a parent, trust us on this; it's not if, it's when).

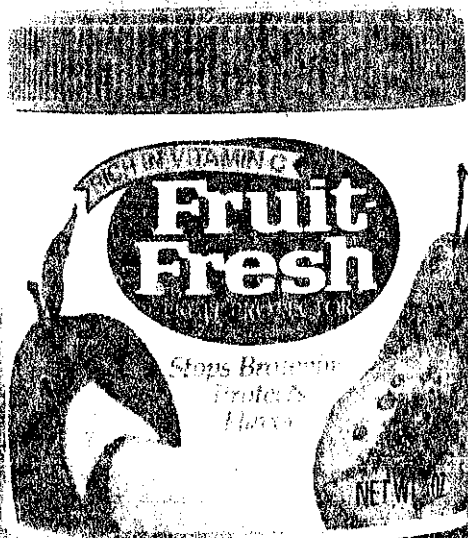
Angry enough at the pinheads who promote this stuff for garden and playground use yet? We have enough studies to rant on for 10 more pages. But I think the dan-

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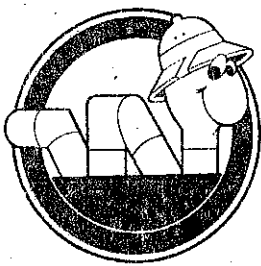
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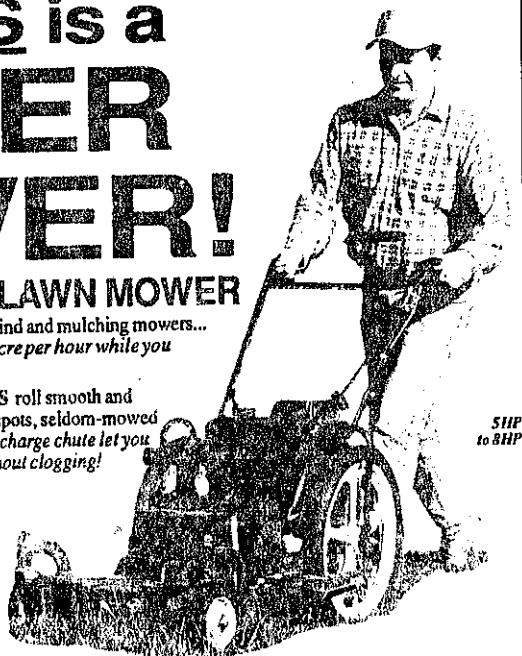
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gens—and what kind of people we're dealing with here—are pretty obvious.

OK, advice time: If you've already used CCA wood in your garden for raised beds, replace the wood if you can. At the very least, dig (carefully!) out the area that touches the wood and line it with plastic or a similar barrier to prevent plants and soil from touching the stuff. Should you replace the soil? The amount of toxin that can leach out depends on many different factors—your specific soil type, pH, amount of rainfall, type of CCA treatment, and whether your wood is sealed or not—to name just a few. There's no way to know if you have a problem without a test. If you want to have your soil tested for toxins, write to Timberleaf Soil Testing Services, 5569 State St., Albany, OH 45710 for prices and details.

If you're planning to build new raised beds, once again, we suggest you use naturally rot-resistant woods such as cedar, cypress or locust; or use stone, brick or concrete blocks. Or just build your raised beds without edging of any kind. If you've used CCA wood for a deck or picnic table, we recommend that at the very least you seal the wood with paint or polyurethane to prevent leaching and skin exposure.

To safely preserve untreated wood for decks, fences, picnic tables and other above-ground uses, the USDA's Forest Products Laboratory has developed a do-it-yourself recipe for a nontoxic wood preservative that has been shown to be as effective as pentachlorophenol (a highly toxic chemical wood preservative). It protects wood for 20 years! Here's the recipe:

- 3 cups exterior varnish or 1½ cups boiled linseed oil
- 1 ounce paraffin wax
- Enough solvent (mineral spirits, paint thinner or turpentine at room temperature) to make the total volume of the mix 1 full gallon
- Melt the paraffin over water in a double boiler. (Do not heat over a direct flame!) Off to the side, stir the solvent vigorously, then slowly pour in the melted paraffin. Add the varnish or linseed oil and continue to stir thoroughly. That's it! Apply by dipping the regular untreated lumber into the mixture for three minutes or brush on a heavy application. If you want, the wood can be painted when it's thoroughly dry.

You may also want to consider wood treated with borax-based preservatives for above-ground uses. Borates are mined natural minerals that are toxic to insects and fungi but relatively nontoxic to humans. For more information about this option, write to U.S. Borax, Box 75128, Sanford Station, Los Angeles, CA 90075.

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## Preserved Wood and Wood Preservative Products

Due to their toxicity to wood destructive organisms, wood preservatives protect wood from decay and increase its life expectancy. Wood is treated in the U.S. primarily by the pressure process, rather than by dipping, brushing, spraying, or vacuum processes. Pressure treatment is often preceded by a process to reduce wood moisture.

<u>Major Types of Wood Preservatives</u>	<u>Comments</u>
1. Creosote	**Avoid Use if Possible
2. Pentachlorophenol (PCP)	**Avoid Use if Possible
3. Arsenicals	
Chromated copper arsenate (CCA)	
Ammoniacal copper arsenate (ACA)	*Use CCA instead
Fluor-chrome-arsenate phenol (FCAP)	
4. Acid copper chromate (ACC)	
5. Chromated zinc chloride (CZC)	
6. Bis,tri-n-butyltin oxide (TBTO)	
7. Copper naphthenate; zinc naphthenate	**Low Human Toxicity
8. Copper-8-quinolinolate	**Low Human Toxicity
9. 3-Iodo-2-propanyl butyl carbamate	

### 1. Creosote:

Creosote is used commonly for railroad ties where, unlike PCP and arsenical treatments, it does not increase wood brittleness and splitting. Creosote is a distillation product of coal tar with a boiling point range 390-750° F. It consists of a mixture of higher molecular weight aromatic hydrocarbons, tar acids, and bases; principally phenanthrene (21%), fluorene (10%), fluoranthene (10%), acenaphthene (9%), and pyrene (9%). Creosote may be used in combination with coal tar or petroleum oil. It is generally used alone, but for marine applications wood may be treated first with arsenicals and then followed by a second pressure treatment with creosote. Alternative marine uses are creosote with 2% PCP, or creosote with copper or zinc naphthenate for marine borers.

Creosote is an irritant, photosensitizer, and potential carcinogen. Direct skin contact can produce skin reddening, chemical burns, and allergic reactions. Creosote contains multiple ring compounds, aromatic amines, and nitrogen compounds which have been shown to increase the risk of skin, lung, and bladder carcinomas; as well as various organic sulfur compounds which have been shown in animal studies to act as accelerators or promoters of carcinogenicity.

### 2. Pentachlorophenol (PCP):

Pentachlorophenol (PCP) is oil soluble; sodium pentachlorophenate is water soluble. PCP is primarily used in a 5% solution in petroleum solvents such as Type A (similar to diesel fuel-where a paintable surface is not required) or Type C (mineral spirits-for a paintable surface). PCP treated wood typically has a darkened natural wood hue. Commercial PCP contains about 90% pentachlorophenol, about 10% tri- and tetra- homologs, and less than 1% dioxin and dibenzofuran contaminants.

PCP is a skin irritant and photosensitizer, and is toxic by inhalation or skin absorption. Chronic exposure may cause severe dermatitis and neurological disturbances. Chronic symptoms include bronchitis and/or chloracne (possibly as a result of dioxin contaminants), conjunctivitis (eyes), sinusitis, bronchitis, polyneuritis, and dermatitis (skin). PCP has been shown to be fetotoxic (poisons the fetus) in animal feeding studies. Common contaminants in PCP have been shown to be fetotoxic and teratogenic (causes defective offspring). Long term exposure to PCP or PCP-treated wood has been linked to increased risks of soft tissue sarcoma, Hodgkin's disease, and nasal and nasopharyngeal cancer. Families living in log homes treated with PCP have reported some of these chronic symptoms.

Formulations of creosote and PCP are restricted for sale to and use by certified pesticide applicators or persons under their direct supervision only. PCP may not be applied inside a residence except to millwork with outside surfaces, and then only if it is sealed appropriately.

USEPA regulations prohibit the use of wood treated or coated with creosote or PCP for:

- farrowing or brooding facilities
- the interior of farm buildings where there may be direct contact with domestic animals which may bite or lick the wood, unless two coats of an effective sealer is applied over the wood preservative
- beehives (where honey contact is possible)
- structures or containers where animal feed could become contaminated
- possible food contact surfaces such as cutting boards or counter tops
- direct or indirect contact with drinking water for humans or domestic animals, or irrigation water
- logs for construction of residential log homes (applies to PCP only)
- the interior of residential buildings except for laminated beams or building components with ground contact, and then only when two coats of an approved sealer (PCP: epoxy, urethane, shellac, enamel, varnish) (creosote: epoxy, urethane, shellac) are applied
- where frequent or prolonged skin contact may occur (e.g., furniture) unless two coats of an approved sealer are applied.

### 3. Arsenicals:

Arsenical wood preservatives are generally water soluble.

Chromated Copper Arsenate (CCA) treated wood consists of Types A, B, and C. The types differ in the percentage composition of the three basic components: salts of hexavalent chromium, bivalent copper, and pentavalent arsenic. Wood treated with CCA is a light greenish color.

Ammoniacal Copper Arsenate (ACA) treated wood has a darkened natural hue and contains trivalent rather than pentavalent arsenic. CCA (pentavalent arsenic) is believed (within minimal evidence) to present a lesser hazard than ACA (trivalent arsenic) because the pentavalent form is commonly present in some seafoods and in most mushrooms. Both trivalent and pentavalent arsenic are mutagenic (cause damage to DNA).

Wipe tests show that the salts are available in significant quantities on the surface of treated wood. Workers handling treated wood have developed skin irritations and unless protective gloves are worn, workers repeatedly handling treated wood are exposed to significant quantities of these metal salts. Occupational exposure to chromium compounds (especially hexavalent chromium) causes dermatitis and ulcers on the hands and forearms. Arsenic poisoning can result from skin absorption and has resulted from the inhalation of sawdust and vapor from powersawing of CCA-treated wood, and from inhaling the fumes from burning treated wood (usually first appears as a tingling of the fingertips). There is also a possible cancer risk from arsenic for either the respiratory system or the skin, depending on the route of exposure. The pentavalent form is mutagenic (occupationally exposed individuals have shown chromosome aberrations), fetotoxic, and considered teratogenic by the EPA (but data on such effects due to exposure to CCA itself are lacking). Wood preservation plant health records have not shown increased carcinogenic or teratogenic effects in exposed employees.

Eating, smoking, or other activities involving hand to mouth contact should not be done in areas where exposure to CCA is possible. Gloves should be worn when handling preserved wood (recommend impervious gloves such as nitrile, PVC, or rubber; regular leather work gloves may be adequate if wood is free of surface deposits, i.e., dry).

Arsenical wood preservatives are unrestricted for commercial construction or over-the-counter sales, however, brush-on arsenical products are for application to the cut ends of pressure treated wood only.

USEPA regulations place the following restrictions on the use of wood treated with arsenical chemicals:

- No restrictions on uses in farrowing or brooding facilities, in the interior of farm buildings where there may be direct contact with domestic animals, or in contact with domestic animal drinking water or irrigation water
- May NOT be used in beehives where honey contact is possible

- May NOT be used in structures or containers where animal feed could become contaminated
- May NOT be used in food contact surfaces (e.g., cutting boards or counter tops)
- May NOT be used in direct or indirect contact with public drinking water.
- May be used inside residences if dust is vacuumed from all wood surfaces
- If free of surface residue, arsenicals may be used for outdoor furniture with direct skin contact. No surface sealer is required by EPA.
- If free of surface residue, arsenicals may be used for patios, decks, and walkways with direct skin contact. No surface sealer is required by EPA.

**4. Acid Copper Chromate (ACC):**

This is a water soluble chemical. Hexavalent chromium can cause severe skin and eye irritation, including dermatitis and ulceration, as was seen from chromates in the arsenical preservatives. Hexavalent chromium may increase the risk of skin cancer and cancer of the nasal and respiratory systems, depending on the route of exposure. Data on long term exposure to actual wood preservatives is limited.

**5. Chromated Zinc Chloride (CZC):**

This is a water soluble chemical. Hexavalent chromium poses health risks as outlined for chromates above. Chromated zinc chloride can cause burns and skin lesions on skin contact. Inhalation of dusts or mists can cause cyanosis, severe lung damage, and even death at high exposures. Ingestion (swallowing) may increase risk of cancers of the pulmonary system, breast, uterus, bone marrow, and other sites.

**6. Bis,Tri-n-Butyltin Oxide (TBTO):**

This is an oil soluble chemical which is about 10 times as toxic to fungi as PCP. It is less toxic and irritating to humans than PCP; and it produces wood with better painting characteristics than PCP. It is limited in its commercial use because it is not very effective for ground contact applications.

TBTO was found in animal studies to cause acute irritation of the eyes, nose and upper respiratory tract; resulting in reddening and discharge at high exposures. Ingestion (swallowing) can effect the eyes and damage the kidneys and adrenal glands.

**7. Copper Napthenate; Zinc Napthenate:**

These are oil soluble chemicals which may be used alone or to augment creosote treatment as protection against marine borers. These are available for over-the-counter sale for brush or spray application. High costs limit the commercial application of these preservatives to specific applications such as park or recreational equipment which require low toxicity. Existing data from animal studies indicate low acute toxicity. Long term exposure data is not available. These are waxy compounds with very high toxicity to wood-destroying fungi. Zinc napthenate has the low toxicity typical of zinc compounds (e.g., fume fever can result if mist/dust inhaled, but no apparent chronic effects). Long term studies of exposure are extremely limited. Experience in ground contact applications is limited.

**8. Copper-8-Quinolinate:**

This is an oil soluble chemical which is used in combination with 2-ethyl hexoate. It is only slightly toxic to humans and has been approved by the FDA for treatment of wood used in food-contact applications. It has been used for outdoor tables and similar wood articles. Animal studies show very low acute toxicity. Long term studies of exposure are extremely limited. Experience in ground contact applications is limited.

**9. 3-Iodo-2-Propanyl Butyl Carbamate:**

Little information available. Requires further evaluation.

**Recommendations for Use of Preserved Wood:**

Choose copper-8-quinolinolate, copper or zinc naphthenate, 3-iodo-propanyl butyl carbamate, or tributyl tin over PCP or creosote. Choose CCA-treated wood over ACA-treated wood. Use appropriate surface sealants to minimize exposure and leaching.

Use rubber or plastic gloves, especially when handling wet wood. Allow freshly treated wet wood to dry thoroughly before handling. Wash exposed skin surfaces thoroughly after working with treated wood. Launder contaminated work clothes frequently and wash separate from other household laundry. When using tools which generate wood dust take necessary precautions to minimize skin contact and inhalation of dust. In addition to general ventilation, this may include goggles, coveralls, NIOSH-approved toxic dust masks, or local ventilation. Do not eat or smoke in an area where treated wood dust is present.

Clean up debris and sawdust after construction, especially when used inside buildings or locations where children may play. Material should be disposed of in the trash or by burial. Do not burn in open fires, stoves, fireplaces, or residential boilers due to the possibility of toxic fumes and toxic products in the ashes. Treated wood from commercial or industrial construction may be burned only in commercial or industrial incinerators or boilers in accordance with state and federal regulations.