

COPPER CHROMIUM ARSENATE (CCA) IN THE ENVIRONMENT

By Deborah Elaine Barrie

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COPPER CHROMIUM ARSENATE (CCA) IN THE ENVIRONMENT

INTRODUCTION

Copper chromium arsenate (CCA) is a substance used to treat wood to produce pressure treated wood. This chemically treated wood is dangerous to the environment and can cause health damage and death in both human and animal life. It is composed of known chemical carcinogens. I have compiled the information in this report in the hopes of not only educating the public on the adherent dangers of CCA treated-wood but also in the hope of persuading governments to outlaw its use or at the very least restrict it. There are safer alternatives available, pressure treated wood (CCA) is unnecessary and dangerous. It is widely misused and abused by both those who are ignorant of its potential dangers and those who are knowledgeable of these facts. Given the enormous amounts produced each year, and the impact on our communities, it is imperative that we act quickly. Arsenic never breaks down into a safe component. This problem will not go away. As one who has suffered from the misuse of this product, I ask you to join me in informing others, so that they will not have to face the ordeal that my family, and countless others, have been put through.

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WHAT IS CCA TREATED-WOOD AND ARE THE CHEMICALS LOCKED IN

“Among building materials, wood is ideal: beautiful, strong, easily shaped. And it’s renewable. Its one big flaw is vulnerability to decay and insects. For centuries, builders resorted to oily smelly solutions like creosote to make wood more durable. Then in the 1930’s, scientists found a way to infuse wood with a solution that included copper (toxic to the fungi that cause rot) and arsenic (then the most common insecticide). To ensure the protection would last, and builders and the environment wouldn’t be hurt, they also added chromium. It triggered a chemical reaction that locked the pesticides into the wood.”¹ “The raw lumber is placed in a pressure cylinder where a vacuum sucks air and water from the wood cells. The cylinders are then filled with a mixture of water and pesticides and pressure is increased to refill the wood’s cells with the mixture. As the wood dries, the chemicals are trapped inside.”²

“The formula became known as chromated copper arsenate, or just CCA. But the industry called it pressure treated because the chemicals were injected under great pressure. The wood dried with a green tint because of the copper, but otherwise it was similar to ordinary lumber, except that it stood up to even the dampest, warmest climates.”¹ during the pressure treatment up to 250 liters of CCA solution per cubic meter of wood is applied, resulting in copper (CU), chromium (CR), and arsenic (AS) concentrations in the range of 1000-5000 mg/kg. In the United States more than 10 million cubic meters of CCA treated wood is produced each year³

The following chart shows the three formulas used for CCA, B being the most common.

Table 1 Composition of CCA-Type A, B, and C (AWPA, 1996)⁴

	CCA-Type A	CCA-Type B	CCA-Type C
Chromium as CrO ₃	65.5%	35.3%	47.5%
Copper as CuO	18.1%	19.6%	18.5%
Arsenic as As ₂ O ₅	16.4%	45.1%	34.0%

“The amount of CCA utilized to treat the wood or retention level depends on the particular application for the wood product.”⁴ See the following chart.

Table 2 Retention Requirements for CCA-Treated Wood (AWPA, 1996)⁴

Applications	Retention Value (lb/ft ₃)
Above ground: lumber, timber, and plywood	0.25
Ground/Freshwater contact: lumber, timber, plywood	0.4
Salt water splash, wood foundations: lumber, timber, and plywood Structural poles	0.6
Foundation/Freshwater: pilings and columns	0.8
Salt water immersion: pilings and columns	2.5

“CCA-treated wood was first used in India in 1933 and was approved by the American Wood Preservers Association for use by Bell Telephone Co. in 1950.”² “Stakes pounded into a termite-infested field at a federal laboratory in Mississippi in the late 1930's remain intact “and some of them will probably last 100 years,” says Jerrold Winandy, a research wood scientist with the U.S. Department of Agriculture’s Forest Products Laboratory in Madison, Wisconsin.

For many decades, pressure-treated wood remained a specialty product; people built porches, decks and fences of untreated redwood, cedar or fir. But as the price of wood soared, marketers of plantation- grown Southern Pine seized on pressure treating as a way to convert their product into one that would command a premium. Sales of the greenish lumber ballooned from practically nothing in the early 1970's to 467 million cubic feet last year-nearly a fifth of all softwood boards and timbers sold.”¹

Even the smallest of pressure treated decks - 8x10 feet - has four pounds of toxic metals in its 1 ½ -inch-thick platform. The recipe for this amount of chromated copper arsenate calls for 1.9 pounds of red crystals (chromic acid), 1.36 pounds of white powder (pentavalent arsenic) and .74 pounds of copper.¹

“CCA preservative is used almost exclusively in the pressure treatment of timber, although it can be used for the sap replacement of hardwood fence posts. Freshly treated timber should be held on the treatment plant premises for a sufficient period to ensure fixation of the preservative and surface dryness. It is recommended that this period be two weeks.

Where treated timber is to be used for playground equipment or log cabin construction, a storage period of four to six weeks is recommended before distribution. All treated lumber intended for this use should also be washed prior to distribution to remove surface build-up of dried salts.”⁵

“A study at the University of Turin in Italy found exposure of CCA-treated wood sawdust to rain water resulted in significant release of the chemicals and was potentially hazardous.

A 1984 study of the biological impact of CCA-treated wood on honeybees found that the bees had elevated arsenic levels and poorer winter survival when kept in CCA-treated hives.

A 1991 study by researchers at Rutgers University found leaching of CCA-treated wood in seawater retarded the growth of fiddler crabs and algae, and resulted in higher death rates for fish and snails.

The leaching research of David E. Stilwell, an analytic chemist at the Connecticut Agricultural Station of New Haven, Conn. found elevated levels of copper, chromium and arsenic in soil samples under seven wood decks built with CCA-treated wood.”²

Burning of the wood also releases these toxins in the smoke and the wood ash is even more dangerous containing around 80% of the toxins. The arsenic in wood ash is highly “leachable” and poses a serious threat to the environment and is capable of causing health damage and death to both humans and animals.

In a question and answer sheet published by the Connecticut Department of Health we read, “Doesn’t pressure-treatment lock pesticides into the wood.” Their answer, “ Not completely. During treatment, the boards are dipped into a CCA bath under high pressure. This forces arsenic into the wood but it doesn’t seal the wood against the weather. Once in the environment, rainwater can penetrate into the wood and dissolve arsenic, bringing it back up to the surface. Cracking of the wood as it ages speeds up the leaching process. New boards may also have surface residue of arsenic-containing pesticide that had not penetrated into the wood during the treatment process. The amount that leaches is enough to contaminate soil immediately below and next to the wood structure, and to leave a residual coating of “dislodgeable” arsenic on the wood surface.”⁶

Alan Wilbur, a spokesman for the American Wood Preservers Institute is quoted as saying, “As in any product line, there are good and not so good manufacturers. There may be folks who take shortcuts. That’s not appropriate, and we do not condone that, but we have no policing powers.”²

In a publication by the European Commission we read this statement concerning the safety of CCA, “The authors indicate that they base their risk assessment on the assumption that “best current practice” is followed at all stages of the manufacture, use and disposal of CCA and CCA-treated wood. To the extent to which the technical specifications for various procedures are imposed by regulatory statutes to which compliance is compulsory, this is a reasonable position.

However, it appears that some of the “best practice” guidelines assumed in the Report to be in general operation are guidelines recommended by professional or other organizations and rely upon voluntary cooperation for their application. Given the well documented problems related to the environment or human exposure arising from past practices, especially at wood treatment sites, it would be important to have an indication of the extent to which such guidelines are indeed employed in practice.”⁷

DECKS MADE FROM PRESSURE TREATED WOOD

Dr. David Stilwell, one of the world’s leading authorities on pressure treated wood is a researcher with the Department of Analytical Chemistry at the Connecticut Agricultural Experiment Station in New Haven, Connecticut. Dr. Stilwell and his research partner, Katja D. Gorny, crawled under decks in 1996 to find out if arsenic was leaching from them. Their findings⁸ challenged the belief that arsenic was locked into pressure treated wood. The EPA has requested their studies and these studies have raised concerns around the world about the safety of pressure treated wood.

They studied the soil under seven decks built from pressure treated lumber ranging in ages from 4 months to 15 years. Since decks are horizontal they found them to be a good indicator of the effects of rain and solar radiation as all leached arsenic would fall beneath such structures. Soil samples were collected in a grid like fashion and a total of 85 soil samples were taken. These samples included control samples, which were taken at a minimum of 5 meters from the decks and at least 4 meters apart. The soils in all areas were considered of a sandy loam type. Samples averaged 100 g and came from the upper 5 cm of soil after all debris such as twigs and leaves were removed. The soil samples were tested and the results are shown in the following charts.

The soil samples were consistent with leaching rather than from left over sawdust, as sawdust would have shown the same proportions to the quantities of the chemicals in the wood.

Table 3 Average Contents in Soils (mg/kg) Compared to Statutory Limits⁸

Location/Limit	Element			
	Cu	Cr	Cr ⁺⁶	As
Beneath Decks	75	43	ND	76
Control Soils	17	20	ND	4
EPA 503 (1993)	1500	1200	-	41
State of CT (1996)	2500	3900	100	10

ND - not determined.

*EPA 503 (1993). **State of Connecticut (1996)

Table 4 Range, Average and Standard Deviations (SD) in the Amount (mg/kg) of Cu, CR, and As in Soil Samples⁸

Deck=	Soil Beneath Deck			Control Soil		
	Range	Avg.	SD	Range	Avg.	SD
Copper						
1	22-63	34	12	13-20	16	3
2	23-65	48	14	12-17	14	2
3	38-145	76	25	18-30	22	4
4	41-140	75	27	18-30	22	4
5	26-273	104	74	10-12	11	1
6	60-410	154	87	15-27	20	5
7	17-46	31	10	10-14	13	2
Overall	17-410	75		10-30	17	
Chromium						
1	20-31	26	4	17-24	20	3
2	16-73	26	17	13-19	16	2
3	27-68	42	11	25-30	27	3
4	34-95	58	17	25-30	27	3
5	26-138	64	35	17-18	18	1
6	31-154	59	33	19-23	21	2
7	16-33	23	5	11-19	14	3
Overall	16-154	43		11-30	20	
Arsenic						
1	3-19	9	5	2.2-3.5	2.6	0.4
2	7-91	34	23	3.6-5.2	4.2	0.6
3	34-99	61	20	2.5-8.3	4.9	2.2
4	44-333	139	66	2.5-8.3	4.9	2.2
5	57-215	113	60	2.2-3.9	2.7	0.7
6	50-350	138	77	3.5-5.3	4.4	0.7
7	6-80	40	21	1.3-2.4	1.9	0.4
Overall	3-350	76		1.3-8.3	3.7	

This study showed an average arsenic level that far exceeds the State level whereby clean- up standards would have to be met to meet guidelines for residential areas. It also showed that coated decks can retard the leaching of arsenic.

The conclusion from this experiment showed clearly that decks made from pressure treated wood do pose a serious threat to the environment.

Dr. Stilwell continued his research and wrote about it in a publication in the fall of 1998. This time David Stilwell used test coupons made from a variety of pressure treated wood surfaces. Wipe samples were taken from these samples. Some of the coupons were coated with different types of treatments. Although the results would not be indicative of wear and tear with the various coatings, it showed a remarkable decrease in the level of arsenic leaching compared to the uncoated wood.

The result of this experiment proved coating pressure treated wood will eliminate much of the leaching of heavy metals.²³

Two charts follow from testing done by *Consumer Reports* in June of 1998 and June of 1999. More recent results might be found at your local Library.

Table5 Exterior Deck Treatemnt⁹

Ratings Exterior deck treatments & Recommendations

Overall Ratings Within types, listed in order of overall score. Shaded products have performed too poorly to recommend.

Product	Price	Overall score	Base type	Resistance to			Comments
				Water	Color Change	Mildew	
SEMITRANSSPARENT TREATMENTS							
Cabot Decking Stain	\$24/gal.	23	Solvent	○	●	●	30 colors available. Resisted Florida mildew best.
Cabot PTW Stain	23	23	Solvent	○	●	●	30 colors available. Resisted Florida mildew better than most. Discontinued but may still be available in some stores.
Golden Endurance Deck and Siding Oil Stain	22	22	Solvent	○	●	○	9 colors available. Resisted Florida mildew better than most.
Olympic Water Repellent Deck Stain	17	17	Solvent	○	○	○	12 colors available. Color tended to scrub out when being clean. Resisted cracking better than most.
Wellman Deck Stain with Water Repellent	21	21	Water	○	○	○	4 colors available. Resisted Florida mildew better than most. Resisted cracking better than most.
Behr Plus 10 Deck & Siding Stain	17	17	Water	○	○	○	40 colors available. Color tended to scrub out when being cleaned.
Tre-Treat Woodman Deck Stain	19	19	Solvent	○	○	○	25 colors available. Resisted Florida mildew better than most. Color tended to scrub out when being cleaned.
Fred & Lambert Stainshield Oil Deck Stain	24	24	Solvent	○	○	○	5 colors available. Resisted Florida mildew better than most. Color tended to scrub out when being cleaned.
Wellman Hair Coat With Natural Wood Toner	5	5	Water	○	○	○	3 colors available. Color tended to scrub out when being cleaned.
TONED (LIGHTLY TINTED) TREATMENTS							
Akzo Nobel Sikkens Cetol DEK (base coat)	51	51	Solvent	○	●	●	5 colors available. Two-coat system; topcoat to be applied within 1 yr of base coat. Resisted Florida mildew better than most. Best at letting dirt be washed off and resisting cracking.
Olympic Natural Look Protector Plus	14	14	Solvent	○	○	○	Not available in different colors. Color tended to scrub out when being cleaned.
Benjamin Moore Moorwood Clear Finish	21	21	Solvent	○	○	○	Not available in different colors.
Behr #81 Waterproofing Sealer, Finish and Stabilizer	16	16	Solvent	○	○	○	Not available in different colors. Color tended to scrub out when being cleaned.
CLEAR TREATMENTS							
DAP Woodlife Premium Wood Preservative	13	13	Solvent	○	○	○	Worse than most at letting dirt be washed off. Resisted cracking better than most.
Olympic Clear Wood Preservative	13	13	Solvent	○	○	○	Worse than most at letting dirt be washed off. Resisted cracking better than most.
Olympic Water Guard Wood Clear	10	10	Water	○	○	○	Two-coat system; topcoat to be applied after base coat. Remains in project until performance of topcoat can be judged.
Flood Seasonite (base coat)	12	12	Water	○	○	○	Two-coat system; topcoat to be applied after base coat. Remains in project until performance of topcoat can be judged.
Benjamin Moore Moorwood Deck Stain	22	22	Solvent	○	○	○	7 colors available. Discontinued but may be available in some stores. Worse than most at letting dirt be washed off.
ZAR Clear Wood Sealer	17	17	Solvent	○	○	○	Worse than most at letting dirt be washed off.
Thompson's Water Seal	16	16	Solvent	○	○	●	Resisted cracking better than most.
Thompson's Water Seal Ultra	14	14	Water	○	○	●	Resisted cracking better than most.
Wellman Raincoat Water Repellent VOC Compliant	21	21	Water	○	○	○	Worse than most at letting dirt be washed off.
Tre-Treat Clear Tre-Seal	11	11	Solvent	○	○	○	Worse than most at letting dirt be washed off.
Behr #92 Waterproofing Sealer, Finish and Stabilizer	17	17	Solvent	○	○	○	Worse than most at letting dirt be washed off.
Sears Weathermaster 18065	9	9	Water	○	○	○	Worst at letting dirt be washed off. Better than most at resisting cracking.

The tests behind the Ratings

We built a large deck frame to support several hundred pieces of pressure-treated deck lumber, then coated each with a deck treatment following manufacturer's instructions for pretreatment and the number of coats to apply. To judge mildew resistance, we applied the treatments to plain pine boards and left them exposed to the weather in New York and in Florida. The overall score summarizes performance in our four main tests after 20 months' exposure to the elements. We judged resistance to the following: dirt accumulation; color change, a measure of the coating's color change (for semitransparent products) or graying of the wood (for clear and toned products); and mildew in our New York test. Most of the treatments are solvent-based; the rest are water-based. Comments note reformulated products, those that were better able to resist mildew in our Florida test, and those that resisted cracking better than most—a mark of effective water-repellency. Price is the estimated average, based on a national survey.

- Excellent
- Very good
- Good
- Fair
- Poor

Gone from stores

The following products were reformulated or discontinued after we began our testing. The version we tested is no longer available. With most of these products, however, there's a new formulation that we are testing. We'll cover their performance in future reports.

- Behr #89 Clear Wood Preservative (Clear)
- Cupnol Deck Clear Seal (Clear)
- Cupnol Deck Stain (Semitransparent)
- DAP Water Repellent Sealer (Clear)
- DAP Water Repellent VOC Waterproofing Sealer (Clear)
- DAP Woodlife Preservative with Water Repellent (Clear)
- DAP Woodlife VOC Wood Preservative (Clear)
- Thompson's House and Deck Stain (Semitransparent)

Table 6 Deck Treatment¹⁰

Ratings & Recommendations Deck treatments.

Tested for 32 months Shaded products have performed too poorly to recommend or would now need to be reapplied.

Product	Price	Overall score	Base type	Resistance to			Comments
				DIRT	COLOR CHANGE	MILDREW	
SEMITRANSSPARENT TREATMENTS							
Cabot Decking Stain	\$24/gal.		Solvent	○	●	●	Largely opaque.
Glidden Endurance Deck and Siding Oil Stain	11*		Solvent	○	●	●	Largely opaque. Resisted cracking better than most.
Wolman Deck Stain with Water Repellent	21		Water	○	○	○	Resisted cracking better than most.
Olympic Water Repellent Deck Stain	17		Solvent	○	●	●	Lost all color.
Behr Plus 10 Deck & Siding Stain	17		Water	○	○	●	Lost all color. Product has been discontinued.
Tru-Test Woodsman Deck Stain	18		Solvent	○	●	●	Lost all color. Current name is Woodsman Deck Stain.
Wolman Rain Coat With Natural Wood Toner	17		Water	○	●	●	Lost all color.
Profi & Lambert StainShield Oil Deck Stain	24		Solvent	○	●	●	Lost all color.
"TONED" (LIGHTLY TINTED) TREATMENTS							
Akzo Nobel Sikkens Cetol BL DEK (topcoat)	50		Water	○	●	●	2-coat system. Topcoat, Akzo Nobel Sikkens Cetol BL DEK, \$50/gal., has been exposed only 7 months. Dirt washes off easily. Resisted cracking much better than most.
Benjamin Moore Moorwood Clear Finish 08800	22		Solvent	○	●	○	Discontinued. New name is Moorwood Clear Finish 07600.
Olympic Natural Look Protector Plus	15		Solvent	○	●	●	Lost all color.
CLEAR TREATMENTS							
DAP Woodlife Premium Wood Preservative	13		Solvent	○	●	●	—
Flood CWF-UV (topcoat)	16		Solvent	○	●	●	2-coat system; topcoat, applied over base coat, has been exposed only 7 months. Resisted cracking much better than most.
Olympic Clear Wood Preservative	13		Solvent	○	●	○	—
Olympic Water Guard Wood Clear	10		Water	○	●	○	—

Tested for 7 months Recent additions, listed within types in order of overall score.

Product	Price	Overall score	Base type	Resistance to			Comments
				DIRT	COLOR CHANGE	MILDREW	
SEMITRANSSPARENT TREATMENTS							
Sherwin-Williams UV Sunblock Deck & Wood Seal by Cuprinol	\$19/gal.		Water	●	●	●	Resisted Florida mildew better than most.
Akzo Nobel Sikkens Cetol SRD	25*		Solvent	○	●	●	Resisted Florida mildew better than most.
"TONED" (LIGHTLY TINTED) TREATMENTS							
Benjamin Moore NaturaGard	24		Solvent	●	●	●	Resisted Florida mildew much better than most. Current name is Moorwood Alkyd Transparent Deck & Siding Stain 09920.
Ambica (WP)	21		Solvent	●	○	●	Resisted Florida mildew much better than most.
Tru-Test Woodsman Clear UV Wood Protector	14		Solvent	○	○	●	Can be cleaned up with water. Current name is Woodsman Clear UV Wood Protector.
Pentafin Penetrating Oil Finish	26		Solvent	○	●	●	Resisted Florida mildew better than most. The 350VOC version tested.
Rhinoguard Wood Defense	35*		Water	○	●	●	—
Sherwin-Williams Clear Deck & Siding Wood Finish by Cuprinol	23		Water	○	●	●	—
CLEAR TREATMENT							
Glidden Endurance Deck Sealer for Pressure-Treated Wood	11		Solvent	○	○	○	—

INCIDENTS REPORTED WHEN WORKING WITH PRESSURE TREATED WOOD

In a study by Henry A. Peters, MD; William A. Croft, DVM, Phd; Edwin A. Woolson, Phd; Barbara A Darcey; and Margaret A Olsen, we are given the facts of a case study of two individuals who were working with pressure treated wood. Here is a summary of these cases.

“In February and March 1983, a man and a woman began construction of picnic tables for the Forestry Service using freshly treated CCA lumber. A radial arm band saw, drill press, and hand drill were used to produce 30 picnic tables. The air in the small non-ventilated room, heated with an overhead space heater, was often so full of sawdust that the garage door had to be opened frequently to clear the air. Sawing this recently treated wood produced sufficient liquid to splash back to a wall 2 ½ feet away and contaminate the clothing. No protective clothing or mask was worn. Within several days both workers began to experience spontaneous nose bleeds, heaviness of the chest, itching and burning of the skin, stomach-ache, and the woman noted that hair pulled out when combed. They also noted alterations in memory, darkening of the urine, and the male worker suffered from severe tarry stools and then massive melena requiring hospitalization and 7 units of blood. Though most symptoms disappeared after three months, when the same two workers resumed the same task a year later, there was an immediate recurrence of symptoms including a repeat massive gastrointestinal bleed from esophageal varices in the male worker. It seems apparent that working with CCA-treated lumber with power equipment in an enclosed area poses a very severe health hazard.”¹¹

These case studies plus the case studies done on a Wisconsin family (another study by Peters and his team which is found under problems presented by wood ash) show another point in determining arsenic poisoning. While hair samples were taken from these people, nail testing showed dramatically higher arsenic concentrations than the hair samples showed.

In an article published by *Weather-Bos* it appears the above male worker is referred to and I quote “In one case James Sipes, a U.S. Forest Service worker in the Hoosier National Forest in Indiana was sawing CCA-treated wood to build picnic tables one spring when he got so sick that he vomited up half the blood in his body. Doctors didn’t identify the cause of his problem until he went back to work. The next spring he was given the same job and he started vomiting blood again. A jury said the chemicals in the wood caused the problems and awarded him \$1,000,000. Twenty-six companies involved with the production and supply of the chemicals and wood settled out of court, paying Sipes \$667,200.

“The problem with CCA exposure is that you can’t show a history, you could have people getting ill and thinking it’s any number of things, arthritis, the flu,” said David McCray, an Indiana lawyer who has won three claims involving injuries from CCA -treated wood.”

This article also refers to a story where, “three quarter horses in Clay County, Florida fell ill after “cribbing” or biting repeatedly on a pressure treated wood fence. Two died.”²

In the article titled, *Arsenic and Old Wood* we are told the story of Rick Feutz. “ When he built a swimming dock off his beach on Steel Lake near Seattle, schoolteacher Rick Feutz thought he

used the perfect wood, pressure treated. “The brochure said it was impervious to rot,” says Feutz, who brought home a pickup load. But while cutting the wood, Feutz, then 38, felt his legs aching and thought, “My God, I’m getting old.” Soon his hands and feet began to tingle “like they were going to sleep.” By the time he finished the job two weeks later, his legs were numb. He collapsed just hours after putting the dock in the water. For three months, he remained partially paralyzed with no sense of feeling in his limbs. Doctors suspected a rare nervous disorder until a series of white half-moon marks appeared on his fingernails, a sign of arsenic poisoning, as is numbness. After tests at the University of Washington found a high level of arsenic in his body, doctors concluded that he must have been poisoned by contact with treated wood. No one else in his family became ill. “We never heard of another case like this,” says David Buschner, who treated Feutz at the Northwest Centre for Environmental Medicine in Bellevue Washington. Feutz sued the lumber yard, wood preserver and preservative manufacturer. They settled 1992-admitting no liability and insisting the amounts be kept secret.¹

A paper published by Health and Welfare Canada-Health Protection Branch-Issues-titled *Pressure-Treated (Preserved) Wood and Wood Preservatives* states, “on rare occasions, toxic effects of wood preservatives and pressure treated wood have been seen both in animals and people. The effects range from slight illnesses to deaths. Accidental illnesses or deaths were traced to improper or careless use of the preservative chemicals or treated wood in the workplace or in the home.”¹²

For a final reference in this section I will quote from the report from the European Commission Health and Consumer Protection “the toxic end-points identified in the Report as the most sensitive ones on which to base human health risk assessment are a) lung cancer by inhalation and b) non-cancerous lesions by ingestion. Surprisingly, no mention is made of the well documented induction in humans of skin cancer (and possibly other cancers) after oral ingestion. For the assessment of cancer risk by inhalation, linear extrapolation with no threshold is accepted and the unit risk derived by World Health Organization (WHO, 1997) adopted. For exposure by the oral route, a total daily intake (TDI) of 2 mcg/kg (WHO; 1989) is adopted for non- carcinogenic effects.

As elsewhere in the Report, “criteria” values developed by various organizations are adopted without adequate justification, such as for example an “environmental assessment level” for air 0.2 mcg/m³ (long term) and 6mcg/m³ (short term) of the UK Environment Agency.”⁷

CCA WOOD PICNIC TABLES AND PLAYGROUND EQUIPMENT

It would seem to me given the various warning about working with pressure treated wood (see Appendix 2) this section should not exist, but due to the fact that both of these items abound in our communities I shall address this serious concern.

David Stilwell has written four papers, that I am aware of, on this subject. You would be hard pressed to study this subject without crossing his name or the name of his research team partner, on his first study, Katja Gorny. The EPA has requested their studies and is presently reviewing

these concerns. While most of Dr. Stilwells research published to date, has been well accepted, very little has been done about the problems of which he has made us aware. His four papers are included in the recommended reading section.

Here I quote from his paper, *Arsenic in Pressure Treated Wood*, “A controversy exists on the extent of arsenic exposure due to physical contact with CCA wood surfaces. Such surfaces include playground equipment, decks and picnic tables built using CCA treated wood. Studies have shown that virtually no inorganic arsenic is absorbed through the skin, but is readily taken up by ingestion. Thus the potential exposure is hand to mouth, and therefore, children are considered the most vulnerable to this potential risk.” In his findings Dr. Stilwell recommends “consider the use of alternative products on areas that may be contacted by children.”³

In a Report by the European Commission it states “Limited data on exposure derived from dermal contact of children in playgrounds are considered. It is concluded that, in a worse case scenario, the latter situation can result in arsenic intake that alone can exceed the total TDI for children while even under less extreme conditions it may make up a substantial proportion of the TDI. It is therefore concluded that such exposure may constitute a health risk for children.

Surprisingly this conclusion is not carried through to the conclusions section of the Report. An attempt to downplay this risk by comparing it to the (unavoidable) risk from exposure to uncontaminated soil cannot be considered valid.

Finally, to the risks for children via dermal exposure, one could add here the risks of additional exposure via ingestion or inhalation of sand particles containing high concentrations of arsenic.”⁷

The National Occupational Health and Safety Commission of the Commonwealth of Australia in a publication on the *Uses of CCA treated wood* says, “Where treated timber is to be used for playground equipment or log cabin construction, a storage period of four to six weeks is recommended before distribution. All treated timber intended for this use should also be washed prior to distribution to remove surface build-up of dried salts.”⁵

In a excerpt from *Spectrum Magazine* we are told that, “the U.S. Product Safety Commission studied wood playground equipment and found that merely touching CCA treated wood can leave arsenic on the skin. Very young children can ingest up to 2,016 micrograms of arsenic per day from playing on treated wood if they put their hands in their mouth. The maximum safe amount of arsenic for a 25-pound child is 3.4 micrograms per day.”¹³

In a health news bulletin put out by *biolifeplus* it states that “soil samples taken from a playground made from pressure treated wood showed an astounding 500 parts per million of arsenic. These levels are so high, that if a child ate just 2 tablespoons of contaminated dirt every day, it could prove fatal. Long term exposure to smaller amounts can cause nerve and blood vessel damage and several types of cancer among other things. Treated wood manufacturers will insist that the wood is safe, but if you can obtain a product brochure from the company, you may be shocked to find out that this product has the potential to kill you.”¹⁴

In an article in *Kitchen Garden* published in July 1998 we are told, “Far more important is the risk of potential transfer of arsenic to skin and mouths, particularly for children, whose small bodies don’t tolerate arsenic as well as ours do. Chaney of the United States Department of Agriculture (USDA) points out that persistent leaching, however small, means that arsenic is continually coming to the surface of the wood, where it can easily be transferred to us or our children when we touch the wood. “There’s just no way around it,” Chaney says. “For me, this is the overriding decision not to use CCA.””¹⁵

From an article published by *Weather-Bos* called, *Wood Treatment Linked to Dangers*, Samuel Rotenberg, a toxicologist at the EPA’s Philadelphia regional office says, “As far as a boardwalk or deck built from CCA wood, I don’t think that would present an unreasonable risk. But I would not build a children’s sandbox out of the stuff because arsenic can leach into the sand and be eaten by the children. I also wouldn’t build a sandbox under such a deck because we know now that there can be increased arsenic levels in those areas from sawdust produced during construction.”²

In an issue of *Environmental Building News* published in January/February 1993 we read that, “Some playground manufacturers have begun substituting plastic for handrails and other surfaces where the danger of splinters is great. Picnic tables and park benches are an increasingly popular use for recycled plastic, particularly as this addresses the concerns about treated lumber and food”¹⁶

“Traces of the chemical salts can dissolve in water and then be transferred to the food by contact.”¹⁷ This information comes from the Canada Plan Service (plan M-9401) *Wood Preservatives*.

In an article *Kids at Risk*, we read, “as the structure ages, the compounds may leach out into the dirt. In lower doses, according to numerous studies, CCA can impair intelligence and memory.”¹⁸

In their article on pressure treated wood the *Environmental News Network* warns, “since chemicals may seep out, avoid using CCA wood on projects that will come in contact with food or water.” Also they state, “Even the smallest amount of arsenic can kill a human being.”¹⁹ On a fact sheet presented in a question and answer format from a maker of pressure treated wood we are on one hand told to wear gloves to avoid splinters when working with pressure treated wood and then we are told it is safe for picnic tables and playground equipment.²⁰

In an evaluation of risk to children using arsenic treated playground equipment published by the Conrad Wood Preserving Co. in an article titled, *Is Wolmanized wood safe around people, plants, and pets?* We are giving the following conclusions:

1. “It appears that the maximal Arsenic (V) exposure estimate for children from use of playground equipment is within the normal variation of Arsenic (V) exposure for children;
2. The maximum estimate of the skin cancer risk associated with such exposure approximates the skin cancer risk from the sunlight experienced during the play period;
3. The scientific studies upon which the association of Arsenic (V) and skin cancer is based are weak; and

4. Finally, the sampling methodology used to measure the potential exposure from wood products is uncertain with little reproducibility by individual samplers or between investigators.”²¹

On a fact sheet printed by the Connecticut Department of Health we are told, “the most toxic part of the CCA pesticide formulation is arsenic. Arsenic is a known human carcinogen, which can also be toxic to the skin and internal organs. These effects require long-term exposure and take years to develop. At high doses arsenic is an acute (immediate) poison that can cause death. However, the levels of exposure possible from arsenic in wood are too low to cause such acute effects. The major health concerns are that daily contact with arsenic leached from CCA treated wood might, under certain circumstances, lead to an increased risk for cancer or other long term health effects.

Recent studies have shown that rainwater leaches (releases) CCA from the treated wood. This can lead to contamination of soil beneath the wood structure. Also, a significant pesticide residue (fine coating) can be left on the wood’s surface and picked up on hands or clothing. While the amount taken up depends on many factors, studies show that new boards and older boards both have significant amount of the arsenic on the surface. Given the widespread use of CCA-treated wood, it is possible for a child to be exposed to dislodgable arsenic at home, at the playground, and at school, making this an everyday kind of exposure for such children.

Young children (under six years of age) who play on CCA-treated decks or playscapes are expected to receive the greatest exposure to arsenic leached from wood. Children in this age category may play for extended periods on backyard or playground structures and they exhibit frequent hand-to-mouth activity. They are also most likely to play for periods of time underneath playscapes or decks.

Older children and adults who spend considerable time playing and working with CCA- treated structures may also receive significant exposures. Further, people who frequently eat on CCA-treated picnic tables that are not properly sealed may receive greater exposures.”⁶

In *CBS’s Buyer Beware* story on pressure treated we are told, “Arsenic doesn’t disappear, that’s the problem with these kinds of toxic heavy metals is it goes into the environment, you never get rid of arsenic you can just move it from place to place and the place I would like to keep it out of is the brains and tummies of people, especially young children.”²²

In the article *Arsenic and Old Wood* we read, “a decade ago, state officials in California became concerned that arsenic could rub off onto children climbing on playground equipment built of pressure- treated wood and required all new equipment at public playgrounds to be sealed every two years.”¹

David Stilwell’s research²³ shows clearly the importance of sealing pressure-treated wood to stop arsenic leaching and is discussed under decks made from pressure treated wood. But I will quote him here from an article in *Weather-Bos*, “If alternative materials are available, why not use them and remove toxic materials away from children’s paths.”² In this article Stilwell also questioned why the EPA requires warning stickers on CCA-treated lumber, but not on products such as picnic tables or playground equipment manufactured from the wood.

DANGERS OF CCA IN THE GARDEN

The Canadian Center for Occupational Health and Safety (CCOHS) had this to say about using CCA near food in their publication. “CCA-treated wood should not be used where it is likely to come in contact with food (for example, cutting boards) since some leaching can occur under certain conditions.”²⁴ Many researchers have shown that acid rain is one of these conditions.

A Canada Plan Service Publication warns “Wood treated with CCA and ACA does not produce poisonous vapors, but traces of the chemical salts can dissolve in water and then be transferred to the food by contact.”¹⁷

Health and Welfare Canada’s publication says that, “it should not be used indoors or where it could come into contact with water, feed, or food.”¹²

The Connecticut Department of Health’s publication tells us, “CCA-treated boards used to frame garden beds can be expected to leach arsenic into the soil next to the boards. The leached arsenic is expected to mix with the remaining soil in the bed as the soil is turned over and prepared for planting. This will decrease the concentration of arsenic in the soil through dilution. This dilution effect combined with the evidence that plant uptake of arsenic is fairly small, suggests that the amount of arsenic in produce grown in such beds will not be a health concern.

The Connecticut Agricultural Experiment Station is planning to further evaluate plant uptake of arsenic. As an added precaution, they suggest lining the inside surface of CCA-treated framing with plastic to minimize the mixing of leached arsenic into the garden bed.”⁶

In a publication by *Weather-Bos* we learn that Edward Polaski who compiled a review of research on pressure-treated wood for the state department of Conservation and Natural Resources found himself fired from his position four months before his retirement. “Polaski said he was let go because of his work on the reports and the resulting pressure from the wood products industry, a charge the state denies.

Polaski’s CCA-treated wood report cited studies showing 20 percent, 30 percent, even more than 50 percent of the chemical can “leach” out of the wood. Much of the problem is caused by impure or improperly applied chemicals used in the wood treatment process, causing incomplete “fixing” of the chemicals within the wood.”

“Polaski is not alone in his concerns. “I don’t think his conclusions are overstated. It’s better to be concerned and conservative before you make the mistake of introducing arsenic into the environment,” said Dr. Garn Wallace, a biochemist at Wallace Laboratory, in El Segundo, California. The private lab specializes in plant nutrition, soil composition testing and heavy metal research.

Wallace said liquid oozing from CCA-treated wood could contaminate ground water under porous- sandy soils and produce a host of health problems in humans, from liver and kidney failure to cancers.

Wallace's study show that arsenic from CCA-treated wood stunts plant growth and turns leaves yellow. Vegetables grown in soil with an elevated arsenic level can contain high arsenic levels themselves. "It's obvious from the studies that the growth of herbaceous plants is injured in the presence of CCA-treated wood," he said. "I don't know at what levels injuries to people occur, but there is a plausible risk factor."

Stilwell's research is referred to in this article and he is quoted as saying, "There is always the benefit vs. risk question to be answered in these situations and that got lost in the promotion of CCA-treated wood," Stilwell said. "It's now being promoted for applications beyond its original scope, and some of those are not a good idea."²

In a publication by Exteriorwood (makers of CCA) the question, "Can I use treated wood around food, water, vegetables or other plants." is asked. Their answer "Treated wood should not be used in direct contact with human food or drinking water. Incidental contact with CCA- treated wood, such as in docks or bridges, is acceptable. Unlike some other types of treated wood, Wolmanized wood is suitable for raised flower or vegetable beds, landscaping, mushroom trays, grape and tomato stakes, greenhouse uses and similar applications. The Wolman preservative is highly leach resistant because the chemicals become locked or "fixed" within the wood."²⁰

In an article by *ENN* we are warned, "Arsenic will collect in the ashes (of burned pressure treated .007.44win the s of 8 0 TD

Agency. The cautions are vague and mild: “Exposure to inorganic arsenic may present certain hazards. Do not use treated wood under circumstances where the preservative may become a component of food or animal feed.” “Nowhere is there a hint of how much pesticide is in each stick of lumber. A single 12-foot long 2 by 6 contains more than an ounce of arsenic- enough to kill 250 adults were they to ingest it.”¹

Stilwell’s research actually began after receiving numerous calls from gardeners concerned about its use in their gardens. His research found significant levels of contamination consistent with leaching not sawdust.

Stilwell in his research grew Romaine lettuce to see its arsenic levels in three mediums, here are his results from his paper.

“Romaine lettuce was container grown in media to which either CCA sawdust or CCA wood blocks were added. After 26 days of growth, the lettuce was harvested, dried and analyzed for arsenic. The lettuce grown alongside the CCA woods blocks contained 1.7 ± 0.32 mg./kg arsenic (dry weight basis). Lettuce grown in media containing CCA sawdust, at a 32 and 480-mg/kg and arsenic level, contained 0.43 and 4.1 mg/kg arsenic respectively. Lettuce grown in control conditions contained less than 0.4 mg./kg. Converting these to $\text{g arsenic}/50\text{g serving}$ yields the following <1(control), 1(grown in media containing 32 mg/kg arsenic), 10 (grown containing 480 mg kg arsenic), and 4 (grown media alongside CCA wood blocks). These values to the dietary intake of inorganic arsenic of 4-12 g/day (all age groups).”

Dr. Stilwell concludes, line interior of raised beds constructed using CCA wood with plastic.”³
P. Cooper of the University of New Brunswick states in *This Old House Magazine* “ that he built a compost bin out of pressure-treated wood and discovered that acids in the compost caused doubled leaching from the wood.”¹

This must lead us to wonder why acidic mulches and compost added to our gardens would not present the same problems if added to pressure treated beds.

PROBLEMS

Table 7 Metal Concentrations in CCA-Treated Wood and Wood Ash⁴

Wood Type		Metals Concentration, mg metal per kg of wood ash			
		Cr	Cu	As	
Unburned Wood ^a	Untreated Wood	7	3.7	2	
	CCA-Treated Wood at 0.25 pcf	2060	1230	1850	
	CCA-Treated Wood at 0.60 pcf	4940	2950	4435	
	CCA-Treated Wood at 2.50 pcf	20600	12300	18500	
Ash ^b	Non-CCA-Treated Wood	141	212	28	
	CCA-Treated Wood at 0.25 pcf	20600	11200	11400	
	CCA-Treated Wood at 0.60 pcf	51100	32300	42800	
	CCA-Treated Wood at 2.50 pcf	174000	104000	113500	
Regulatory Limits	Federal ^c	Ceiling (mg/kg)	Not Applicable	4300	75
		Pollution (mg/kg)	Not Applicable	1500	41
	Florida ^d	Industrial (mg/kg)	430	12000	3.7
		Residential (mg/kg)	290	105	0.8

^a Computed values assuming that retention rating equals amount of chemical in wood

^b Measured values

^c Federal Register 40 CFR Part 503. 13, Standards for the Use or Disposal of Sewage, Subpart B, Land Application

^d Florida Department of Environmental Protection, Proposed Chapter 62-777, F.A.C. Contaminant Target Clean-up Levels

Table: Chromium, Copper, and Arsenic Concentrations in Treated Wood and Treated Ash Samples Used in This Study. Regulatory Levels Provided for Comparison.

In this article we are also told, “that the official warning label on pallets of pressure treated wood says it should not be burned in stoves, fireplaces or residential boilers. Waste wood at construction sites “may be burned in commercial or industrial incinerators or boilers in accordance with state and federal regulations,” the label says. But the Environmental Protection Agency issued that statement in 1988, and incinerating pressure-treated wood is no longer legal in any state because the dangers are too great.

Because of such hazards, researchers are scrambling to find ways to extract the chemicals from scrap wood so it can be recycled safely. Using citric or other acid is too expensive, and no one wants pressure-treated fibers in particleboard. In the meantime the volume of the scrap is growing. In 2020, the years total is expected to be 467 million cubic feet-enough to build a boardwalk 3 feet wide and 1 ½ inches thick all the way to the moon. “And every piece of it is headed for the landfill,” says Jeff Fehrs, an engineer with C.T. Donovan Associates of Burlington, Vermont, which finds markets for scrap wood.”¹

In an article from *News and Analysis* titled, New Technique to dispose of treated wood developed by University of Florida researchers, we learn of the continuing struggle to solve the scrap problem.

Florida’s concerns are particularly high as they burn 70% of their waste treated wood in their electricity - generating wood incinerators, says C.Y.Wu, assistant professor of Environmental Engineering at the University of Florida.²⁵

“Wu’s research shows that much of the arsenic escapes into the air when treated wood is burned. That is because the pollution control devices in the incinerators smokestacks capture only relatively large particles. In the heat of the incinerator, however, the arsenic vaporizes and forms extremely tiny particles-less than 1 micron in diameter or more than 100 times smaller than the diameter of a human hair. These tiny particles can not be perfectly captured in traditional pollution devices.”²⁵

The University of Florida, in a new technique, introduced limestone into the burning process which reacts with the arsenic to form larger particles, in the range of 50 microns. Instead of escaping through the smokestack, those particles wind up in the waste ash.²⁵

That may appear to merely transfer the problem from place to another, but Wu said tests reveal that the arsenic -limestone particles are also much less likely to leach into the groundwater than the tiny arsenic particles when placed in the landfill.²⁵

“So far, the incinerator technique has only been tested in laboratories. But Wu noted that power plants already use a similar technique involving injecting limestone into air pollution devices to reduce sulfur dioxide emissions, which suggests adopting the process for wood incinerators is a distinct possibility.

John Schert, director of the Florida center for Solid and Hazardous Waste Management at the University of Florida’s College of Engineering, said “If somebody can figure out how to burn CCA treated wood and not let the arsenic escape into the atmosphere, that’s the Holy Grail for disposing of CCA wood.”²⁵

The other research team members are Timothy Townsend, an assistant professor of environmental engineering, and Kenjiro Iida, John Pierman and Thabet Tolaymat, all students in the department of environmental engineering.²⁵

I personally believe while their work should be applauded, that the ash remaining although less “leachable”, still contains 80% of the toxins and poses a serious environmental danger. Even a small amount of leaching, when you take into consideration the enormous amount of waste wood that would be burned, would cause serious problems. I believe instead of trying to fix this problem so more of this wood can be made, we should be outlawing its use and using alternatives which will be later discussed. Then perhaps their research could be put into use to dispose of what we have already unwittingly put into our environment.

Others share my opinion as can be seen in the U.S.NEWS online in an article called, *Kids at Risk* by Sheila Kaplan and Jim Morris. “The chemical industry prefers to police itself, when given a choice. But this approach seldom works, as evidenced by the Environmental Protection Agency’s (EPA) failed attempt to restrict a pesticide known as chromated copper arsenic, or CCA. The compound is applied to pressure-treated wood and commonly found on decks and playground equipment. Since the late 1970’s, EPA researchers have reported that CCA poses a special threat to pregnant women and children because it combines three neurotoxic compounds. People can be exposed to CCA by breathing fumes from unfinished wood during home repair and construction. As a structure ages, the compounds may leach out into the dirt. In lower doses, according to numerous studies, CCA can impair intelligence and memory.

The EPA tried to restrict CCA in 1984, but homebuilders’ and wood preservers’ groups lobbied Congress so hard that the EPA retreated, asking only that retailers distribute advisories that the compound could endanger children. A decade later, the effort had gone nowhere. “We checked retailers,” said John McCauley of the Kentucky Department of Agriculture, “and they had no clue what a consumer information sheet was.”¹⁸

On a fact sheet printed by a manufacturer of pressure treated wood, Exterior wood, the dangers of this wood seem to be downplayed according to my research. Even still, this is what they have to say about burning the wood. “Question - are there any special precautions that apply to treated wood and do not apply to untreated wood?” Answer “Treated wood should not be burned. If you burn the wood, you release the preservative constituents that are locked in the wood

cellulose. Burning destroys the wood cellulose and the metals end up in the wood ash. If that ash is not properly handled, it could cause health or environmental concerns.”²⁰

Mark Harris brings up another point in his article titled *Earth-Friendly Living: Pressure-Treated Wood Get Low Marks From the Environmentalists*. I quote him, “don’t burn your scraps. Burning will send arsenic laden smoke wafting throughout your house. Arsenic will collect in your ashes, tainting them, so don’t spread them in the garden.”¹⁹

A paper written by Henry A. Peters, MD and his research team called *Seasonal Arsenic Exposure From Burning Chromium-Copper-Arsenate-Treated Wood* was written on the experiences of a rural Wisconsin family of eight who had been burning scrap pressure treated wood in their home wood stove as fuel and was published in the *JAMA* in May 11 1984.²⁶

This study describes in detail the health problems of this family and the tests that were done to determine the cause of their illnesses. The family did not know why they were sick nor did the investigators at the beginning. Foul play was even suspected at one time. But finally the cause was poisoning from both the wood ash and the smoke from the stove. The family’s problems went on for almost four years but would improve in the summer when the wood stove was not in use.

Here is an excerpt from that paper, “An eight member family from northern Wisconsin experienced health problems involving the eyes, respiratory system, CNS, gastrointestinal (GI) tract, blood, reproductive system, skin, and hair. The exposure to arsenic, copper, and chromium occurred through ingestion, inhalation, and direct contact. This resulted in chronic exposure (1) to the skin and eyes where it caused pruritic dermatitis; (2) to the respiratory system where it caused severe irritation and some pneumonic problems (almost fatal to the fourth child); (3) to the gastrointestinal tract where it caused severe diarrhea; (4) to the CNS where it caused loss of sensation, seizures, blackouts, and headaches; and the most puzzling lesions of all, (5) the seasonal hair loss among all the family members.”²⁶

Charts showing their symptoms and hair and fingernail analysis follow. The family’s many symptoms show it would be difficult for a doctors to diagnose this problem if they were not looking for it.

In a second paper titled *Hematological, Dermal and Neuropsychological Disease from Burning and Power Sawing Chromium - Copper- Arsenic (CCA)-Treated Wood*¹¹ Peters and his team again recount the story of the Wisconsin family and the hazard of improper disposal of CCA treated lumber. They stress the need to publicize the issue. They go on to describe two case studies of workers who became ill while using pressure treated wood. These cases are discussed in the section titled *Incidents Reported While Working With Pressure Treated Wood*.

In an article in *Weather-Bos* we are told that, “the Wisconsin’s environmental agency fined John Menard, owner of the 200 store Menard’s home improvement chain, \$1.7 million for burning CCA scraps to heat the company’s lumber production facility. Menard was caught carrying the ash from that facility to his home, where he disposed of it with the family trash.”²

In a report by the European Commission Health and Consumer Protection “*Assessment of the risks to health and the environment of arsenic in wood preservatives and of the effects of further restrictions on its marketing and use*” expressed at the 5th CSTEE plenary meeting, Brussels, 15 September 1998 we find the following statement.

Uncontrolled burning of CCA-treated wood in homes or in open grounds is discussed in the Report and it is concluded that air emissions from such practices can give rise to increased estimated risks of lung cancer. The CSTEE notes that indeed there is direct literature documentation of acute health effects in families burning such wood in their home, the significance of this possible source of human exposure lying in the difficulty of recognizing CCA-treated old wood. Ash left over from uncontrolled burning of wood in open grounds is considered in the Report to generate unacceptably high soil contamination and, if the same site is used repeatedly, it may present a risk of ground water contamination.”⁷

In their conclusions the Report states, “marginally increased lung cancer risks from controlled incineration of CCA-treated wood-significantly increased lung cancer risks from uncontrolled use of CCA-treated wood for home heating-significant effects on the environment from uncontrolled burning and disposal of CCA-treated wood-potential risks from the unpredictable long-term leaching behavior of arsenic in special waste landfills.” The Report further recommends, “it would be advisable to exercise caution by limiting the use of arsenic- based wood preservation to those situations where it is absolutely necessary.”⁷

ALTERNATIVES TO PRESSURE TREATED WOOD

In an article titled *Arsenic and Old Wood* we learn some alarming facts from the very makers of CCA treated-wood. “Wood preservers could easily switch to arsenic-free formulas- using the same equipment and procedures-if consumers demanded it. “It’s what I’ve been trying to argue for years,” says Douglas Mancosh, president of BB&S Treated Lumber of New England, one of North-East’s largest wood preservers.

As a hedge against any future federal and state bans on chromated copper arsenate, the three licensed suppliers of the preservative have developed a new generation of chemical mixes: ammoniacal copper quaternary (ACQ), copper azole and copper citrate. In addition, other

companies have recipes to protect wood without arsenic or chromium. The most heavily promoted is Kodiak Preserved Wood, made with copper dimethyidithiocarbamate.

All of these alternatives are ready to go- the Environmental agency says they're safe, and the American wood Preservers Association says they work. However, the association's endorsement for copper azole is limited to above-ground use; ground contact approval is pending. The formula

is common in Japan and Europe, in part because of concerns about the hazards of arsenic in

The new formulas cost more because they are richer in expensive copper. But wood and labor, not chemicals, are the most costly elements of wood-preserving, Mancosh says; these remain constant no matter what chemicals are used. His company uses ACQ to treat a small portion of its wood, and he says the finished products cost 8 percent more than the standard pressure-treated wood. "It's pretty insignificant," he says.

In Chippewa Falls, Wisconsin, another wood preserver, Northern Crossarm Co., switched to ACQ last fall because of fears about worker safety and its own liability, owner Pat Bischel says the new wood generally costs about 5 percent more than the old.

Of the alternatives, ACQ is the least expensive and most common. Only one company California uses copper citrate to treat Douglas fir. Kodiak is the most expensive, but it includes a color stain that the other treated woods lack.

Mancosh, still churning out bundles of wood treated with a chemical recipe dating from the 1930's (CCA) says the industry could switch to the arsenic free alternatives tomorrow. But the industry is fragmented and hard to move, he says, "There's no one to take the lead. To me it seems an absolute no brainer to make the switch."

Despite all the concerns about pressure-treated wood, there might be some justification for using arsenic if chromated copper arsenate were the only formula available. But safer recipes exist, and some are just as effective.

The most common compound known as ACQ, manufactured by Chemical Specialties Inc. of Charlotte, North Carolina. The company, which also makes about one third of all CCA sold, has had little success selling the safer alternative, says Tom Bailey, the company's marketing manager. Although wood with ACQ costs as little as five percent more than the standard pressure-treated lumber, that is a big enough premium to prevent most retailers from stocking it, Bailey says. "Unfortunately the choice is not ours to make. The market is being driven by retailers, and these retailers are under more pricing pressure than they have ever been." But the results nag at him, "I have kids, sons 8 and 5," Bailey says, "In my quiet moments, I feel better about offering ACQ than CCA. I feel that our industry has to change eventually. And the reason is arsenic."¹

In a publication by the Environmental Protection Agency (EPA) of the United States called *Chromated Copper Arsenicals (CCA) and its Use as a Wood Preservative* the question of alternatives was answered in this way. "Since CCA treated wood does not pose a significant risk to human health and the environment, EPA does not recommend replacement solely on that basis. When selecting materials to use for decks, playgrounds, and other outdoor uses, consumers and communities should consider other factors in addition to the environment, such as cost, strength, and durability. From an environmental standpoint, however, the production of plastic, steel, and concrete also have environmental impacts that should be considered when choosing a material."²⁷

The next question on this sheet is "What is the EPA's position on the findings of a recent study conducted by Dr. David E. Stilwell and Katja Gorny of Connecticut Agricultural Experiment

Availability: Redwood and cedar are sold in all standard dimensions. Cedar 5/4x6 in. Deck boards are easy to find. Redwood can take a few days for special orders.

Recommendations: For redwood, use kiln-dried deck heart or deck common. Clear heart, clear, B heart, and B grade redwood are fine for lower budgets. For cedar, clear all heart is the premium choice. Good, lower-cost alternatives include appearance grade and for dry areas, No. 1 select tight knot (STK). Use hot dipped galvanized, aluminum or stainless steel (ring-shanked) nails, screws and other fasteners.

Cost: About \$18 to \$22 per square foot; the higher grades of redwood cost much more.

Plastic-Wood Composites

Advantages: Virtually indestructible, plastic-wood composites blend 30 to 50 percent recycled plastic with wood fibers for skid resistance and stain-ability. Composite lumber is low-maintenance, and resists rot, insects and UV rays. It's also splinter-free and easy to work with. Deck screws sink in and disappear. Trex, TimberTech and DuraWopood Ex come with 10-year warranties, while ChoiceDek and DuraWood PE are backed for 20 years.

Disadvantages: Some composite lumber has a plastic appearance and some colors fade over time. During construction, sawdust and shavings must be collected in a drop cloth because they aren't biodegradable. What's more, not all composite lumber can span traditional 16 or 24 in. joist spacing; narrower joist layout may be needed, boosting cost. Some building codes don't allow composite lumber; check with your building department before ordering.

Availability: Trex, approved by most building codes, is sold in most standard dimensions, including 5/4x6 in. and 2-by. Choice Deck and Smartdeck come in 5/4 by 6 in. Timber tech is 1 1/2 x 6 and 1 1/2 x 8.

Recommendations:

Typical choices are plain deck boards (which you install) and SmartDeck's Durawood EX (installed by a certified contractor). SmartDeck also offers a 100 percent plastic product, called

at the factory. Fasteners can be completely hidden once planks are installed. The three major manufacturers of vinyl deck systems Kroy, Dreamdeck and EZ Deck offer limited lifetime warranties.

Disadvantages: These systems are relatively expensive. Vinyl can fade and get brittle with age unless specially treated at the factory, and all vinyl eventually loses its gloss. Sawdust isn't biodegradable so it must be collected in a drop cloth.

Availability: Kroy deck planks come in 8 in wide, DreamDeck planks are 5 1/4 in wide and EZ Deck planks are 4 or 6 in. wide. These systems must be ordered through distributors.

Recommendations: Choose skid resistant planks, available in a variety of colors from Kroy, Dreamdeck and EZ Deck. Also opt for colorfast, no-fade treatments like the one used by EZ Deck. Planks can be cut to length by a circular saw; plank ends are covered with vinyl caps. Proprietary strip systems are screwed to joists with galvanized or stainless steel screws, then planks snap into place.

Cost: About \$13 per square foot installed for Kroy, \$18 for Dream Deck and \$22 for EZDeck, not including substructure. Decking itself costs about \$7 to \$12 per square foot.

In an article, titled *Does Pressure-Treated Wood Belong in Your Garden*, published by Kitchen Garden in July 1998 and written by Ruth Lively we learn some additional choices. She suggests "Check out the locals. Depending on where you live, you may have access to a native species whose heartwood is decay resistant. Black locust, red mulberry, osage orange, and Pacific yew show outstanding longevity. Other highly rot-resistant species include catalpa, Arizona cypress, juniper, mesquite, and several oaks, namely bur, chestnut, Gambel, Oregon white, post, and white."¹⁵

She also informs us of the new safer pressure-treated wood. "Public concerns over potential hazards of CCA has led the industry to look for safer, less controversial preservatives touted as environmentally sound. ACQ is a mix of and a quaternary ammonium compound, nicknamed quat. Small amounts of copper and quat do leach, but nothing in ACQ is considered hazardous by the EPA, and no ingredient is a known or suspected carcinogen. The maker, Chemical Specialties, Inc. (CSI), uses only recycled copper in ACQ. The wood is expected to last as long as CCA-treated lumber.

I (Lively) first heard about ACQ four years ago, but never found a place to buy it. Why, I wondered, was it so unavailable if it had so much to recommend it? The first version to go on the market contained no water repellent and had to be treated by the buyer to minimize cracks and warping. In late 1997, CSI came out with a version, ACQ Type D, which has a built-in water repellent. The company hopes the new formulation will be more attractive to lumber retailers and consumers. ACQ-treated wood is about 10% more expensive than CCA because it contains more copper."¹⁵

Here's what the *Environmental news Network* has to say about ACQ in their article. There's ACQ Preserve lumber to choose from. Also a pressure-treated wood, ACQ lumber is treated with a greener blend of ammonia, copper and quaternary ammonia. These ingredients won't earn ACQ lumber non-toxic status, but they do replace the more seriously toxic arsenic and chromium products that taint other outdoor woods."¹⁹

In an article published by the *Environmental Building News* we read, "although ACQ and other less toxic alternatives to CCA have been in the works for years, they have not been promoted for fear of feeding consumer concerns about the dangers of CCA."¹⁶

WHAT TO DO IF YOU BELIEVE YOU MAY HAVE BEEN CONTAMINATED BY CCA

Go to an emergency room and request blood work is done if exposure is recent. Hair and nail analysis should be done if exposure is long term or longer than several days past. Chelation treatment is an accepted treatment for the removal of heavy metals. Minerals and vitamins will need to be taken to replace the depletion both chelation and heavy metals cause. An environmental doctor is the professional of choice in heavy metal poisoning. Be persistent in your pursuit for health care.

In conclusion I have added two appendices, one contains facts about the chemicals in CCA and how they can affect you, the other is a list of warnings to anyone who is working with or comes in contact with CCA. I firmly believe CCA should not be allowed to be sold to anyone who is not knowledgeable of these facts. I also believe Emergency Medical workers should be taught the treatment for those who are contaminated by CCA given its wide use.

APPENDIX 1 SOME FACTS ABOUT THE CHEMICALS IN CCA

SENSITIZER NOTICE - “Some substances can cause a specific immune response in some people. Such substances are called sensitizers and the development of a specific immune response is termed ‘sensitization.’ Exposure to a sensitizer, once sensitization has occurred, may manifest itself as a skin rash or inflammation or as an asthmatic condition, and in some individuals this reaction can be extremely severe.”²⁹

SENSITIZERS - “Following the induction of a sensitized state, an affected individual may subsequently react to exposure to minute levels of that substance. Although low values have been assigned to strong sensitizing agents, compliance with the recommended exposure standard may not provide adequate protection for a hypersensitive individual. Persons who are sensitized to a particular substance should not be further exposed to that substance.”²⁹

CHROMIUM (A) - “Chronic exposure to dusts or mists containing chromium salts may cause ulceration and perforation of the nasal septum. Respiratory irritation may occur with symptoms resembling asthma. Other symptoms may include conjunctivitis, anorexia, nausea, gastritis, duodenal ulcers and colitis. Liver damage may occur. Chronic skin exposures may lead to a skin rash, and entry of chromium salts into open wounds may cause chromium ulcers.”³⁰

CHROMIUM (B) - “Acute poisoning from ingestion of chromium and its salts may cause dizziness, intense thirst, abdominal pain, shock and reduction in urinary output and vomiting. Prolonged skin exposure might cause ulceration of the skin. Acute exposure to dry chromium salts may cause severe irritation of the eyes, nose throat, bronchial tubes and lungs.”³¹

COPPER - “chronic exposure to dusts or mists containing copper may cause irritation of the eyes, nose and respiratory tract, dermatitis and perforation of the nasal septum.”³⁰

ARSENIC (A) - “chronic arsenic poisoning, whether through ingestion or inhalation, may be manifested by many symptoms. Digestive disturbances such as nausea, cramps, constipation or diarrhea with associated weight loss are likely, and liver damage may also occur. Disturbances of the kidneys, the nervous system and of the blood, such as anemia, are not infrequent. Arsenic may cause a variety of skin abnormalities, including itching and pigmentation. These effects may result from dermal exposures or from systematic distribution. Chronic dermatitis commences with patchy erythema and may lead to papular or vesicular eruptions. Optic and peripheral neuritis may also develop with prolonged exposure. Aplastic anemia has also been observed.

Chronic exposures to dusts or mists containing arsenic may cause irritation of the nose and pharynx, leading to acute or chronic rhinitis. Prolonged exposures may occasionally lead to perforation of the nasal septum.”³⁰

ARSENIC (B) - “acute poisoning from ingestion of arsenic at doses approaching the minimum lethal dose causes restlessness, nausea, vomiting, headaches, dizziness, chills, cramps, irritability

and variable paralysis which may progress over a period of several weeks. Ventricular

APPENDIX 2 - PERSONAL PROTECTION WHEN WORKING WITH PRESSURE TREATED WOOD

-The preservative chemicals are toxic. These chemicals and the treated wood must be handled and used carefully to avoid ill effects on people, the environment and animals (*Health Protection Branch Issues*).¹²

-Be especially careful with liquid preservatives used on the job site (*Wood Preservatives*)¹⁷

-Wear gloves to avoid direct skin contact when handling or working with pressure treated wood (*Health Protection Branch Issues*).¹²

-These gloves should be made of NBR, neoprene, rubber or PVC (*CCA poison sheet*).³³ Wear gloves to help avoid splinters (*Tips on Use and Handling of Wolmanized Wood*).³⁴

- People who handle the chemical solution without using protective clothing may develop skin irritation or rashes. There is also a slight possibility that this could occur in people who repeatedly, day after day, move and handle pressure-treated lumber (*Chromated Copper Arsenate CCOHS*).²⁴

-Wear boots, an apron, coveralls, chemical goggles or a facesheild over glasses if there is a risk of splashing when unloading chemicals during mixing and sampling operations (*CCA Poison Sheet*).³²

-Avoid inhaling CCA mists and sawdust from treated wood (*CCA Poison Sheet*). Whenever possible, these operations should be performed outdoors to avoid indoor accumulations of airborne sawdust (*Tips on Use and Handling of Wolmanized Wood*).³⁴

-Wear a dust mask when handling or sawing or machining treated wood (*CCA Poison Sheet*).³³

-Reports in medical literature show that high exposures occur when burning or grinding pressure treated wood (*Health Protection Branch Issues*).¹²

-During maintenance vessel entry or emergencies wear SCBA with a full facepiece in addition to protective clothing (*CCA Poison Sheet*).³³

-Leave contaminated clothing at work (*CCA Poison Sheet*)³³

-Wash clothes separately from other clothing before re-wearing. (*Health Protection Branch Issues*).¹²

-It should not be used indoors, or where it could come in contact with water, feed, or food since some leaching can occur under certain conditions high exposures occur when the chemicals or

wood are used in the interior of homes (*Health Protection Branch Issues*)¹² (*Chromated Copper Arsenate from CCOHS*).²⁴

-Do not use treated wood for cutting boards or countertops, or construction of beehives or hive platforms. Do not use treated wood shavings or sawdust for bedding or litter in barns, chicken houses or similar structures (*Tips on Use and Handling of Wolmanized Wood*).³⁴

-Preservative treated wood should not be used to line wells or water conduits (*Health Protection Branch Issues*).¹²

-Avoid handling freshly treated wood (*CCA Poison Sheet*).³³

- Occupational exposure to the chemicals used in the preservative solution occurs if the wood is handled before the liquid dries. It is during this drying period, after application of the solution, that the bonding with the wood occurs. Exposure to the chemicals may also occur when the cut ends of the wood are treated with the preservative solution (*Chromated Copper Arsenate CCOHS*).²⁴

-Maintain a clean shop; do not leave sawdust or scrap lumber around as they pose fire and accident hazards (*Tips on Use and Handling of Wolmanized Wood*).³⁴

-Construction workers who handle, drill, saw, or grind treated wood, may have a high exposure. The exposure is greater for workers in wood treatment plants. People who sell freshly treated lumber, and linemen who often have to climb pressure-treated utility poles may be regularly exposed (*Health Protection Branch Issues*).¹²

-If you have purchased wolmanized wood that was dried after treatment, you may paint or stain it immediately, provided the weather is suitable. If your wood has not dried after treatment, allow several weeks for the wood to air dry and then wait for clear weather (*Tips on Use and Handling of Wolmanized Wood*).³⁴

-Clean up thoroughly before eating, drinking, or using tobacco products (*EPA Office of Pesticide Programs Chromated Copper Arsenicals (CCA) and its Use as a Wood Preservative May 1997*).²⁷

-Perform the work outdoors on a dropcloth so that the sawdust can be collected and discarded (*Fact Sheet-Connecticut Department of Public Health*).⁶

-During winter months the CCA may not be totally fixed when buying wood- in this case the wood is highly “leachable”, posing both environmental and health risks-the surface precipitates, usually white crystals-exercise extreme caution (*Environmental Building News*).¹⁶

-Perspiration from hands increases the absorption of CCA through your skin (*Environmental Building News*).¹⁶

-Chemical listed as a carcinogen or potential carcinogen (*Material Safety Data Sheet 7-T*).³⁶

FIRST AID

-Skin contact-flush with water for a minimum of fifteen minutes- wash thoroughly with soap and water –remove contaminated clothing (*CCA Poison Sheet*).³³

-Ingestion-give conscious victim water- induce vomiting (*CCA Poison Sheet*).³³

-Eye contact-open eyelids and flush with soap and water for a minimum of fifteen minutes (*CCA Poison Sheet*).³³

-Inhalation-remove victim to fresh air (*CCA Poison Sheet*).³³

Contact First Aid get medical help (*CCA Poison Sheet*).³³

HEALTH HAZARDS

-Individuals with an existing (or a history of) disease of the skin, kidney, liver, lungs, or nervous system may be at greater risk of developing either acute or chronic effects (*Material Safety Data Sheet 6-T for liquid CCA*).³³

-Acute overexposure –toxic by ingestion, causes gastroenteritis, esophageal pain, vomiting and anuria or oliguria (*Material Safety Data Sheet 6-T for liquid CCA*).³⁵

-This solution is highly corrosive, as indicated in its pH. Skin or eye contact may result in severe burns. Chronic Skin Exposure may result in skin ulcers. Inhalation of this solution is highly irritating, and acute exposure by inhalation may result in chemical pneumonitis. (*Material Safety Data Sheet 6-T For Liquid CCA*).³⁵

-While all three chemicals are toxic, chromium and copper do not raise many concerns if we do not inhale them (e.g. while burning), arsenic is worrisome (*Does Pressure Treated Wood Belong in Your Garden*).¹⁵

-Compared to organic arsenic, inorganic arsenic is much more likely to accumulate in living tissues, where it interacts with cell enzymes and impairs metabolism (*Does Pressure Treated Wood Belong in Your Garden*).¹⁵

-At present there are no wood preservatives in Canada for direct contact with food (*Wood Preservatives*).¹⁷

-On rare occasions, toxic effects of pressure treated wood have been seen both in animals and people. The effects range from slight illnesses to deaths. Accidental illnesses or deaths were traced to improper or careless use of the preservative chemicals or treated wood in the workplace or in the home (*Health Protection Branch Issues*).¹²

-Ceilings over stored food are a special problem. Moisture condensing on the underside of a ceiling can drip back down onto the stored food (*Wood Preservatives*).¹⁷

-Not much is known about the long-term effects of frequent exposure to wood preservatives. Some health studies have been carried out on workers in the wood preservation and lumber industry, and people living in houses containing treated wood. Most of these studies showed little or no obvious effect on normal organ function and on health. However, some people heavily exposed to preservative chemicals have become seriously ill, and a few have died. Studies in the smelting and metal processing industries have shown that arsenic and chromium (which are present in CCA) can irritate the skin and may cause or promote some forms of cancer (*Health Protection Branch Issues*)¹²

-Young children are most at risk from the health effects (*Fact Sheet Pesticides Used In Pressure Treated Wood*).⁶

-Keep Children and Pets out of under- deck areas where arsenic may have leached in the past (*Fact Sheet Pesticides Used in Pressure Treated Wood*).⁶

-Recent studies have shown that rainwater leaches (releases) CCA from the treated wood (*Fact Sheet Pesticides in Pressure Treated Wood*).⁶

EYE CONTACT

-May cause burns and swelling (*CCA Poison Sheet*).³³

SKIN CONTACT

-Irritates the skin (*CCA Poison Sheet*).³³

-Prolonged Exposure may cause drying, peeling, itching,, reddening, blistering and hardening (*CCA Poison Sheet*).³³

-May cause ulcers of the skin (*CCA Poison Sheet*).³³

INGESTION

- Irritates the mouth, throat and stomach (*CCA Poison Sheet*).³³
- May cause stomach pain and vomiting (*CCA Poison Sheet*).³³
- Repeated ingestion may cause changes to the blood and liver and kidney damage and (*CCA poison sheet*).³³
- May cause shock and death (*CCA Poison Sheet*).³³

INHALATION

- Information is based on known effects of individual components: copper oxide, chromic and arsenic acids (*CCA Poison Sheet*).³³
- The few studies done have found no evidence of health problems with proper handling of CCA (*CCA Poison Sheet*).³³
- Mists or dusts can irritate nose and throat (*CCA Poison Sheet*).³³
- Prolonged exposure may cause ulceration and perforation of tissue in the nose (*CCA Poison Sheet*).³³
- Excessive and prolonged exposure to arsenic and chromium compounds is suspected of causing cancer (*CCA Poison Sheet*).³³
- Excessive exposure to chromium may cause nosebleeds, sore throats and kidney damage (*CCA Poison Sheet*).³³
- Excessive and prolonged exposure to arsenic may cause liver damage and nerve damage (*CCA Poison Sheet*).³³
- Contact of CCA with zinc or aluminum (e.g. galvanized steel) may form arsine, an extremely poisonous, but non-irritating gas (*CCA Poison Sheet*).³³
- Arsine may cause changes to the blood, liver, and kidney damage. (*CCA Poison Sheet*).³³

STORAGE AND HANDLING

- Protect containers against rupture (*CCA Poison Sheet*).³³
- Concentrated solutions must be handled by trained personnel (*CCA Poison Sheet*).³³

- Easy-to-read-instructions for safe handling should be posted near work and storage areas (*CCA Poison Sheet*).³³
- Steam-or detergent- clean contaminated equipment prior to welding (*CCA Poison Sheet*).³³
- Welding should be done close to an exhaust system (*CCA Poison Sheet*).³³
- Wear a respirator (SCBA, airline, or cartridge respirator with high efficiency particulate filters, as required) when welding; toxic fumes may be formed (*CCA Poison Sheet*).³³
- Change clothing when contaminated (*CCA Poison Sheet*).³³
- Treated wood should not be burned in open fires or stoves (*CCA Poison Sheet*).³³
- Toxic materials may be produced in smoke or ashes (*CCA Poison Sheet*).³³
- Have a safety shower and eye wash in storage and handling areas (*CCA Poison Sheet*).³³

FIRE FIGHTING

- Not flammable, but contact with combustible material may result in explosion or fire (*CCA Poison Sheet*).³³
- Use SCBA to fight fire near CCA; toxic compounds may be released (*CCA Poison Sheet*).³³
- Wear full protective equipment (*Material Safety Data Sheet 7-T*).³⁶

EMERGENCY RESPONSE SPILLS

- Evacuate the area (*CCA Poison Sheet*).³³
- Put on personal protective equipment (*CCA Poison Sheet*).³³
- Ventilate the area (*CCA Poison Sheet*).³³
- Clean-up operations require an airline respirator or SCBA with full facepiece because toxic gases may be generated (*CCA Poison Sheet*).³³
- Do not discharge spill to drain or sewer (*CCA Poison Sheet*).³³

-Recycle spilled solutions (*CCA Poison Sheet*).³³

-Absorb residue onto vermiculite and transfer to a labeled metal container with lid for transport to disposal site (*CCA Poison Sheet*).³³

-Wash spill site with soap and water (*CCA Poison Sheet*).³³

-Collect absorbent and contaminated soil in DOT approved containers. This material is toxic to fish and wildlife, do not allow it to contaminate waterways. Individuals involved in cleanup should be protected from contact with solution by using appropriate protective equipment. The reportable quantity for this material in Canada is five (5) liters. If more than five (5) Liters is released it represents danger to health, life, property or the environment, contact the local police force and file a dangerous occurrence report (*Material Safety Data Sheet 6-T Liquid CCA*).³⁵

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