

Guidelines for Use of Chemically Treated Wood on the Farm and in the Home

A. E. Marczewski, Center for Environmental Toxicology
M. L. Lockwood, L. R. Shull*, Department of Animal Science
M. Kamrin, Center for Environmental Toxicology

Because the chemicals used to preserve wood are pesticides, treated wood must be used only when warranted and it must be used properly.

The purpose of this bulletin is to supply information to consumers, especially farmers and livestock producers, that they can use to determine whether they need wood that is chemically treated, and if so, whether the intended use is proper and safe.

Use of treated wood is warranted when conditions indicate a need for protection against destructive bacteria, fungi and insects.

Treated wood is used properly when it does not result in excessive exposure of humans or animals to preservative chemicals.

Various chemicals are used as preservatives in wood, including pentachlorophenol (Penta), chromated copper arsenate (CCA), ammoniacal copper arsenate (ACA), fluorochrome arsenate phenol (FCAP), creosote, copper sulfate, tributyl-tin oxide, tetrachlorophenol and zinc naphthenates. Penta-treated and CCA-treated wood are the two types of chemically preserved wood currently available in Michigan retail lumber stores. Both chemicals effectively extend the life of wood by protecting it against destructive, rot-causing bacteria and fungi that typically inhabit high-moisture environments such as water, soil and manure. Because structures are commonly built in such environments on livestock farms, preserved wood is frequently used to prolong the life of these structures. Using this treated wood improperly, however, can pose a threat to the health of both humans and farm animals. This fact sheet presents information and guidelines for the consumer for proper use of chemically treated wood.

*Current Address: Department of Environmental Toxicology, University of California, Davis, CA 95616

Arsenate (CCA)-Treated Wood

The arsenical preservative compounds have been finding wider application in lumber, plywood, fence posts, supports, decks and recreational equipment because of their cleanliness, lack of color and odor, durability, paintability and low potential for human or animal exposure. By far the major use for arsenates is in the treatment of lumber. Poles, fence posts and railroad ties are minor uses of arsenate-treated wood. Arsenically treated railroad ties are used in landscaping.

Virtually all arsenate treatment of wood is accomplished at industrial plants where the chemicals are forced by pressure into the wood and become fixed in the wood in insoluble form. CCA is the arsenate mixture used on most treated wood sold in Michigan retail lumber stores. It is a mixture of copper, chromium and arsenate.

Of the three elements in CCA, arsenic poses the greatest potential hazard. The trioxide form of arsenic is four to five times as toxic as the pentavalent form, which is the one present in CCA. There is no direct toxicological evidence that it can be converted to the toxic trioxide form. Based on indirect evidence, however, the Environmental Protection Agency has concluded that chronic exposure to trivalent or pentavalent arsenic may induce cancer.

Though arsenic is fixed in treated wood, studies have shown that leaching of this chemical, as well as blooming of its salts, can occur. (Leaching is the movement of the chemical to the surface by the action of water, and blooming is the vaporization of crystalline surface chemicals.) Osmotic pressure from surrounding moisture will cause leaching even if wood has been washed. As a result of leaching and blooming, arsenic may become available for human and animal exposure. Humans may absorb arsenic through the skin as a result of handling or touching, while animals may ingest the material through licking

Table 1. Types and Characteristics of Treated Wood.

	Pentachlorophenol-Treated Wood	Creosote-Treated Wood	Arsenate-Treated Wood
Major uses	utility poles, lumber and timbers, crossarms, posts	railroad ties, utility poles, pilings	lumber and timbers, plywood, poles, posts
Color	natural to dark brown	brown to black	green, yellowish (sometimes gray to tan)
Odor	may emit antiseptic-like odor	strong chemical odor	no characteristic odor
Surface Characteristics	may appear oily for several months/years	may appear oily for several months/years	water soluble residue may be present on wood surface
Bleeding Tendency	may bleed	may bleed	none
Availability in Retail Stores			
1. Pressure-treated wood	yes	yes — fence posts, bridge planks	yes
2. Solutions	yes	yes	no
Common Names	PENTA PCP	Coal Tar Creosote	CCA
Trade Names	Dowcide Pentacon Penwar Sinituho Santobrite Santophen	Creosote Wood Preserving Solution Parks Creosote Preservative Koppers Dewitts Dark Creosote Wood Preservative Creosote Coal Tar Solution Creosote Oil	Greensalt Boliden Wolman Wolmac

and chewing. There have been no reported cases of toxic effects in farm animals attributed to exposure to arsenate-treated wood, however.

Arsenicals have been found to be poorly absorbed and rapidly excreted in urine of experimental animals. The levels of arsenic found in animals exposed to it in the air did not indicate a serious residue problem. Thus, arsenic probably does not pose a hazard for food animals or humans exposed to treated wood.

Penta-Treated Wood

Penta is used primarily to treat poles, crossarms, timbers, lumber and fence posts. Millwork such as window and door frames in homes is penta-treated, as is particleboard.

Natural wood ceilings, walls or paneling have been reported to be treated with penta. Penta is also used to control fungi in green lumber after it is cut in sawmills, and in freshly peeled poles.

Almost all wood treated with penta has the chemical impregnated into the wood by pneumatic or hydrostatic pressure. The remainder is applied by non-pressure processes that may be employed commercially or by individuals for home, farm and garden uses. Since penta is nearly insoluble in water, petroleum is used to dissolve the chemical and carry it uniformly into the wood.

Most wood treated with penta by pressure processes will bleed. Bleeding refers to the slow migration of the penta solution from the interior to the surface of the wood. It is a spontaneous reversal of the pressure process. Non-bleeding penta-treated wood is available commercially but is more costly and available in limited supply.

Table 2. Routes of Exposure to Chemicals in Treated Wood.

	Humans	Farm Animals
ORAL INGESTION		
PENTA	accidental ingestion of treated wood sawdust (minor)	1) ingesting feed contaminated with chemical 2) chewing or licking treated wood (especially chemical on surface from bleeding)
CCA	accidental ingestion of treated wood sawdust (minor)	1) ingesting feed contaminated with chemical 2) chewing or licking treated wood
DERMAL ABSORPTION		
PENTA	while handling—direct skin contact with chemical on surface from bleeding	rubbing against treated wood—contact increased because of chemical bleeding onto surface
CCA	while handling—skin contact with treated wood	minimal—surface residue only (chemical does not bleed)
INHALATION		
PENTA	1) inhaling fumes from treated wood 2) inhaling treated wood sawdust	inhaling fumes from wood—especially in confinement barns
CCA	inhaling treated wood sawdust	not likely—chemical not easily volatilized from wood

Penta is composed mainly of the active ingredient pentachlorophenol (PCP), but it also contains tetrachlorophenols, trichlorophenols, and various chlorodioxin and chlorofuran contaminants. Commercial preparations of penta are composed of approximately 85 percent PCP and less than 1 percent dioxins and furans, with the remainder being the other chlorinated phenols. The most toxic of the dioxins—2,3,7,8-TCDD—has not been found in penta.

The components of penta are fat soluble. They can be absorbed through the skin, and some components are easily volatilized from the surface of

General Guidelines for Working with Treated Wood

Precautions

- Use only in well ventilated areas.
- Wear gloves (rubber or vinyl) whenever handling treated wood. Leather does not protect.
- Avoid inhaling saw or sander dust from treated wood. Wear a dust mask and keep dust out of eyes (wear goggles).
- To avoid skin contact with treated wood or treated wood sawdust, wear coveralls or other protective clothing when working with treated wood. (Launder clothes used for working with treated wood separately from other laundry before reuse.)
- If skin contact occurs, wash or rinse area of contact thoroughly.
- Do not use penta-treated wood where people, pets or desirable plants are likely to come into contact with it.

Recommendations

- Ask for wood treated according to American Wood Preservers Association standards.
- Buy a size and length of treated wood requiring no cutting, if possible.
- If cutting is necessary, protect newly cut surfaces with wood preservative solution applied according to label directions.
- CCA-treated wood can be painted; most penta-treated wood cannot.
- In using CCA-treated lumber, the designation LP 2 is for above-ground use and LP 22 is for uses that may involve soil contact.
- The amount and concentration of preservative retained in treated wood varies with different products. When purchasing treated wood, ask the retail lumber dealer for assistance. If you specify the intended use, the dealer can help you choose the product offering the proper degree of protection for that structure.

treated wood. PCP and other chlorophenols may readily volatilize, whereas dioxins and furans volatilize very slowly. Bleeding further increases the potential for volatilization by bringing the chemicals to the wood surface.

Because of the bleeding, fat solubility and volatility of penta or its components, potential for human and animal exposure by ingestion, skin contact or inhalation is high. Livestock around penta-treated wood are of special concern because both chlorophenols and dioxins can accumulate in the edible tissues of animals or in milk and so present a residue problem in foods.

PCP itself is considered to be relatively non-toxic, but some of the dioxins and furans are highly toxic. Dioxins and furans accumulate in the body and after prolonged exposure may reach toxic levels in tissues. Toxic effects in cattle include decreased growth rate, decreased feed efficiency and progressive anemia.

Use of Treated Wood On the Farm

Food Animals

Though all treated wood may cause overt toxicity to farm animals, penta-treated wood is of most concern because penta residues accumulate in food animals and are most likely to appear in food products, and penta has the greatest toxic potential. Livestock may become contaminated with penta by inhalation, oral ingestion or dermal absorption.

Cattle—Cattle may accumulate penta residues as a result of:

—inhaling vapors, especially in confinement barns. Exposure from treated free-stall head boards may be high while a cow lies in close proximity.

—licking or chewing treated wood, especially bleeding wood.

—trace, low-level contamination from feed that comes into contact with treated wood, such as in wood bunker silos, and feed bunks or self-feeders constructed from treated wood. The largest exposure would occur from freshly treated lumber that was bleeding.

Poultry—Penta residues in poultry may result if treated wood shavings, sawdust or chips are used for poultry bedding. A metabolite of penta in the

Guidelines for Proper and Safe Use of Treated Wood Around Farm Animals

Precautions

- No treated lumber of any kind should be used in feed bunks, bunker silos or any other structure in direct contact with feed.
- Use treated wood only where conditions warrant its use. (Foundation timbers, pole supports, the bottom 8 inches of stall skirt-boards and other wood in contact with soil or in frequently moist conditions in barns, stables and similar structures are the only structures that should be constructed from treated wood.)
- Design facilities and use treated wood to minimize continuously high exposure to preservative chemicals, especially in confinement barns.

Recommendations

- Check feed bunks and facilities to determine whether treated wood is present and whether it is bleeding.
- Feed bunks made of treated wood should preferably be replaced, or covered with untreated lumber, plywood or tempered hardboard. (Washing or steam cleaning the treated lumber, before covering it, is an additional safeguard.)
- In bunker silos constructed of treated wood, silage within about 1 foot of the sides should be discarded. The treated lumber should be cleaned and covered with untreated wood or polyethylene sheets before refilling the silo.
- Treated wood used in free-stall dividers or uprights should be cleaned and covered, or replaced if bleeding is noticeable.

litter is absorbed by the chicken, leading to the development of a musty taint in meat and eggs.

Pigs—Death of piglets and burns on the sow's udder have been reported as a result of exposure to penta when sows are farrowed on freshly treated lumber or on wood that was bleeding. Any or all three routes of exposure may have resulted in these effects on pigs. Newborn piglets are particularly sensitive to penta.

Table 3. Recommended Use of Treated Wood Around Farm Animals.

Structure	Recommended Use*		Reason	Exceptions or Special Considerations
Feed bunks or feeders	PENTA CCA	NO NO	Ingestion of preservative on feed	None
Bunker silo or other feed storage or holding structure	PENTA CCA	NO NO	Ingestion of preservative absorbed on feed	None
Splash boards (skirt-boards, heading or baseboards)	PENTA CCA	YES YES	High moisture conditions and low animal contact with treated wood	Do not use above bottom 8 inches (18 inches to 24 inches if inside bumper board is used)
Free-stall dividers	PENTA	NO	Animal(s) exposed to the chemical by rubbing, licking, chewing or inhalation Not likely to be absorbed through skin	None
	CCA	YES		Use only where needed
Pen dividers or confinement structures (farrowing crates, hutches)	PENTA	NO	Animal(s) exposed to the chemical by rubbing, licking, chewing or inhalation Not likely to be absorbed through skin	None
	CCA	YES		Use only where needed
Poles (below-ground installations inside buildings)	PENTA	YES	High moisture conditions and direct soil contact	If bleeding is noticed, cover with untreated wood or install barricades to minimize direct animal contact
	CCA	YES		
Fence posts, gates (outside structures)	PENTA	YES	High moisture conditions and direct soil contact	If animals are observed to rub against, chew or lick the wood, take steps to prevent, as with bleeding wood
	CCA	YES		
Other building components (rafters, studs, etc.)	PENTA	NO	High moisture conditions seldom present**	Only if wood is exposed to excessive moisture
	CCA	NO		

*For all treated wood, wash surface with water before allowing animal contact, especially if residue is visible on the wood surface.

**Moisture problems in enclosed livestock buildings can be avoided by proper ventilation. Do not use treated wood to compensate for poor ventilation.

Horses—Toxicity in horses with a tendency toward chewing wood, or cribbing, can result if stalls or other nearby structures contain treated wood.

Small/Fur Animals

If enclosed housing for small animals is constructed from treated wood, significant exposure to the preservative chemicals may occur through inhalation of vapors and possible licking and chewing of the wood. Either route of exposure may lead to toxic effects.

Disposal of Treated Wood

Treated wood scraps should not be burned. Wood treated with any of the types of commonly used wood preservatives, when burned, produces highly toxic compounds. The farmer should not dispose of treated wood on the farm but should take it to a licensed sanitary landfill. This will minimize possible leaching of the wood preservative into water sources. The homeowner may wrap treated wood scraps in paper and include with other household garbage.

Table 4. Use of Treated Wood Around the Home.

The following is a guide to the proper places to use penta- and arsenate-treated wood around the home:

PENTA	CCA
Retaining walls	Retaining walls
Fence posts	Fence posts and boards
Light standards	Light standards
Supports for decks	Decks and porches
Patio blocks	Picnic tables and benches
Steps in embankments	Playground equipment
Landscape timbers	Grape or tomato supports
Trim and siding (in water-repellent solution)	Sills, floor plates, headers, frames
Lawn edging	Patio separators
	Planting boxes

Use of Wood Preservative Formulations

Creosote and penta wood preservative solutions may be used to treat wood after it has been installed. However, the Environmental Protection Agency recently put these solutions on the restricted list, so they may be used only by certified applicators. In addition, indoor treated wood must be covered with two coats of an appropriate sealer; i.e., urethane, epoxy or shellac. Arsenical wood preservative formulations are not available for home or farm use. A water-repellent solution of penta in mineral spirits is the most commonly available type.

Inhalation is the major route of exposure during application or soon after application of the treatment solution. Inhalation exposure resulting from

the application of over-the-counter wood preservative solutions may take two forms: human inhalation during the application phase, and human and animal inhalation of vapors or particulates from the surface of the treated wood following application. Most applications of these formulations will take place outdoors during treatment of fence posts and other exterior wood structures. These treatment operations are likely to be in well ventilated areas with minimal inhalation of the chemical. Indoor applications, however, may result in excessive exposure to humans in enclosed structures, and particularly to animals inside confinement structures. After application of the treatment solution and installation of the wood structure, dermal and oral exposure to the chemical to both humans and animals may also occur, just as from commercially treated wood.



MSU is an affirmative-action, equal-opportunity institution. Cooperative Extension Service programs are open to all without regard to race, color, national origin, sex, or handicap.

Issued in furtherance of Cooperative Extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. J. Ray Gillespie, Interim Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.

2P-2.5M-8:89-TCM-KE, Price 30 cents.

FILE: 24.7
(Pesticides-General)