

Workplace Health and Safety

Bulletin



Health Effects From Exposure to Wood Dust

Workers can be exposed to wood dust at all stages of wood processing. For many years, wood dust was considered to be a nuisance dust that irritated the nose, eyes, or throat, but did not cause permanent health problems. Numerous recent studies, however, have shown that exposure to wood dust can cause health problems.

Wood is classified as either softwood or hardwood. Softwoods come from coniferous trees such as spruce, pine, and fir. More than 90 percent of the woods used in Alberta's forestry industry are softwoods.

Hardwoods come from deciduous trees such as oak, alder, and maple. Alberta hardwoods are mainly poplar and aspen and are used in the pulp and paper industries and the manufacture of strandboard.

Secondary industries such as construction and furniture make use of a wider variety of woods. Many of these woods are imported from British Columbia and elsewhere. Of these, western red cedar is the wood of most concern. Its exposure-related health effects are well documented. Table 1 summarizes the types of woods used and wood products made in Alberta.



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Government of Alberta ■
Employment and Immigration

Table 1 Woods used in Alberta

Product/Industry	Woods Used	Woods From
Construction, housing	Spruce Lodgepole, Jack pine Western red cedar Balsam, Alpine fir	Alberta, B.C.
Laminated beams and engineered wood products	Douglas fir Spruce	Alberta, B.C.
Furniture, cabinetry	Red oak Maple Teak Walnut Birch White pine Hemlock Aspen	USA, eastern Canada USA, eastern Canada Asia, Africa USA Alberta B.C., eastern Canada B.C. Alberta
Plywood	Spruce Pine Poplar	Alberta Alberta Alberta
Laminated products, hybrid products (used in furniture making)	Spruce Pine Rosewood Teak Walnut Oak Birch	Alberta Alberta South America, Asia Asia, Africa USA USA, eastern Canada Alberta, B.C.
Oriented strandboard	Aspen	Alberta
Pulp and paper, kraft mills	Spruce Pine Aspen	Alberta Alberta Alberta
Pulp and paper, mechanical mills	Spruce Pine Aspen	Alberta Alberta Alberta
Windows and doors	Oak Birch Spruce Pine	USA, eastern Canada Alberta, B.C. Alberta Alberta
Toys	Aspen Birch	Alberta Alberta
Firewood Carvings, baskets, native crafts	Birch Willow Birch (bark) Variety of other softwoods	Alberta Alberta Alberta Alberta and imported

Data provided by Alberta Economic Development

The health effects from exposure to wood dust are due to chemicals in the wood or chemical substances in the wood created by bacteria, fungi, or moulds. Coughing or sneezing are caused by the dust itself. Dermatitis and asthma may be due to sensitivities to chemicals found in the wood. Plicatic acid, for example, found naturally in western red cedar, is responsible for asthma reactions and allergic effects associated with the wood. Workers exposed to wood dust need to understand the potential health effects of such exposure and take precautions to reduce their exposure.

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Toxic effects

Toxic woods contain chemicals that may be absorbed into the body through the skin, lungs, or digestive system and cause effects in other parts of the body. Health effects can include headaches, giddiness, weight loss, breathlessness, cramps, and irregular heart beat. Toxic woods are typically hardwoods such as yew, teak, oleander, laburnum, and mansonia. None of the native woods harvested in Alberta are known to be toxic or poisonous. Table 2 summarizes the health effects reported for exposures to various types of wood.

Irritation of the eyes, nose and throat

Many hardwoods and softwoods contain chemicals that can irritate the eyes, nose and throat, causing shortness of breath, dryness and soreness of the throat, sneezing, tearing and conjunctivitis (inflammation of the mucous membranes of the eye). Wood dust usually collects in the nose, causing sneezing and a runny nose (rhinitis). Other observed effects include nosebleeds, an impaired sense of smell, and complete nasal blockage.

Dermatitis

Chemicals in many types of wood can cause dermatitis, a condition in which the skin can become red, itchy, or dry, and blisters may develop. Wood dust in direct contact with the skin can also cause dermatitis. With repeated exposures, a worker can become sensitized to the dust and develop allergic dermatitis. Once a worker becomes sensitized, exposure to small amounts of dust can cause a reaction that becomes more severe with repeated exposures.

Allergic dermatitis is most often caused by exposure to tropical hardwoods such as obeche, mahogany, and rosewoods. Cases of allergic dermatitis resulting from exposure to Douglas fir and western red cedar have been reported. Irritant dermatitis has also been reported with exposure to western hemlock, sitka spruce, pine, and paper birch.

Respiratory system effects

Respiratory system effects due to wood dust exposure include decreased lung capacity and allergic reactions in the lungs. Two types of allergic reaction can take place in the lungs: hypersensitivity pneumonitis (inflammation of the walls of the air sacs and small airways) and occupational asthma.

Decreased lung capacity is caused by mechanical or chemical irritation of lung tissue by the dust. This irritation causes the airways to narrow, reducing the volume of air taken into the lungs and producing breathlessness. It usually takes a long time to see a reduction in lung capacity.

Studies showed that sawmill workers exposed to softwood dusts arising from Douglas fir, western hemlock, spruce, balsam, and alpine fir had reduced lung function. In a 1995 study which looked at a group of sawmill workers in Alberta who were processing pine and spruce for a least three years, workers who smoked and were exposed to wood dust were more greatly affected than workers who did not smoke. This condition can worsen during the work week and improve during a worker's days off. Over the long term, some workers may develop a permanent decrease in lung function (chronic obstructive lung disease).

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Hypersensitivity pneumonitis appears to be triggered when small particles penetrate deeply into the lungs where they trigger an allergic response. Particles that are known or suspected to cause this condition include moulds, bacteria, and the fine dust from some tropical hardwoods. The initial effects can develop within hours or after several days following exposure and are often confused with flu or cold symptoms (headache, chills, sweating, nausea, breathlessness, and other fever symptoms). Tightness of the chest and breathlessness often occur and can be severe. With exposure over a long period of time, this condition can worsen, causing permanent damage to the lungs. The walls of the air sacs thicken and stiffen, making breathing difficult.

Some diseases that have been classified as hypersensitivity pneumonitis include maple bark strippers' disease, sequoiosis (from breathing redwood dust containing mould particles), wood trimmers' disease, and wood-pulp workers' disease. These diseases are caused by moulds growing on the wood rather than the wood dust itself. The mould spores become airborne when wood chips are moved, lumber is trimmed, and bark is stripped.

Asthma involves a narrowing of the airways which results in breathlessness. Coughing and a runny nose can also develop. One of the most studied woods with respect to wood-dust related asthma is western red cedar. It has been estimated that at least five percent of forest industry workers in British Columbia exposed to cedar dust are allergic to it. The first symptoms of asthma due to exposure to western red cedar usually begin late at night and resemble a cold (eye and nose irritation, stuffiness, runny nose, dry cough, and tightness in the chest). Eye and nose irritation can slowly improve, leaving wheezing and coughing as the only symptoms. With prolonged exposure, wheezing and coughing happen during the day as well. In some cases, the asthma attacks can start after only a few weeks of contact with cedar dust.

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Table 2 Health Effects Reported with Various Types of Woods

Wood Type	Found	Use	Health Effects
Alder (common, black, red)	Europe, North America (red) Western Asia	Toys, general turnery, broom and brush backs	Dermatitis associated with black alder, no reports with red alder, decrease in lung function (red alder)
Aspen	North America	Furniture, strandboard, pulp and paper	No health effects reported
Beech	Europe	Furniture, bobbins, brush backs, handles, domestic woodware, flooring, plywood manufacture, instruments	Dermatitis (wood cutters' disease) due to lichens growing on the bark of beech trees, rhinitis, asthma, nasal cancer
Birch (paper, white)	US and Canada (paper birch) Europe (white birch)	Furniture, decorative objects, pulp and paper	Irritant dermatitis
Cedar, Western Red	West Coast of North America	Building construction material, boats, planking, framing	Asthma, allergic contact dermatitis, sensitizer, decrease in lung function, eye irritation and conjunctivitis, rhinitis
Douglas Fir	West coast of North America, Europe	Interior and exterior construction, flooring, boats, veneer, furniture	Contact eczema, decrease in lung capacity
Fir (grand, balsam, silver, alpine)	US and Canada Europe (silver fir)	Interior construction, joiner, plywood	Skin irritation, dermatitis, rhinitis, asthma, possible decrease in lung function
Hemlock	North America	Furniture, cabinetry	Skin irritation, decreased lung function
Larch	Europe, North America	Construction, frame work, boats, flooring	Allergic dermatitis from European larch, no reports with western larch
Mahogany	Africa	Furniture, cabinetry, boats, mouldings, etc.- all purpose wood, used where good quality wood is required	Dermatitis, sensitizer
Maple	Europe, North America	Furniture, interior construction, cabinets	Rhinitis, asthma, Maple Bark Strippers' Disease (mould spores in bark)
Oak	Europe, North America	Furniture, decorative veneer	Nasal cancer
Pine (white, lodgepole, jack)	Europe, North America	Interior and exterior construction, pulp and paper	Skin irritation, contact dermatitis, Wood-Pulp Workers' Disease (mould in bark), rhinitis, and asthma
Poplar	Europe, North America	Plywood, matches, toys, pulp and paper	Contact dermatitis (with sawdust contact), rhinitis
Rosewood	South America, Asia	Decorative veneer, furniture, cabinets instruments	Eczema, allergic contact dermatitis
Spruce	Europe, North America	Interior and exterior construction, furniture, pulp and paper	Skin irritation, Wood-Pulp Workers' Disease (mould spores in bark), decrease in lung function
Teak	Asia, Africa, West Indies	Ship building, interior fittings and mouldings, furniture, flooring	Toxic, dermatitis, sensitizer
Walnut (black)	Europe, US	Veneer, cabinet making, furniture, decorative paneling, gun stocks	Skin irritation, rhinitis, possible asthma
Yew	Europe, Asia, North Africa	Carving, veneer, cabinet making	Irritation of skin, dermatitis, toxic

Most workers who develop cedar asthma do not have a history of allergies. Workers who develop cedar asthma may not recover completely when they are no longer exposed to cedar dust. In fact, asthma attacks can be triggered by other substances. Ash, oak, mahogany, and European species of spruce and pine have also been reported to cause asthma in some workers.

Workers who are allergic to aspirin should be aware that willow and birch contain large concentrations of salicylic acid, the predecessor of aspirin. Sensitive individuals may react with only casual exposure to the woods.

Cancer

The International Agency for Research on Cancer (IARC) has classified wood dusts as carcinogenic to humans. A study completed in 1965 observed that a large number of furniture workers and other workers exposed to wood dust in England developed a rare form of nasal cancer (adenocarcinoma). Since that time, many additional studies have shown that workers employed in logging, sawmills, furniture and cabinet making, and carpentry are at an increased risk of developing nasal cancer.

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The highest risks appear to be to those workers exposed to hardwood dusts, most commonly beech and oak. Many of the studies looked at workers exposed in the 1940s and 1950s (the cancer can take more than 20 years to develop), and most of the exposure levels were much higher than those seen in today's industry. Most of the studies looked at workers who were exposed to unspecified types or mixtures of wood dust.

Controlling exposure

The most important factor affecting exposure to wood dust is the type of work being performed. Finer dusts produced by processes such as shaping, sanding, and routing are associated with higher exposure levels. The type and quantity of wood dust generated is also related to the density of the wood. Hardwoods are generally more dense than softwoods, and under similar conditions will usually produce more

dust. The freshness of the wood can also influence the amount of dust produced during processing, with dryer woods tending to produce more dust. Workers in logging operations, pulp mills and sawmills tend to use fresher woods; those employed in the furniture, cabinet, pattern, and model making industries tend to use drier woods.

Exposure to wood dust can be controlled through the use of appropriately designed ventilation systems or respiratory protection. The National Institute for Occupational Safety and Health (NIOSH) in the U.S. has developed guidelines for local ventilation systems for several types of wood working equipment (horizontal belt sanders, shapers, automated routers, large diameter disc sanders, orbital hand sanders, and table saws). This information is available from the NIOSH Web site at: www.cdc.gov/niosh

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The NIOSH guidelines use local ventilation hoods to capture wood dust which is then collected in a filtration system. Good general ventilation can also reduce exposure to wood dust. Wood dust collecting within the building, on the floor, or on equipment, means that the ventilation system is inadequate or is not working properly.

Local ventilation may not be practical for some operations and in some cases the concentration of wood dust in the air cannot be adequately controlled by ventilation alone. In such cases respiratory protection may be needed if the Occupational Exposure Limit for wood dust is or may be exceeded.

For more information:

- http://employment.alberta.ca/documents/WHS/WHS-PUB_ppe01.pdf
Respiratory Protective Equipment – Employers Guide
- http://employment.alberta.ca/documents/WHS/WHS-PUB_ppe04.pdf
Guidelines for the Development of a Code of Practice for Respiratory Protective Equipment

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