*Project S.E.N.S.O.R. News

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# *Occupational Asthma and Wood Dust*

Wood dust is a common exposure in the workplace. Many products we use are made from wood and many workers are exposed to wood dust during their manufacture; occupations with exposure to wood dust include carpenters, furniture makers, cabinet makers, instrument makers, and saw mill workers. This newsletter focuses on asthma among these workers. Other respiratory conditions that can occur with exposure to wood dust include hypersensitivity pneumonitis, chronic bronchitis/COPD, and mucosal irritation. In addition, wood dust exposure has been linked to nasopharyngeal cancer and cancer of the nasal and paranasal sinuses and has therefore been classified as a human carcinogen (Group 1) by the International Agency for Research on Cancer (IARC) (http://monographs.iarc.fr/ENG/Monographs/vol100C/mono100C-15.pdf).

The major components of wood are cellulose (40-50%), lignin (25-35%) and hemicellulose (polyose) (15-30%). Other components include non-polar organic extractives (fatty acids, resins, waxes, alcohols, terpenes, sterols, steryl acids, and glycerides), polar organic extractives (tannins, flavinoids, and quinones) and water soluble extractives (carbohydrates, alkaloids, proteins and inorganic material). In tropical woods, extractives represent 15% or more of the wood mass, while in temperate climate trees they are less than 1% of the wood mass. This increased percentage of extractives in tropical woods, which is probably an adaptive response to increased fungi and insects in the tropics, explains why more species of tropical than temperate woods have been shown to cause occupational asthma (see Tables 1 and 3). Additional causes of work-related asthma include products of trees – latex from rubber trees, colophony, tall oil and turpentine from pines, terpenes from Western Red Cedar, and gums that have been used in printing, dentistry and hairdressing salons (acacia, guar, gutta-percha, and karaya).

There are 247 families of trees and hundreds of thousands of species. Tables 1 (temperate trees) and 3 (tropical trees) show the specific species of trees where there have been positive specific antigen challenge tests for wood dust/extracts from these species. Table 2 shows the tree products and their sources where there have been positive specific antigen challenge tests.

In addition to these individual case reports, there have been multiple epidemiologic studies that have shown increased respiratory adverse health effects in furniture manufacturers and sawmill workers (1, 2). The increased risk of asthma was ~ 1.5 in both meta analyses (1,2). In a Danish study of furniture workers, only seven of 131 (5.3%) workers with asthma had IgE to pine, the predominant wood being used, indicating that sensitization to wood dust is only one mechanism for asthma noted in the wood working industries (3).

## References

1. Wiggans RE, Evans G, et al. Asthma in furniture and wood processing workers: a systematic review. Occupational Medicine 2016; 66:193-201.
2. Pérez-Rios M, Ruano-Ravina A, et al. A meta-analysis on wood dust exposure and risk of asthma. Allergy 2010; 65:467-473.
3. Skovsted TA, Schlünssen V, et al. Only few workers exposed to wood dust are detected with specific IgE against pine wood. Allergy 2003; 58:772-779.

There have been 34 individuals with work-related asthma from exposure to wood dust reported in Michigan since 1989, 29 were new onset and five aggravation of pre-existing asthma. We are interested in receiving reports of additional individuals with asthma when wood dust is the possible cause or a significant cause of aggravation. Dr. Rosenman can be contacted at 1-800-446-7805. He is available to discuss diagnostic or management issues of patients with work-related asthma.

### Case Reports

#1 A man in his 30's worked for about one year at a company making wooden doors before he developed wheezing and shortness of breath. His symptoms were related to his work, sanding the doors and improved on weekends and on vacations. He used an air hose to clean up the saw dust. The wood was maple and oak. He was begun on Albuterol and Symbicort. He was fired five months after his symptoms began. His respiratory symptoms improved but continued to require asthma medicine. He had never smoked cigarettes and had no family or personal history of allergies. Spirometry six months after he left work was normal and a methacholine challenge test was positive at the second concentration.

An inspection of his workplace by Michigan OSHA found violations for not having a written hazard communication standard and not assessing formaldehyde levels in the Veneer area.

#2 A man in his 20's worked for about one year sanding and using a router at a wood furniture manufacturer before developing wheezing, cough, chest tightness and shortness of breath. His symptoms were related to work and improved on weekends and vacations. The wood was many different types from all over the world. He was begun on Albuterol. He had two emergency department visits and one hospitalization for his asthma in the three years after his respiratory symptoms began. He was fired for missing too many days of work. His symptoms improved after he left, although he still used Albuterol about three times per week. He smoked half a pack of cigarettes for seven years before his symptoms began. He had a history of hay fever and allergies to pollen.

An inspection of his workplace by Michigan OSHA found no violations, but did recommend down-draft ventilation for the sanding table to reduce exposures.

#3 A man in his 40's, who planed and sanded instruments made from ebony, developed wheezing, cough, chest tightness and shortness of breath. His respiratory symptoms began two months after beginning work and improved on weekends and vacations. He was begun on Albuterol and had three courses of Prednisone. Two months later he left work on the advice of his doctor. His symptoms improved but he continued to use Albuterol. He had smoked a half to one pack of cigarettes per day for 25 years. He had no personal history of allergies, although there was a family history of asthma. His FEV1 was 87% of predicted with a FEV1/FVC ratio of 66%. Serial spirometry showed a reduction in his FEV1 in relationship to work.

An inspection of his workplace by Michigan OSHA showed inadequate guarding of the wood buffing wheels and the disc sander, improper labeling of containers, lack of education of hazards, inadequate recording of injuries and illnesses, inadequate evaluation of hazards and the need for protective equipment, including respirators.

There is no specific allowable air level for wood dust. Wood dust is regulated as a nuisance dust and none of the companies were cited for overexposures.

**Table 1. Temperate Trees Causing Occupational Asthma**

| Common Name | Species | Family | Where Tree Grows | Ref |
|---|---|---|---|---|
| Ash (American Ash, White Ash) | *Fraxinus americana* | *Oleaceae* | Eastern part of North America | 1 |
| California Redwood | *Sequoia sempervirens* | *Cupressaceae* | Coastal California | 2 |
| Eastern White Cedar | *Thuja occidentalis* | *Cupressaceae* | North Eastern North America | 3 |
| Oak | *Quercus* | *Fagaceae* | Asia, Europe, North America | 4 |
| Western Red Cedar | *Thuja plicata* | *Cupressaceae* | Pacific North West | 5 |

References for Table 1


1. Fernández-Rivas M, Pérez-Carral C, Senent CJ. Occupational asthma and rhinitis caused by ash (*Fraxinus excelsior*) wood dust. Allergy 1997; 52:196-169.
2. Chan-Yeung M, Abboud R. Occupational asthma due to California red wood (*Sequoia sempervirens*) dusts. Am Rev Respir Dis 1976;114: 1027-1031.
3. Malo JL, Cartier A, et al. Prevalence of occupational asthma among workers exposed to eastern white cedar. Am J Respir Crit Care Med 1994; 150:1697-1701.
4. Malo JL, Cartier A, et al. Occupational asthma caused by oak wood dust. Chest 1995; 108: 856-858
5. Chan-Yeung M, Barton GM, et al. Occupational asthma and rhinitis due to Western red cedar (*Thuja plicata*). Am Rev Respir Dis 1973;108:1094-1102.


**Table 2. Tree Products Causing Occupational Asthma**

| Common Name | Species | Family | Where Tree Grows | Use of Product | Ref |
|---|---|---|---|---|---|
| Acacia | *Acacia senegal, Vachellia (Acacia) seyal* | *Fabaceae* | Africa, India, Pakistam | Ingredient in multiple products including emulsifier and a thickening agent in icing, fillings, chewing gum | 1 |
| Carene | Obtained from turpentine | | | | 2 |
| Colophony | Mainly Pines and also spruces | | | Ingredient in multiple products including flux, glue, ink & soap | 3 |
| Gutta-percha | *Palaquium gutta, Isonandra gutta, Dichopsis gutta* | *Sapotaceae* | Indonesia, Malaysia | Dentistry | 4 |
| Karaya (Marathi) | *Sterculia urens* | *Malvaceae* | India, Burma | thickener in medications, cosmetics, and denture adhesives | 5 |
| Latex | *Hevea brasiliensis* | *Euphorbiaceae* | Brazil, Southeast Asia | Natural rubber products | 6 |
| Tall oil | All conifers | | | Component of adhesives, rubbers, inks, emulsifier | 7 |
| Turpentine | *Pinus pinaster, Pinus halepensis, Pinus massoniana, Pinus merkusii, Pinus palustris, Pinus taeda, Pinus ponderosa* | Pinaceae | China, Middle East, North America | Solvent, chemical raw material | 8 |

**References for Table 2**


1. Fowler PB. Printers' asthma. Lancet 1952; 2:755-757.
2. Seaton A, Cherrie B, Turnbull J. Rubber glove asthma. British Medical Journal 1988; 296:531-532.
3. Burge PS. Colophony hypersensitivity revisited. Clin Exp Allergy 2000; 30: 158-159.
4. Boxer MB, Grammer LC, Orfan N. Gutta-percha allergy in a health care worker with latex allergy. J Allergy Clin Immunol 1994; 93:943-944.
5. Wagner W. Karaya gum hypersensitivity in an enterostomal therapist. JAMA 1980; 243: 432
6. Tarlo SM, Wong L, Roos J, Booth N. Occupational asthma caused by latex in a surgical glove manufacturing plant. J Allergy Clin Immunol 1990; 85:626-631.
7. Tarlo SM. Occupational asthma induced by tall oil in the rubber tyre industry. Clinical and Experimental Allergy 1992; 22: 99-101.
8. Dudek W, Wittczak T, Swierczynska-Machura D, Walusiak-Skorupa W, and Palczynski C. Occupational asthma due to turpentine in art painter – case report. International Journal of Occupational Medicine and Environmental Health 2009; 22: 293-295.

| Table 3. Tropical Woods Causing Occupational Asthma | | | | |
|---|---|---|---|---|
| **Common Name** | **Species** | **Family** | **Where Tree Grows** | **Ref** |
| Abiruana | *Pouteria glomerata* | *Sapotaceae* | South America | 1 |
| African Cherry (Makore) | *Prunus africana* | *Rosaceae* | Central & South Africa | 2 |
| African Maple (Abachi, Obeche, Wawa, Ayous, Samba) | *Triplochiton schleroxylon* | *Malvaceae* | West-Central Africa | 3 |
| African Zebrawood (Allen Ele, Tigerwood, Zebrano, Zingana) | *Microberlinia brazzavillensis* | *Fabaceae* | Central Africa | 4 |
| Angelim pedra | Hymenolobium petraeum | Fabaceae | Amazon Basin | 5,6 |
| Aningré (Mukali, Tanganyika) | *Pouteria altissima, Pouteria Vierra (Aningeria robusta)* | *Sapotaceae* | East & West Central Africa | 7.8 |
| Antiaris | *Antiaris Africana (Antiaris toxicaria)* | *Moraceae* | Senegal, Nigeria, Sudan, and Uganda, Australia, Indonesia, Philippines | 9 |
| Australian Blackwood (Blackwood Acacia, Sally Wattle) | *Acacia melanoxylon* | *Fabaceae* | Tasmania, Australia | 10 |
| Cabreuva | *Myrocarpus fastigiatus* | *Fabaceae* | Central & South America | 11 |
| Cedroarana | *Cedrelinga catenacformis ducke* | *Fabaceae* | Peru | 12 |
| Central American Walnut | *Juglans olanchana* | *Juglandaceae* | Central America | 13 |
| Chengal | Neobalanocarpus heimii | *Dipterocarpaceae* | Malaysia | 14 |
| Cocabolla | *Dalbergia retusa* | *Fabaceae* | Central America | 15 |
| Ebony (Gabon ebony, African ebony, W African ebony, Benin ebony) | *Diospyros crassiflora* | *Ebenaceae* | West Africa | 16 |
| Imbuia (Brazilian Walnut) | *Ocotea porosa* | *Lauraceae* | Brazil | 17 |
| Ipe (Bethabara) | *Tabebuia* | *Bignoniaceae* | Central & South America | 18 |
| Iroko (Mvule, African Teak) | *Milicia excelsa* | *Moraceae* | Tropical Africa | 19 |
| Kejaat (African teak, wild teak) | *Pterocarpu angolensis* | *Fabaceae* | Southern Africa | 20 |
| Kotibe | *Nesorgordonia papverifera* | *Sterculiaceae* | West Africa | 21 |
| Mahogany | *Swietenia macrophylla* | *Meliaceae* | Central and South America | 22 |
| Palisander (Brazilian rosewood, caviuna, pianowood,obuina ) | *Dalbergia nigra* | *Fabaceae* | Brazil | 23 |
| Pau Marfim (Guatambu) | *Balfourodendron riedelianum* | *Rutaceae* | Brazil, Paraguay, Argentina, Uruguay | 24 |
| Ramin (Melawis, Telon) | *Gonystylus bancanus* | *Thymelaeaceae* | South East Asia | 25 |
| Soapbark | *Quillaja saponaria* | *Quillajaceae* | Chile | 26 |

**References for Table 3**


1. Booth BH, LeFoldt RH and Moffitt EM. Wood dust hypersensitivity. J Allergy Clin Immunol 1976; 57:352-357.
2. Obata H, Dittrick M, et al. Occupational asthma due to exposure to African cherry (Makore) wood dust. Intern Med 2000;39: 947-949.
3. Ferrer A, Marañón F, et al. Asthma from inhalation of Triplochiton scleroxylon (Samba) wood dust. J Investig Allergol Clin Immunol 2001; 11:199-203.
4. Bush RK, Yunginger JW, Reed CE. Asthma due to African zebrawood (Microberlinia) dust. Am Rev Respir Dis. 1978;117: 601-603.
5. Alday E, Gómez M, Ojeda P, Caballero ML, Moneo I. IgE-mediated asthma associated with a unique allergen from Angelim pedra (Hymenolobium petraeum) wood. J Allergy Clin Immunol 2005;115: 634-636.
6. Alday E, Gómez M, et al. IgE-mediated asthma associated with a unique allergen from Angelim pedra (Hymenolobium petraeum) wood. J Allergy Clin Immunol 2005;115: 634-636.
7. Paggiaro PL, Cantalupi R, et al. Bronchial asthma due to inhaled wood dust: Tanganyika aningré. Clinical Allergy 1981; 111:605-610.
8. Garcés Sotillos MM, Blanco Carmona JG, et al. Occupational asthma and contact urticaria caused by mukali wood dust (Aningeria robusta). J Investig Allergol Clin Immunol 1995; 5:113-114.
9. Higuero NC, Zabala BB, et al. Occupational asthma caused by IgE-mediated reactivity to Antiaris wood dust. J Allergy Clin Immunol 2001; 107:554-556.
10. Wood-Baker R, Markos J. Occupational asthma due to blackwood (Acacia Melanoxylon). Aust N Z J Med. 1997 Aug;27(4):452-453.
11. Innocenti A, Romeo R, et al. Asthma and systemic toxic reaction due to cabreuva (Myrocarpus fastigiatus Fr. All.) wood dust. Med Lav1991; 82: 446-450.
12. Eire MA, Pineda F, et al. Occupational rhinitis and asthma due to cedroarana (Cedrelinga catenaeformis Ducke) wood dust allergy. J Investig Allergol Clin Immunol 2006;16: 385-387.
13. Bush RK, Clayton D. Asthma due to Central American walnut (Juglans olanchana) dust. Clinical Allergy 1983; 13: 389-394.
14. Lee LT, Tan KL. Occupational asthma due to exposure to chengal wood dust. Occup Med (Lond) 2009; 59:357-359.
15. Eaton KK. Respiratory allergy to exotic wood dust. Clin Allergy. 1973;3: 307-310.
16. Maestrelli P, Marcer G, Dal Vecchio L. Occupational asthma due to ebony wood (Diospyros crassiflora) dust. Ann Allergy 1987; 59: 347-349.
17. Jeebhay MF, Prescott R, Potter PC, Ehrlich RI. Occupational asthma caused by imbuia wood dust. J Allergy Clin Immunol 1996; 97: 1025-1027.
18. Algranti E1, Mendonça EM, et al. Occupational asthma caused by Ipe (Tabebuia spp) dust. J Investig Allergol Clin Immunol. 2005; 15: 81-83.
19. Ricciardi L, Fedele R, et al. Occupational asthma due to exposure to iroko wood dust. Ann Allergy Asthma Immunol. 2003; 91 :393-397.
20. Ordman D. Wood dust as an inhalant allergen; bronchial asthma caused by kejaat wood, *Pterocarpus angolensis*. S Afr Med J 1949;23:973-975.
21. Gozalo Reques F1, Pelta Fernandez R. [Occupational asthma due to exotic wood: Nesorgordonia papaverifera (danta or kotibe)]. Rev Mal Respir 1988; 5:71-73. [Article in French]
22. Sosman AJ, Schlueter DP, Fink JN, Barboriak JJ. Hypersensitivity to wood dust. N Engl J Med. 1969; 281: 977-980.
23. Godnić-Cvar J, Gomzi M. Case report of occupational asthma due to palisander wood dust and bronchoprovocation challenge by inhalation of pure wood dust from a capsule. Am J Ind Med 1990; 18: 541-545.
24. Basomba A, Burches E, Almodovar A, de Rojas DH. Occupational rhinitis and asthma caused by inhalation of Balfourodendron riedelianum (Pau Marfim) wood dust. Allergy 1991; 46: 316-318.
25. Hinojosa M, Losada E, et al. Occupational asthma caused by African maple (Obeche) and Ramin: evidence of cross reactivity between these two woods. Clin Allergy 1986; 16: 145-153.
26. Raghuprasad PK, Brooks SM, Litwin A, Edwards JJ, Bernstein IL, Gallagher J. Quillaja bark (soapbark)-induced asthma. J Allergy Clin Immunol 1980; 65:285-287.

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