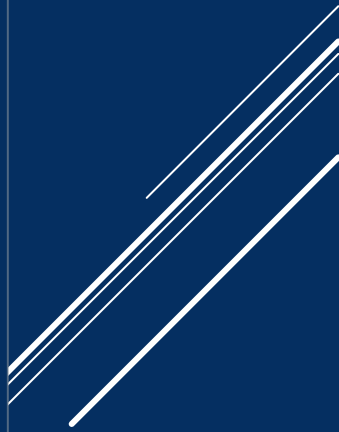


Understanding the Toxicity of Wood Dusts

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- ▶ **Recognition**
- ▶ **Evaluation**
- ▶ **Control**

- ▶ **No Harmful Substances, only Harmful Concentrations**
- ▶ **Published Standards: 40h/week, 40 years, healthy**
- ▶ **Human body has defence and repair capability**

Principles

Harm/discomfort from Wood Dust

- ▶ **Allergic Reactions and Irritation – common**
- ▶ **Some rare Cancers –especially in the pharynx**
- ▶ **Systemic Poisoning – uncommon in woodworking:
mostly from raw wood and burning**
- ▶ **Fibrosis in lungs – a few cases**

Acute and Chronic Reactions

Acute

- Shows up in the short-term - immediate to several months
- Sensitizers accelerate the process
- Easy to detect – eg asthma, hay-fever

Chronic

- Result from long-term exposure – months to years
- Difficult to detect – few show up as a result of known dust exposure

Dust production

▶ Comminutive* processes

‘*Making small rocks from big rocks’ (Minerals)

Mostly hard rock

Can be very fine, eg in gold mining

▶ Cutting, Sawing, Sanding

- Mostly relatively coarse.

- Lots of ‘nuisance’ dust

Focus on Airborne Dust

- ▶ **'Coarse' Dust - $>30\mu\text{m}$**
 - ▶ Visible, depending on properties, 'motes' floating in the air
 - ▶ Significant settling rate in air, depending on shape and density.
- ▶ **'Fine' - dust – $10\text{-}30\ \mu\text{m}$. Invisible.**
- ▶ **Aerosol's/ 'Respirable' dust $<10\mu\text{m}$. Brownian motion**

Dust penetration Approx values

Human hair ~75 μ m

Mucociliary
escalator

Alveoli – 300*10⁶,
70m² /lung

Light wavelengths
0.3 – 0.7 μ m

Upper respiratory tract

Nasal cavity

Pharynx

Larynx

Lower respiratory tract

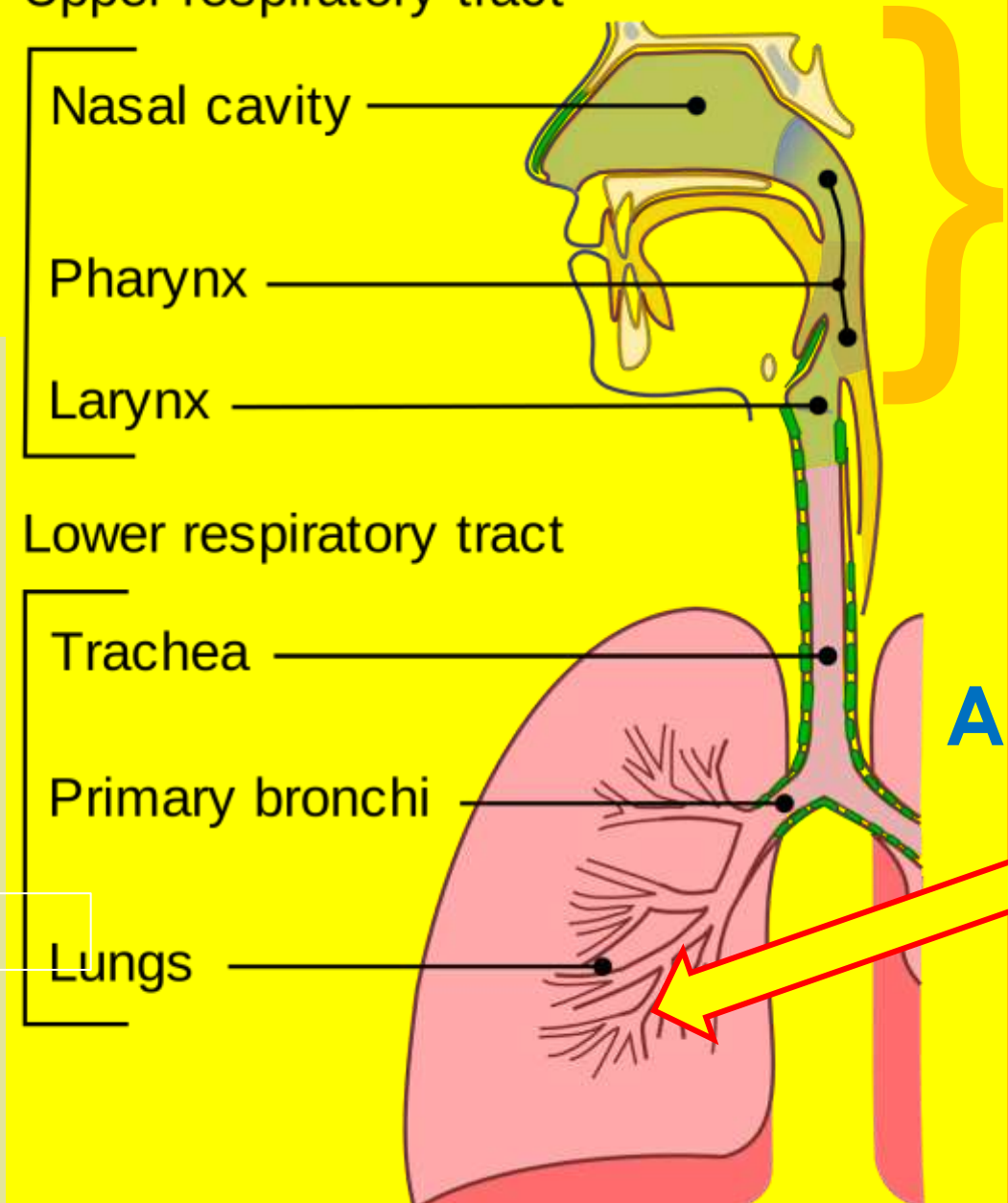
Trachea

Primary bronchi

Lungs

Coarse particles*
>5 μ m
* Invisible <30 μ m

Aerosol 0.1 - 5 μ m
Stay airborne



Focus on Two Toxic Reactions to Dust

Asthma

Blocks/Strangles Airways

Acute reaction (within a few hours)

Easy and quick detection

Can react to very fine dust

Naso-Pharyngeal Cancer

Dust collected on mucus membranes of Pharynx

Usually $>5 \mu\text{m}$

Chronic – no easy unique early signals

Very rare

Avoiding Exposure to (Toxic) Dust

- **Substitution** – use a less toxic wood
- **Good General Ventilation (Open doors and Windows)**
 - Deals with Aerosols and some Coarse Dust
- **Dust Extraction System (relates to good housekeeping)**
 - Designed to capture most dust. High efficiency requires an enclosure or very high capture velocities
 - Filter at outlet if disposal is a nuisance
 - Ensure good air movement around outlet
 - Design to avoid dust settlement in system
- **Personal Protection (Last resort)**
 - Dust masks – for effectiveness need good seal, high efficiency
 - high breathing resistance
 - Ventilated facemasks
 - Connected to clean air or with very good filter




SELECTED ITEMS FROM AMERICAN WOODTURNER JUNE 1990

Type	Reaction	Site	Potency	Source	Incidence
Balsam Fir	Sensitizer	Eyes, skin	+	Leaves, bark	Common
Beech	Sensitizer, nasopharyngeal cancer	Eyes, skin, respiratory	++	Leaves, bark; dust	Common
Iroko	Irritant, sensitizer, pneumonia	Eyes, skin, respiratory	+++	Dust, wood	Common
Mahogany (Swietenia)	Sensitizer, pneumonia	Skin, respiratory	+	Dust	Unknown
Rosewoods	Irritant, sensitizer	Skin, eyes, respiratory	++++	Dust, wood	Common
Walnut, Black	Sensitizer	Skin, eyes	++	Dust	Common
Teak	Sensitizer, pneumonia	Skin, eyes, respiratory	++	Dust	Common
Yew	Irritant, direct toxin, nausea	Skin, eyes, cardiac	++,++++	Dust, wood	Common

Iroko	Irritant, sensitizer, pneumonia	Eyes, skin, respiratory	+++	Dust, wood	Common
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Relative Toxicity

- NIOSH 'All dusts', 5 mg/m³ (few measurements)
 - Exposure limit applies to 8h /day 40 years
 - Some dose related, some size related
 - Most common – allergic reactions: very individual
 - Various published tables
- 

Levels of formaldehyde in various situations involving MDF

Formaldehyde Levels (ppm)	Description
0.1	Level expected to cause symptoms in sensitive individuals
0.75	OSHA worker exposure limit (40h/week, working lifetime)
0.01-0.14	Sawing and sanding MDF in ventilated dust chamber
0.19-0.78	Sanding particleboard under laboratory conditions
Not detectable–0.6	Buildings in which smoking is permitted
0.48–5.31	Indoor air while cooking fish
0.08	Urban background during heavy traffic

Eric Meier, Wood Dust Safety, (very focused on allergic reactions)

<https://www.wood-database.com/wood-articles/wood-dust-safety/>

<https://www.cdc.gov/niosh/docs/wooddust/default.html>

Symptoms and Lung Function Among Danish Woodworkers

Schlünssen, Vivi MD, PhD; Schaumburg, Inger MD, PhD; Taudorf, Ebbe MD, DMSc; Mikkelsen, Anders B. MSc, PhD; Sigsgaard, Torben MD, PhD

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Allan Hildesheim, Mustafa Dosemeci, Chang-Chuan Chan, Chien-Jen Chen, Yu-Juen Cheng, Mow-Ming Hsu, I-How Chen, Beth F. Mittl, Brenda Sun, Paul H. Levine, Jen-Yang Chen, Louise A. Brinton and Czau-Siung Yang

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