

# Environmental and indoor exposure to Asbestos Fibers

Are the current practices and regulation protective enough ?

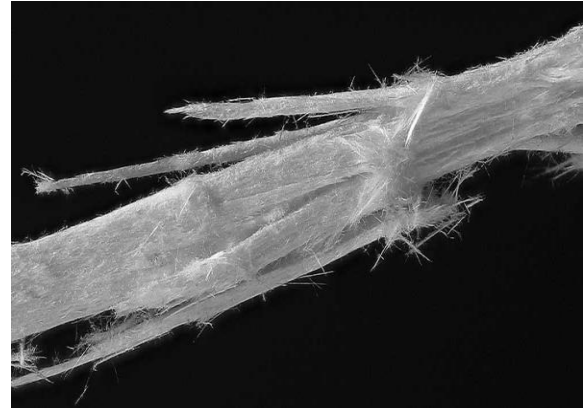


## Introduction: *What is asbestos?*

# What is asbestos ?

"Asbestos is a group of **mineral fibres** [...] which can cause **deaths** and **serious ill-health** in workers and other people who are exposed to these fibres" (WHO)

→ Our focus today!



<https://baronandbudd.com/news/what-is-asbestos-why-is-it-dangerous/>

## 2 main categories of asbestos

CROCIDOLITE



- **Amphibole** (*includes crocidolite, amosite, anthophyllite*)
  - Straight and stiff fibers
  - More pathogenic, penetrates deeper into the lungs
  - $< 5 \mu\text{m}$

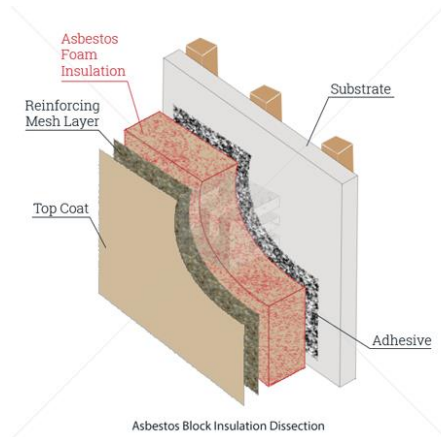
CHRYSOTILE



- **Serpentine** (*chrysotiles*)
  - Curly and flexible fibers
  - Less pathogenic, settle in the upper respiratory track
  - Most widely used ("white asbestos")

# Historical use

- Extensive use in construction during the mid-20th century
- **Banned** in Switzerland since 1990



<https://www.elglaw.com/products/block-insulation/>

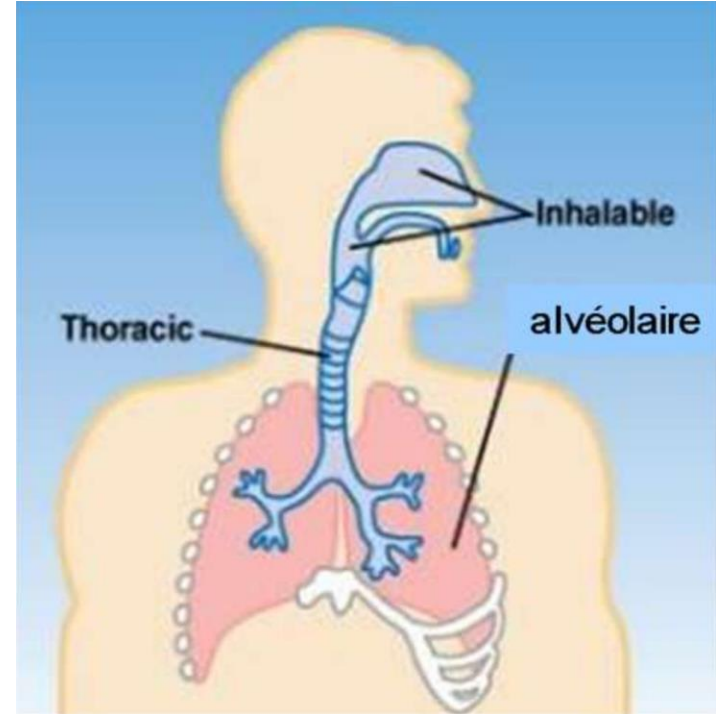
## Properties

- Low thermal conductivity
- Fire resistance
- Strength, durability
- Sound absorbance
- **Low cost + high availability!**

# Hazards linked to asbestos

# Entry route

- Main entry route: inhalation
- Mucociliary function: weak inside the lungs  
→ **alveolar fraction**
- Skin penetration, ingestion: negligible effects



# Hazards

- 200'000 deaths / year according to WHO

Effects after several years or decades

## Cancer

*Lung cancer  
Larynx cancer*

## Mesothelioma

*< 1 year life  
expectancy*

## Asbestosis

*Non-malignant  
Respiratory difficulties*

# Exposure of Mesothelioma patients

**Table 1: Occupational and non-occupational exposure assessment, by sex, 2010–2020**

Any exposure indicated	Men		Women		Persons	
	No.	%	No.	%	No.	%
Occupational exposure only	124	15.5	1	0.5	125	12.2
Non-occupational exposure only	177	21.5	191	93.2	368	35.8
Both occupational & non-occupational exposure	522	63.4	13	6.3	535	52
<b>Total</b>	<b>823</b>	<b>100</b>	<b>205</b>	<b>100</b>	<b>1,028</b>	<b>100</b>

Source: AIHW analysis of AMR data at 1 May 2021, based on interviews completed among people who were diagnosed with mesothelioma between 1 July 2010–31 December 2020.



# Ways of exposure

# Types of exposures



## INDOOR

*Domestic exposure*

- Release of fibers by the building
- During house works



## OUTDOOR

*Environmental exposure*

- Outdoor air pollution
- Release of fibers from buildings
- Erosion, mining of rocks

# Factors of risk for non occupational exposure

- Undertaking / living with **home renovations**
- Living with someone working with asbestos, **coming home dusty**
- Living in a **house <1990**



# Where is asbestos, in residences?



- Fibrocement plaques



- Vinyl floors



- Electrical panels, conduits



- Thermal isolants



- Mastics, joints



- Plasters

# Environmental exposure

- Living near an industrial site (ex: asbestos cement plant)
  - Higher risk of Mesothelioma
  - Decrease with distance
  - Clear evidence from studies in Italy
  
- Naturally Occurring Asbestos (NOA)
  - Through weathering or human activity
  - Limited knowledge
  - Not in Switzerland
  
- Neighborhood concentration < 650 f/m<sup>3</sup>

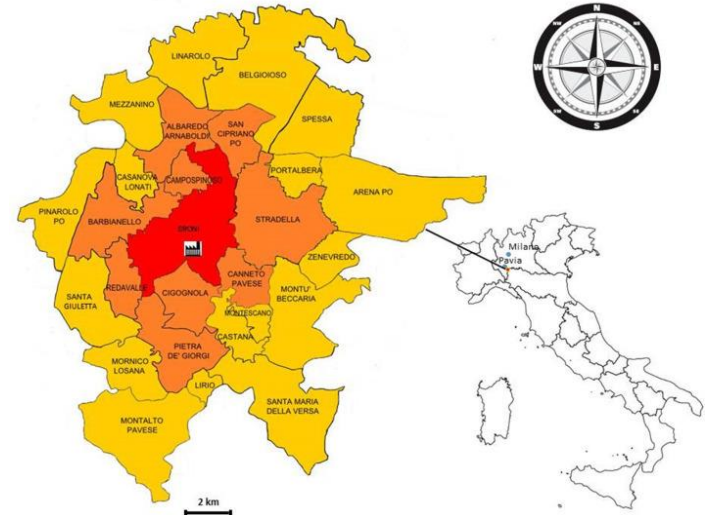




Photo Courtesy: Maxime Schinner

# Effective levels of exposure, Current practices

# Indicative values for toxicity

- No legal limits for residential exposure!
- Residential recommendations (OFSP): **1 000 f/m<sup>3</sup>**
- OEL (comparison): **10 000 f/m<sup>3</sup>**  
*Based on appearance frequency of lung cancer and mesothelioma*

# Domestic exposure

Asbestos presence	Airborne concentration	Safety (comp. with 1000 f/m <sup>3</sup> )
None	1 f/m <sup>3</sup>	<< Limit
Yes, in good condition	1 000 f/m <sup>3</sup>	± Limit
Yes, in poor condition	30 000 f/m <sup>3</sup>	>> Limit
During maintenance works	4 000 f/m <sup>3</sup>	> Limit If asbestos is removed: "a blessing in disguise"?
Non-professional ( <i>DIY</i> ) works	Up to 3 000 000 f/m <sup>3</sup>	>> Limit

- 1h exposure to 1 500 000 f/m<sup>3</sup> ≈ 1.7 years of lifetime ambient exposure  
(Comparison done probably with ~500 f/m<sup>3</sup>, environmental exposure)

# Domestic exposure - during maintenance

Type of work	Personal 8h-exposure (average)	Materials containing asbestos
Run / pull a cable	48 000 f/m <sup>3</sup>	Scratched partitions, joints
Replacement of ceiling tiles	350 000 f/m <sup>3</sup>	False-ceilings
Electrical repairs	20 000 f/m <sup>3</sup> Up to 200 000 f/m <sup>3</sup>	Ducts, boxes
Polishing / stripping vinyl floors	~200 000 f/m <sup>3</sup> Up to 2 600 000 f/m <sup>3</sup>	Floors, in adhesive or tiles
Cleaning asbestos debris	74 000 f/m <sup>3</sup>	Dusts (after works)

- If not properly equipped: inhalation of lots of fibers!

# Exposure during cleaning

Type of cleaning	Personal 8h-exposure (average)
Wet wipe	34 000 f/m <sup>3</sup>
Vacuum cleaner	98 000 f/m <sup>3</sup>

- Most people use vacuum!  
→ Reflex to change
- Importance of good reflexes (wet materials: prevents resuspension)



**72%**

72% of owner-builders had done some renovation work to a pre-1990 property. **81% conducted some of this work themselves.**



**50%**

Nearly 50% of owner builders **were not confident** that they could **identify materials that might contain asbestos.**



**66%**

66% of those who completed work had to remove asbestos. **31% did it themselves. 64% used a professional.**



**90%**

90% knew asbestos could be in ceilings, roofs & walls. **But did not know** that asbestos can be in **splashbacks, insulation, vinyl/carpet underlay, fencing or fuse boxes.**

# Australia, 2023 - Call of specialists



- **22%: Asbestos removed by specialists**
- **38%: Too expensive - 27% are financially exposed**
- **15%: "No special knowledge required"**

**Under 50% sought advice to professionals !**



# Australia, 2023 - Precautions taken (DIY)

- **Under 25% wore protective equipment!**
  
- 35% Asbestos → Bin
  - Exposes neighbourhood
  - Source of volatile asbestos in houses
  - Misidentification of asbestos sources



# Legal basis

# In Switzerland

- Usage, production, etc. **banned since 1990**
- Big emphasis on prevention



## Before construction work

Obligatory investigation  
(OTConst)

## During construction work

- *Precaution measures*
- *OEL to be respected (LAA)*

## After construction work

*Waste disposal in Type E landfills (highest protection)*

## Gaps:

- **Only applies for companies, not in a “DIY” context**
- **No obligation to remove asbestos from residences**

# Rest of the world

- **Developped countries** (EU, North America, Australia...):
  - ± Same as Switzerland
  
- **Developping countries:**
  - Asbestos still used
  - Weak regulations
  - Low awareness on asbestos-linked risks



**Are current  
practices safe  
enough?**



**Asbestos is dangerous to health.**



**Awareness achieved**

Needs simple reinforcement, primarily as a motivator.



**Asbestos is common in homes built before 1990 (including locations).**



**Awareness improving**

More targeted advice needed, population cohorts need different strategies.



**There are simple ways to stay safe, including by engaging asbestos professionals.**



**Low awareness**

And low motivation to do the right thing – especially around correct disposal with cost and convenience being significant barriers.

# Overall

## Good practices / Strengths

- Prevention
- Legislation about occupational exposure
- Disposal

## Gaps / Weaknesses

- Protection of residents near industrial sites
- Location of legacy asbestos in households
- Limited scientific knowledge on NOA

# Overall

- **Lack of knowledge around asbestos**
  - Risks: well known by people
  - Locations, risky practices: not well known
  
- **Not enough contact with specialists**
  
- **Environmental exposure**
  - Mostly a burden in other countries → bans, regulation, protective measures
  - Long-time health effects → precautionary principle



**Thank you for  
your attention !**

Slide 3, 7, 8, WHO data: <https://www.who.int/news-room/fact-sheets/detail/asbestos>

Slide 4, asbestos types: <https://www.ncbi.nlm.nih.gov/books/NBK555985/>

Slide 5, historical use: [https://www.dechets.ch/pages/info/pdf/3A\\_D%C3%A9chets\\_Amiante.pdf](https://www.dechets.ch/pages/info/pdf/3A_D%C3%A9chets_Amiante.pdf)

Slide 8, principal diseases: <https://www.epa.gov/asbestos/learn-about-asbestos>

Slide 9, 12, mesothelioma prevalence (exposures): <https://www.asbestossafety.gov.au/sites/default/files/documents/2023-03/NSP%202019-2023%20Mid-term%20Progress%20Report%20-%20Final.PDF>

Slide 11, types of exposures: <https://link.springer.com/article/10.1023/A:1007691003600>

Slide 13, presence of asbestos in houses: <https://doi.org/10.1186/1476-069X-13-59>

Slide 14, environmental exposure: <https://www.sciencedirect.com/science/article/pii/S0013935119307650>

Slide 14, indicative values: <https://www.suva.ch/fr-ch/prevention/par-danger/materiaux-rayonnements-et-situations-a-risque/amiante/les-consequences-de-l-amiante>

Slide 17, domestic exposure: [https://www.researchgate.net/publication/312949883\\_The\\_risks\\_to\\_health\\_from\\_exposure\\_to\\_asbestos\\_and\\_man-made\\_mineral\\_fibres\\_in\\_buildings\\_and\\_the\\_environment](https://www.researchgate.net/publication/312949883_The_risks_to_health_from_exposure_to_asbestos_and_man-made_mineral_fibres_in_buildings_and_the_environment)

Slide 18, 19, exposure during works and cleaning: <https://www.atsdr.cdc.gov/ToxProfiles/tp61.pdf>, p173 – 178

Slide 20, 21, 22, 28, studies by Australian government: <https://www.asbestossafety.gov.au/sites/default/files/documents/2023-03/NSP%202019-2023%20Mid-term%20Progress%20Report%20-%20Final.PDF>, and: <https://www.asbestossafety.gov.au/what-we-do/news-and-announcements/asbestos-safety-and-home-improvement-research>

Slide 24, 29, Swiss regulations: [https://www.dechets.ch/pages/info/pdf/3A\\_D%C3%A9chets\\_Amiante.pdf](https://www.dechets.ch/pages/info/pdf/3A_D%C3%A9chets_Amiante.pdf), <https://www.suva.ch/fr-ch/prevention/par-danger/materiaux-rayonnements-et-situations-a-risque/amiante/quelle-est-la-base-legale-concernant-lamiante>

Slide 26, regulations in the rest of the world: <https://www.asbestos.com/mesothelioma/worldwide/>