



Ontario

Cancer Care Ontario

Action Cancer Ontario



Cancer Risk Factors in Ontario

Dusts and Fibres



DUSTS AND FIBRES

Risk factor/exposure	Cancer	The context where high risks were reported	Magnitude of risk*	Strength of evidence ^a
Asbestos (all forms)	Larynx	Occupational	1.2 ^a	Sufficient
	Lung	Occupational	2–5 ^{a,b}	
		Environmental	...	
	Mesothelioma	Occupational	†	
		Environmental	†	
	Ovary	Occupational	1.3–1.8 ^{c,d}	Limited
	Colon and rectum	Occupational	...	
Pharynx	Occupational	...		
Stomach	Occupational	...		
Silica dust, crystalline (in form of quartz or cristobalite)	Lung	Occupational	1.3–2.6 ^a	Sufficient
Wood dust	Sinonasal	Occupational	2–50 ^{e,f}	Sufficient
	Nasopharynx	Occupational	1.5–2.5 ^a	

Sources: ^aIARC, 2012; ^bLenters et al., 2011; ^cReid et al., 2009; ^dCamargo et al., 2011; ^eDemers et al., 1995; ^fIARC, 1995

*Relative risk (RR) estimate for persons exposed vs. unexposed.

...Magnitude of risk not shown in table if strength of evidence could not be accurately estimated or is "limited."

† The vast majority of mesotheliomas are the result of occupational exposure to asbestos, the remaining cases are likely the result of the environment. The precise magnitude of risk is difficult to determine.

ASBESTOS (ALL FORMS)

Background

- » Asbestos is a commercial term for a group of six fibrous minerals made of silicon and magnesium, including amphibole minerals (actinolite, amosite, anthophyllite, crocidolite, tremolite) and serpentine minerals (chrysotile), that are found naturally in soil and rocks.^{108,123}
- » Asbestos fibres have several desirable properties, including resistance to heat, durability and strength, that have led to their use in a wide range of industrial applications, most frequently involving insulation and friction materials (e.g., brake pads and shoes).¹²⁴
- » Asbestos fibres are released into the environment from the weathering or mining of natural asbestos deposits and when asbestos-containing products are worn down or damaged.¹²⁴ The primary route of human exposure is inhalation of these airborne asbestos fibres.¹²⁴
- » Exposure is most likely to occur in occupational settings. Workers in several industries may have been or are currently exposed to asbestos, including those involved in asbestos mining, manufacturing, construction and transportation, as well as in the maintenance and remediation of asbestos containing structures.¹²⁵

- There is consistent evidence that exposure to asbestos causes mesothelioma, and cancers of the lung, larynx and ovary.¹²⁴
- There is a clear [dose-response](#) relationship between asbestos exposure and lung cancer risk.¹²⁶ A [meta-analysis](#) has shown that people in the highest exposed groups of workers (e.g., miners and insulators) are between 2 and 5 times more likely to develop lung cancer.¹²⁶ The impact of different asbestos fibre types and sizes on lung cancer risk remains unclear.¹²⁴ It is uncertain whether there is an increased risk for lung cancer at low levels of asbestos exposure.¹²⁴ The magnitude of risk from environmental exposure is too difficult to determine based on the existing literature.
- Mesothelioma, in contrast, can occur at low levels of exposure to asbestos as demonstrated by cases that occur as a result of environmental exposures. This is also indicated by studies where household members of asbestos workers have been found to be at risk of mesothelioma from contact with asbestos carried into the home (i.e., via hair, shoes and clothing) from their household member's workplace.^{127,128} The vast majority of mesothelioma cases are the result of occupational exposure to asbestos; many of the remaining cases are likely the result of environmental exposure.
- Exposure to materials that are contaminated with asbestos is also associated with an increased lung cancer risk. For instance, vermiculite mined in Libby, Montana was contaminated with amphibole fibres (asbestos) and caused increased mesothelioma and lung cancer rates.¹²⁴ This asbestos-contaminated vermiculite was shipped to other areas, including Ontario and other Canadian provinces.
- Smoking does not affect the risk of mesothelioma; however, smokers who are exposed to asbestos have a greatly increased risk of developing asbestos-related lung and laryngeal cancer.¹²⁴
- A [meta-analysis](#) found that, after adjusting for alcohol and tobacco consumption, people exposed to asbestos have an approximately 20% higher risk of laryngeal cancer.¹²³ Higher risks of asbestos-related laryngeal cancer have also been observed in certain populations.¹²⁴ There is evidence of a [dose-response](#) relationship for cumulative asbestos exposure and laryngeal cancer.¹²⁴
- A [dose-response](#) relationship exists between asbestos exposure and ovarian cancer risk;¹²⁴ some studies have found that women living near asbestos facilities have a higher risk of ovarian cancer.^{128–130} Women with occupational asbestos exposure have an approximately 30%–80% increased risk of ovarian cancer.^{130,131}
- There is limited evidence for an association between asbestos exposure and cancers of the colon and rectum, pharynx and stomach.¹³² Individuals with any exposure to asbestos are 50% more likely to develop pharyngeal cancer and 10%–40% more likely to develop colorectal or stomach cancer^{123,124} compared to people with no exposure.
- The biologic mechanisms by which asbestos can induce cancer include impaired fibre clearance leading to macrophage activation, inflammation, generation of reactive oxygen and nitrogen species, tissue injury, [genotoxicity](#), aneuploidy and polyploidy, [epigenetic](#) alteration, activation of signaling pathways, and resistance to [apoptosis](#).¹³² A study has also found that the release of the HMGB1 protein triggers a chronic inflammatory response in human mesothelial cells, which can lead to [carcinogenesis](#).¹³³

SILICA DUST, CRYSTALLINE (IN THE FORM OF QUARTZ OR CRISTOBALITE)

Background

- » Silica is one of the most common minerals, naturally occurring in both crystalline and amorphous forms.¹²⁴ The most common type of crystalline silica is α -quartz; other common types include cristobalite and tridymite.¹²⁴
 - » Crystalline silica is found naturally in rocks, soil, sands, acid volcanic rocks, some bentonite clays and in diatomaceous earth, and can be produced through the conversion of amorphous forms of silica in the presence of heat.¹²⁴
 - » The main categories of commercial silica products are sand and gravel (used in manufacturing glass, ceramics, foundry and abrasives), quartz crystals (used in jewelry, electronics and optical components), and diatomaceous earth (used in filtration as fillers in and as carriers for pesticides and other commercial products, such as cleaners).¹²⁴
 - » Workers in industries and occupations involving the movement of earth (e.g., mining, farming), the disturbance of silica-containing products (e.g., demolition of concrete) and the handling or use of sand or other silica-containing products (e.g., foundry processes) are considered to be at high risk of silica exposure,¹²⁴ with inhalation the primary route of exposure.
 - » Exposure in the general population is most likely to occur during the use of commercial products containing quartz (e.g., cleansers, cosmetics, art clays and glazes, pet litter, talcum powder, caulk, paint and mortar), with inhalation as the primary route of exposure.¹²⁴
- There is consistent evidence demonstrating an association between crystalline silica (in the form of α -quartz and cristobalite dust) and lung cancer, with a clear [dose-response](#) relationship.¹²⁴ Exposure to silica dust increases lung cancer risk 1.3–2.6 fold,^{124,134} with higher risks from higher exposure levels.¹²⁴
 - The established biologic mechanisms for [carcinogenesis](#) include impaired particle clearance leading to macrophage activation and persistent inflammation.¹³²

WOOD DUST

Background

- » Wood dust is generated during the processing of wood (e.g., via sawing, sanding). It can come from softwood trees, which are mainly conifers, or hardwood trees, which are primarily deciduous trees in North America.¹²⁴
- » Wood dust exposure is generally highest during the manufacturing of wood furniture and cabinets, especially during the process of machine-sanding.¹²⁴ The primary route of exposure is inhalation of the dust.
- » Since the industrial revolution, woodworking machines have increased in efficiency, increasing both production, and the generation of more and finer wood dust.¹²⁴

- There is consistent evidence that exposure to wood dust causes sinonasal and nasopharyngeal cancer.¹²⁴
- For sinonasal adenocarcinoma, there is strong evidence for a [dose-response](#) relationship. Depending on exposure level and wood dust type, risk ranges from 2–50 times that of the general population.^{135,136} The highest risks for sinonasal adenocarcinoma have been observed for people exposed to high levels of hardwood dust and very high [relative risks](#) have been primarily observed in European studies.^{124,135}
- People in wood-related occupations or who are exposed to wood dust are at 1.5–2.5 times increased risk of nasopharyngeal cancer, with insufficient evidence for a [dose-response](#) relationship.¹²⁴
- The biologic mechanisms by which wood dust causes cancer have not been established.¹²⁴

OTHER DUSTS AND FIBRES

- There is sufficient evidence that exposure to erionite (a fibrous zeolite similar to asbestos) causes mesothelioma.¹²⁴ Environmental and epidemiological evidence is mainly derived from high-risk populations where erionite is most prevalent (e.g., Turkey).^{137,138}
- In occupations with high exposure to leather dust (e.g., boot, shoe or other leather workers), there is sufficient evidence of increased risk of sinonasal cancer.¹²⁴ The evidence has come primarily from European studies.¹²⁴