

Asbestos

1332-21-4

Hazard Summary

Asbestos production and use has decreased dramatically over the years in the United States. Exposure to asbestos may occur from ambient air, indoor air, or water. Effects on the lung are a major health concern from asbestos, as chronic (long-term) exposure to asbestos in humans via inhalation can result in a lung disease termed asbestosis. Asbestosis is characterized by shortness of breath and cough and may lead to severe impairment of respiratory function. Cancer is also a major concern associated with asbestos exposure, as inhalation exposure causes lung cancer and mesothelioma (a rare cancer of the thin membranes lining the abdominal cavity and surrounding internal organs), and possibly stomach, laryngeal, and colorectal cancer. EPA has classified asbestos as a Group A, known human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (2), which contains information on the carcinogenic effects of asbestos including the unit cancer risk for inhalation exposure, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Asbestos. (1)

Uses

- Asbestos production and use in the U.S. has decreased dramatically over the years due to health concerns and regulations banning its use. (1)
- U.S. production of asbestos decreased from 300 million pounds in 1973 to 6 million pounds in 2002. (3)
- In 2010, there were two U.S. suppliers of asbestos and most of the asbestos used in the U.S. is imported from Canada. (3)
- Asbestos has been used in building materials, paper products, asbestos-cement products, friction products, textiles, packings and gaskets, and asbestos-reinforced plastics. (1,4)
- Many uses have been prohibited, including the spraying of asbestos-containing material on buildings and structures for fireproofing, insulation and decorative purposes, asbestos inclusion in patching compounds and asbestos heat shields in hair dryers. Asbestos substitutes continue to be developed. For example, nonasbestos friction materials are currently being used in disc brake pads, and substitutes have been developed for drum brake linings. (1)

Sources and Potential Exposure

- Airborne exposure to asbestos may occur through the erosion of natural deposits in asbestos-bearing rocks, from a variety of asbestos-related industries, or from clutches and brakes on cars and trucks. The concentrations in outdoor air are highly variable. (1,4)
- Asbestos has been detected in indoor air, where it is released from a variety of building materials such as insulation and ceiling and floor tiles. It is only released, however, when these building materials are damaged or disintegrate. (1)
- Asbestos may be released into water from a number of sources, including erosion of natural deposits, corrosion from asbestos-cement pipes, and disintegration of asbestos roofing materials with subsequent transport into sewers. (1,4)

Assessing Personal Exposure

- It is possible to test for the presence of asbestos fibers in urine, feces, or mucus. In addition, a chest X-ray, although it cannot detect the asbestos fibers themselves, can detect early signs of lung disease caused by asbestos. (1)

Health Hazard Information

Acute Effects:

- No studies were located on the acute (short-term) toxicity of asbestos in animals or humans. (1)

Chronic Effects (Noncancer):

- Chronic inhalation exposure to asbestos in humans can lead to a lung disease called asbestosis, which consists of a diffuse fibrous scarring of the lungs. Symptoms of asbestosis include shortness of breath, difficulty in breathing, and coughing. Asbestosis is a progressive disease, i.e., the severity of symptoms tends to increase with time, even after the exposure has stopped. In severe cases, this disease can lead to death, due to impairment of respiratory function. (1,2)
- Other effects from asbestos exposure via inhalation in humans include pulmonary hypertension and immunological effects. (1,2)
- Feeding studies in animals exposed to high doses of asbestos have not detected any evidence of adverse toxic effects. (1,2)
- EPA has not established a Reference Concentration ([RfC](#)) or a Reference Dose ([RfD](#)) for asbestos. (2)

Reproductive/Developmental Effects:

- No studies were located on the developmental or reproductive effects of asbestos in animals or humans via inhalation. (1)
- Birth defects were not noted in the offspring of animals exposed to asbestos in the diet during pregnancy. (1)
- No effects on fertility were observed in animals exposed to asbestos in the diet during breeding, pregnancy, and lactation. (1)

Cancer Risk:

- A large number of occupational studies have reported that exposure to asbestos via inhalation causes lung cancer and mesothelioma (a rare cancer of the membranes lining the abdominal cavity and surrounding internal organs). (1,2,3)
- Individuals who smoke and are also exposed to asbestos have a greater than additive increased risk of developing lung cancer. (1,2,3)
- Long- and intermediate-range asbestos fibers (>5 micrometers (μm)) appear to be more carcinogenic than short fibers (<5 μm). (1)
- Some occupational studies have reported an increased risk of stomach, laryngeal, or colorectal cancer from asbestos exposure. However, the data are not as strong as that for lung cancer and mesothelioma. (1)
- Epidemiological studies have not found a clear association between asbestos exposure in drinking water and an increased risk of stomach cancer. (1,2,3)
- A series of large-scale lifetime feeding studies in animals reported that exposure to intermediate-range asbestos fibers increased the incidence of a benign tumor of the large intestine in male rats, while short-range asbestos fibers showed no significant increase in tumor incidence. (1)
- EPA has classified asbestos as Group A, human carcinogen. (2)
- EPA uses mathematical models, based on human and animal studies, to estimate the probability of a person developing cancer from breathing air containing a specified concentration of a chemical. EPA calculated an inhalation unit risk estimate of 2.3×10^{-1} (fibers/ cm^3) $^{-1}$. EPA estimates that, if an individual were to continuously breathe air containing asbestos at an average of 0.000004 fibers/ cm^3 over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million increased chance of developing cancer as a direct result of breathing air containing this chemical. Similarly, EPA estimates that breathing air containing 0.00004 fibers/ cm^3 would result in not greater than a one-in-a-hundred thousand increased chance of developing cancer, and air containing 0.0004 fibers/ cm^3 would result in not greater than a one-in-ten-thousand increased chance of developing cancer. (2)

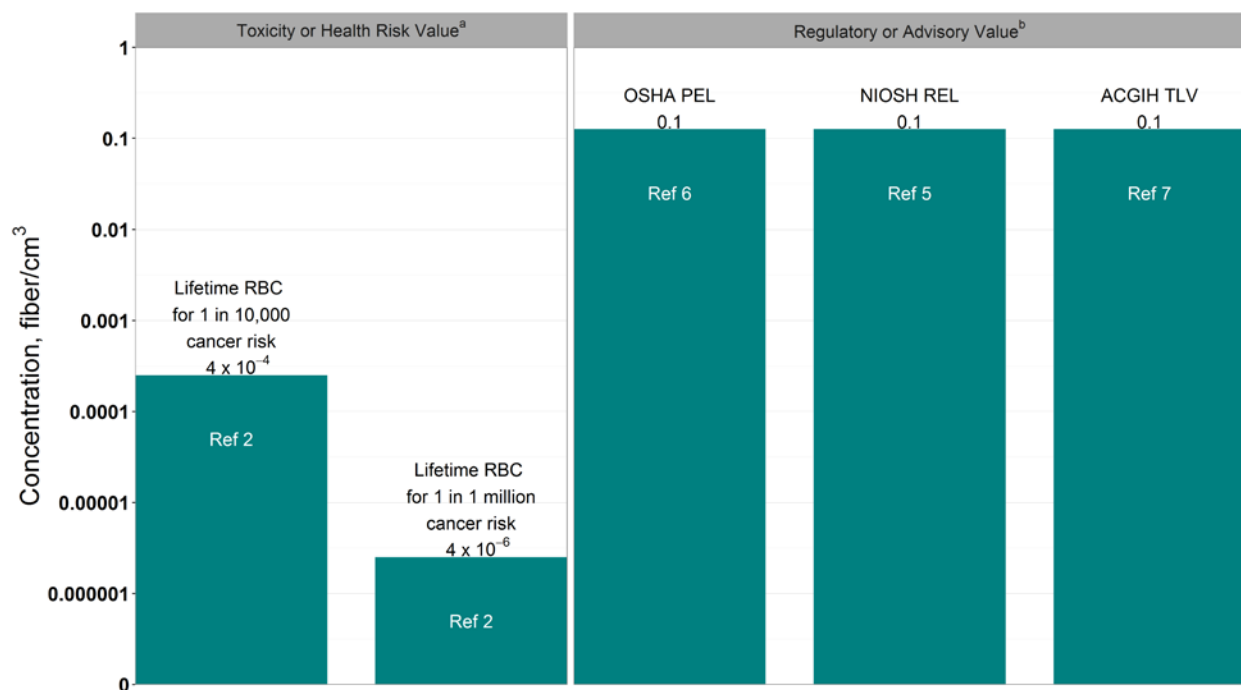
Physical Properties

- Asbestos is the name applied to a group of six different fibrous silicate minerals that occur naturally in the environment. (1)
 - There are two groups of asbestos minerals: serpentine and amphibole. There are also nonfibrous forms of serpentine and amphibole which are not asbestos. (1)
 - Serpentine asbestos are relatively long and flexible crystalline fibers that may be woven, and includes the mineral chrysotile, and amphibole asbestos are more brittle than serpentine asbestos and includes the minerals amosite, crocidolite, tremolite, anthophyllite, and actinolite. (1)
 - Asbestos is neither volatile nor soluble; however, small fibers may occur in suspension in both air and water. (1)
-

Conversion Factors and Units

Asbestos concentrations are reported as either fibers per mL air (fibers/mL) or fibers per cm³ air (fibers/cm³). Note that fibers/mL = fibers/cm³.

Health Data from Inhalation Exposure



ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

NIOSH REL--National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH--recommended exposure limit for asbestos fibers >5 micrometers in length. Additionally, NIOSH considers asbestos to be a potential occupational carcinogen and recommends that exposures be reduced to the lowest feasible concentration.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as an 8-hour time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

RBC (Cancer risk-based concentration)--a calculated concentration of a chemical in air to which continuous exposure over a lifetime is estimated to be associated with a risk of contracting cancer not greater than the specified probability (e.g., 1 in 1 million).

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

References

1. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Asbestos. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 2001. <http://www.atsdr.cdc.gov/ToxProfiles/tp61.pdf>
2. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Asbestos. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. Last revised 9/26/1988. <http://www.epa.gov/iris>
3. National Toxicology Program (NTP). Report on Carcinogens, Thirteenth Edition. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service. 2014. <http://ntp.niehs.nih.gov/pubhealth/roc/roc13/>
4. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Arsenic, Metals, Fibres, and Dusts. Volume 100C. World Health Organization, Lyon, France. 2012. <http://monographs.iarc.fr/ENG/Monographs/vol100C/mono100C-11.pdf>
5. National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 2015. <http://www.cdc.gov/niosh/npg/>
6. Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. Code of Federal Regulations. 29 CFR 1910.1000. 1998. https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992&p_text_version=FALSE
7. American Conference of Governmental Industrial Hygienists (ACGIH). 2015 TLV's and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices. Cincinnati, OH.