



Health Effects of Asbestos

A TOSC Fact Sheet (1997)

What is asbestos?

Asbestos is the name applied to a group of six different minerals (amosite, chrysotile, tremolite, actinolite, anthophyllite, and crocidolite) that occur naturally in the environment. The most common mineral type is white (chrysotile), but others may be blue (crocidolite), gray (anthophyllite), or brown (amosite). These minerals are made up of long, thin fibers that appear somewhat similar to fiberglass. Asbestos fibers are very strong and are resistant to destruction by heat and chemicals. Because of these properties, asbestos fibers have been used in a wide range of products, mostly in building materials, friction products, and heat-resistant fabrics. Because the fibers are so resistant to chemicals, they are also very stable in the environment; they do not evaporate into air or dissolve in water, and they are not broken down over time.

How might I be exposed to asbestos?

You are most likely to be exposed to asbestos by breathing in tiny asbestos fibers suspended in air. These fibers can come from natural outcroppings of asbestos, but many come from the degradation or breakdown of human-made products such as insulation, ceiling and floor tiles, roof shingles, cement, automotive brakes and clutches, and many others. Low levels of asbestos can be detected in almost any air sample. For example, in rural areas, there are usually an average of around 0.03 to 3 fibers present in a cubic meter (f/m^3) of outdoor air^a. (A cubic meter is about the amount of air you breathe in 1 hour.) Higher levels are usually found in cities, where there may be 3 to 300 f/m^3 . Close to an asbestos mine or factory, levels could reach 2,000 f/m^3 or higher. Levels could also be above average near a building that is being torn down or renovated, or near a waste site where asbestos is not properly covered up or stored to protect it from wind erosion.

In indoor air, the concentration of asbestos depends on whether asbestos was used for insulation, ceiling or floor tiles, or other purposes, and whether these asbestos-containing materials are in good condition or are deteriorated and easily crumbled. Concentrations measured in homes, schools, and other

^a The number of fibers depends on how they are measured. Values in air are reported as phase contrast fibers per cubic meter. This is the same measure as used to describe health effects. The values in water are reported as transmission electron microscope fibers. This method is more sensitive than phase contrast microscopy, so values in air and water are not comparable.

buildings that contain asbestos range from 30 to 6,000 f/m³. People who work with asbestos (e.g., miners, insulation workers, automobile brake mechanics) are likely to be exposed to much higher levels of asbestos particles in air.

You can also be exposed to asbestos by drinking fibers present in water. Even though asbestos does not dissolve in water, fibers can enter water by being eroded from natural deposits or piles of waste asbestos, or from cement pipes used to carry drinking water. The U.S. Environmental Protection Agency (U.S. EPA) has set a maximum contaminant level in drinking waters of 7 million fibers per liter (MFL). Most drinking water supplies in the United States have concentrations less than 1 MFL^a. (A liter is about the same as a quart.) However, in some locations, there may be concentrations of 10 to 100 MFL or higher.

How can asbestos enter and leave my body?

If you breathe asbestos fibers into your lungs, some of the fibers will be deposited in the air passages and on the cells that make up your lungs. However, very few of these fibers move through your lungs into your body. Instead, most fibers are removed from your lungs by being carried away in a layer of mucus to the throat, where they are swallowed into the stomach. This usually takes place within a few hours, but fibers that are deposited in the deepest parts of the lung are removed more slowly, and some can remain in place for many years and may never be removed.

If you swallow asbestos fibers (either those present in water or those that are moved to your throat from your lungs), nearly all the fibers pass along your intestines within a few days and are excreted in the feces. A small number of fibers become stuck in the cells that line your stomach or intestines, and a few penetrate all the way through and get into the blood. Some of these become trapped in other tissues, and some are removed in the urine.

How can asbestos affect my health?

The U.S. Department of Health and Human Services has determined that asbestos is a known carcinogen. Information on the health effects of asbestos in humans comes mostly from studies of people who were exposed in the past to high levels of asbestos in the workplace. These asbestos workers were found to have increased chances of getting two types of cancer: cancer of the lung tissue itself, and mesothelioma, a cancer of the thin membrane that surrounds the lung and other internal organs. Both lung cancer and mesothelioma are usually fatal. These diseases do not appear immediately, but develop only after a number of years. There is also some evidence from studies of workers that breathing asbestos can increase the chances of getting cancer in other locations (e.g., stomach, intestines, esophagus, pancreas, kidneys), but this is less certain. Members of the public who are exposed to lower levels of asbestos may also have increased chances of getting cancer, but the risks are usually small and are difficult to measure directly.

Besides causing cancer, breathing asbestos can also cause a slow accumulation of scar-like tissue in the lungs and in the membrane which surrounds the lungs. This scar-like tissue does not expand and contract like normal lung tissue, and so breathing becomes difficult. Blood flow to the lung may also be decreased, and this causes the heart to enlarge. When the injury is mostly in the lung itself, the disease is called asbestosis. This is a serious disease, and can eventually lead to disability or death in people exposed to high levels of asbestos. However, asbestos is not usually of concern to people exposed to low levels of asbestos. Similar injury to the membrane surrounding the lung is quite common in people exposed to high concentrations of asbestos, but effects on breathing are usually not serious.

The health effects from swallowing asbestos are unclear. Some groups of people who have been exposed to asbestos fibers in their drinking water have higher-than-average death rates from cancer of the esophagus, stomach, and intestines. However, it is very difficult to tell whether this is caused by asbestos or by something else. Animals that were given very high doses of asbestos in food did not get any more fatal cancers than usual, although some extra nonfatal tumors did occur in the intestines of rats in one study.

What levels of exposure have resulted in harmful health effects?

The levels of asbestos in air that lead to lung disease depend on a large number of factors. The most important of these are 1) how long you were exposed, 2) how long it has been since your exposure started, and 3) whether you smoked cigarettes. Also, there is a scientific debate concerning the differences in the amount of disease caused by different fiber types and sizes. Some of these differences may be due to the physical and chemical properties of the different fiber types. There are several studies which suggest that amphiboles (tremolite, amosite, and especially crocidolite) may be more potent than chrysotile. However, most data indicate that fiber size is the most important factor for cancer causing potential. Most studies indicate that long fibers (where "long" means greater than about 1/5,000th of an inch) are more likely to cause injury than short fibers (where "short" means less than about 1/10,000th of an inch). Levels of 1,000,000 and 3,400,000 f/m³ in air have been shown to cause lung injury and death, respectively, in some people.

As noted above, eating or drinking asbestos fibers may increase risk of cancer, but this is not certain. Eating or drinking asbestos fibers at levels below the U.S. EPA MCL is not thought to cause any harmful noncancer effects.

Is there a medical test to determine whether I have been exposed to asbestos?

The most common test used to determine if you have been exposed to asbestos is a chest X ray. The X ray cannot detect the asbestos fibers themselves, but can detect early signs of lung disease caused by asbestos. While other things besides asbestos can sometimes produce similar changes in the lungs, this test is usually reliable for detecting asbestos-related effects.

It is also possible to test for the presence of asbestos fibers in urine, feces, mucus, or material rinsed out of the lung by a doctor. Low levels of asbestos fibers are found in these materials for nearly all people. Higher-than average levels can show that you have been exposed to asbestos, but it is not yet possible to use the results to estimate how much asbestos you have been exposed to, or to predict whether you are likely to suffer any health effects.

What recommendations has the federal government made to protect human health?

Despite the ongoing debate concerning health effects resulting from the different asbestos fiber types, The Centers for Disease Control consider the different mineral forms of asbestos to be known human cancer causing substances with a prolonged latency period of between 10 and 30 years between exposure and the onset of disease. The federal government has taken a number of steps to protect citizens from exposure to asbestos.

First, the U.S. EPA has established a very broad ban on the manufacture, processing, importation, and distribution of materials or products that contain asbestos. These regulations were initiated in 1990, and are to be in full force by 1997. This ban will result in elimination of asbestos in insulation, brakes, floor and ceiling tiles, cement, paper, and nearly all other asbestos-containing materials. Second, EPA has established regulations that require school systems to investigate whether asbestos exposure is a problem inside their school buildings, and if so, to reduce or eliminate the exposure, either by removing the asbestos or by covering it up so it cannot get into air. In addition, EPA provides guidance and support for reducing asbestos exposure in other public buildings. Third, EPA regulates the release of asbestos from factories and during building demolition or renovation to prevent asbestos from getting into the environment. EPA also regulates the disposal of waste asbestos materials or products, requiring these to be placed only in approved locations. Fourth, EPA has set a limit of 7 MFL on the concentration of asbestos that may be present in drinking water.

In addition, the Food and Drug Administration (FDA) regulates the use of asbestos in the preparation of drugs, and restricts the use of asbestos in food-packaging materials.

Finally, the Occupational Safety and Health Administration (OSHA) has established a limit of 200,000 fibers/m³ on the average daily concentration of asbestos allowed in air in the workplace.

The information in this fact sheet was taken from Asbestos, a Centers for Disease Control, ATSDR Public Health Statement, December, 1990.