

ASBESTOS AND MESOTHELIOMA AN OVERVIEW

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Asbestos and Its Health Hazards, A Brief History

Asbestos is the name given to a number of naturally occurring, fibrous silicate minerals mined for their useful properties such as thermal insulation, chemical and thermal stability, and high tensile strength. Asbestos is commonly used as an acoustic insulator, and in thermal insulation, fire proofing and other building materials. Many products in use today still contain asbestos.

Asbestos is made up of microscopic bundles of fibers that may become airborne when asbestos-containing materials are damaged or disturbed. When these fibers get into the air they may be inhaled into the lungs, where they can cause significant health problems.

Information about the health hazards of asbestos came to light over a century ago. In 1898, British factory inspectors recognized the asbestos exposure was a health risk for workers. More than 100 years ago, in 1906, a London physician found asbestos fibers in the lungs of a worker who died from pulmonary fibrosis—scarring in his lungs. And in 1912, scientists used animal studies to show that asbestos inhalation causes pulmonary fibrosis. The U.S. Bureau of Labor Statistics reported in 1918 the “unusually high death rate” among asbestos workers.

By the 1920s, asbestosis was receiving increased attention from scientists. A series of papers appeared in British Medical Journal in 1924 on asbestosis—the disease named for the mineral that causes it. In 1930, two scientists, Drs. Merewether and Price, published a historic report on the asbestos textile industry and found a “definite occupational risk among asbestos

workers as a class." Highlights from the Merewether and Lewis report were republished in two prominent medical journals, the *Journal of the American Medical Association (JAMA)* and *Lancet*, including the astounding finding that "80% of asbestos workers employed for 20 years or more develop asbestosis."

In the 1930s, scientists began to connect asbestos and cancer. Numerous well-known medical journals published scientific studies that linked asbestos exposure to cancer. In 1935, the *American Journal of Cancer* published "Pulmonary Asbestosis: Carcinoma of the Lung in Asbesto-Silicosis." Following the publication of several articles between 1933 and 1936 connecting asbestos exposure with cancer, German physicians identified lung cancer as an occupational disease of asbestos workers in 1938. And by 1945—more than 60 years ago—it was accepted by the medical and scientific communities "in all countries" that asbestos is a carcinogen. In 1955, scientists confirmed what they had long suspected; there was an unmistakable connection between asbestos exposure and ingestion of asbestos fibers and the development of certain forms of lung cancer (what later came to be known as mesothelioma). The link between mesothelioma and asbestos was reported in 1960.

Finally, in 1964, at a conference in New York City, Dr. Irving Selikoff presented a now famous study of insulators. That study brought the scientific information about the health hazards of asbestos into the scientific community and popular press. By that date, however, there were already over 700 articles in the medical and scientific literature on the health effects of asbestos.

Despite the growing evidence of health risks of asbestos exposure, manufacturers and companies continued its use in many of their projects. In many cases, these manufacturers were aware of the potential health risks of asbestos exposure but chose to ignore them. These same companies also ignored the availability of safer alternative materials like fiberglass that were being developed at the time. Unfortunately, the victims were, for the most part, men of working families who had no knowledge of the potential health risks of asbestos exposure.

World-wide asbestos mining and production grew rapidly in the 1960s and 1970s until it reached a peak of 45,000,000 tons around 1980. In the 1970's health concerns regarding asbestos led to the ban of some of its uses and some voluntary phase outs. Mining and milling of the raw material and production of asbestos has declined since the early 1970s, but asbestos is still used in some construction materials. Furthermore, some asbestos-containing products, such as amphibole-contaminated vermiculite insulation, remain in many homes in the United States.

These asbestos fibers are released into the air and dust when asbestos-containing materials are loose, crumbling, or disturbed. Today, most of the asbestos used in the U.S. is imported. Worldwide asbestos mining and production in 2000 was more than 20,000,000 tons—higher than it was in 1960.

Asbestos-containing products are used for thermal insulation. Most insulation materials before the mid-1970s did contain some degree of asbestos. Countless products have, at one time or another, contained asbestos, including (but not limited to): thermal seals, insulating cement, asbestos cloth, asbestos cement pipe, pipe-covering, refractory and boiler insulation materials, packing materials, fireproofing spray, transite board, gaskets, insulating block, joint compound, duct insulation for heating, vinyl floor tile, ceiling tile, adhesives, mastics, coatings, roofing products, acoustical textures, insulated electrical wire and panels, ventilation and air conditioning (HVAC) systems, and brake and clutch assemblies.

The United States Occupational Safety and Health Administration (OSHA) has stated that no other toxic substance has more clearly demonstrated deleterious health effects on humans than asbestos has. From the years 1940 to 1970, approximately 27.5 million individuals had potential work-related asbestos exposure. By one estimate, 1.2 billion square feet of asbestos-containing insulation is housed in 190,000 buildings in the United States. It has been estimated that only the number of workers exposed as a consequence of asbestos brake and clutch work is approximately 900,000. In 1989, EPA issued a rule banning most asbestos-containing products. In 1991, however, this regulation was overturned by the Fifth Circuit Court of Appeals. EPA was unable to persuade the Justice Department to appeal the ruling. Nothing has been banned since 1991 under the Toxic Substances Control Act, and asbestos products continue to be manufactured and imported for use here.

While more than 30 countries have banned the use of asbestos, the U.S. government has not. However, four years after the introduction of the original bill, the U.S. Senate finally and unanimously passed a bill to ban asbestos, in 2007. The bill had faced opposition from the stone and mineral industries which had concerns about low levels (under 1%) of asbestos contamination of some of their materials. In order to overcome their opposition, compromises were made, the most significant of which involved the issue of contaminant asbestos. The revised U.S. bill restricted the national prohibitions to materials with more than 1% asbestos. The figure of 1%, which has no health basis, was adopted by the EPA in 1973 because of analytical

limitations which existed at that time. Materials with well under 1% bulk content of asbestos can give rise to high levels of airborne asbestos when used or disturbed.

Since 2006, major initiatives on asbestos have been undertaken by the World Health Organization (WHO), the International Labor Organization (ILO), and the World Bank. The World Health Organization has concluded that “the most efficient way to eliminate asbestos-related diseases is to stop the use of all types of asbestos.” The WHO is now working with the ILO to help countries around the world to develop national and international plans to eliminate asbestos use and minimize the hazards from in-place asbestos materials. The World Trade Organization has given its blessing to national asbestos bans.

Although manufacturers have removed the asbestos from many new products, asbestos may still be found at mines. Moreover, asbestos-containing building materials such as reinforced cements, could present a hazard during maintenance, construction, remodeling, rehabilitation, or demolition projects. Asbestos in manufactured products, such as electrical insulation, joint and packing compounds, automotive clutch and brake linings, and fireproof protective clothing and welding blankets, could present a hazard during activities that may cause a release of fibers.

Exposed Populations

- *Today, the populations most heavily exposed to asbestos are those in construction trades. Mechanics are also among the exposed population.*
- *In the past, pipe fitters, shipyard workers, military workers, automobile mechanics, and people in many other occupations were also exposed.*
- *The household contacts of asbestos workers were (and could be) exposed to asbestos dust on workers' skin and clothing.*
- *People in homes and buildings with loose, crumbling, or disturbed asbestos materials could be exposed to asbestos.*

Asbestos Exposure and Malignant Mesothelioma

Malignant mesothelioma is an uncommon form of cancer, and the most serious of all asbestos related diseases. Malignant mesothelioma is caused almost exclusively by the inhalation of airborne asbestos particles. It is a “signature disease” of asbestos exposure because in the

absence of asbestos exposure, mesothelioma is almost nonexistent. Malignant mesothelioma can develop up to 40 years after the initial asbestos exposure. The incidence of mesothelioma rises with the intensity and duration of asbestos exposure. Cases of mesothelioma among people with very little asbestos exposure have been documented. Many of those who are being diagnosed with mesothelioma today unknowingly experienced asbestos exposure many years ago.

The symptoms associated with the disease make it difficult for doctors to diagnose. Often, by the time that a proper diagnosis is made, the disease has progressed to a point where patients do not respond well to treatment therapy. Another unique factor associated with the disease is that there can be a long latency period, twenty to forty years, between the time an individual is exposed to asbestos and the actual manifestation of the disease in the form of malignant mesothelioma. Depending on the kind of tissue and organ involved in the cancer, there are several forms of this disease.

Pleural Mesothelioma

Malignant pleural mesothelioma often originates within the chest cavity and may involve the lung. This particular form of mesothelioma can metastasize to numerous organs in the body - even the brain.

The survival rate for patients diagnosed with pleural mesothelioma is not normally high. Patients typically do not live beyond eighteen months from the onset of symptoms. Only 8% of those diagnosed with mesothelioma will live three to five years from the onset of symptoms.

Peritoneal Mesothelioma

Peritoneal mesothelioma originates in the abdomen and will frequently spread to other organs in the area including liver, spleen or bowel. The survival rate is even worse for those diagnosed with peritoneal mesothelioma, with patients typically surviving about a year from time that they first started experiencing the symptoms of the disease.

Pericardial Mesothelioma

Pericardial mesothelioma is the least common form of mesothelioma. As the name suggests pericardial mesothelioma involves the heart. This rare type of mesothelioma invades the pericardium, the sac that surrounds the heart. As the cancer progresses, the heart is not able to

deliver oxygen as efficiently to the body causing further decline in health at an increasingly rapid rate.

Benign Mesothelioma

Cystic mesothelioma primarily affects women of younger age and affects the peritoneum. This type of mesothelioma is not frequently diagnosed and is also not a malignant form of the disease. It is, however, extremely difficult to identify and requires specialized microscopes and immunologic techniques to aid in diagnosis.

Mesothelioma in Uncommon Sites

A form of cardiac cancer that is rarely seen involves the pericardium. Tumors associated with this type of mesothelioma are not easily detectable and patients presented with this diagnosis tend to have a very low survival rate. There have also been reports of mesothelioma involving ovaries in women and the scrotum in men. Treatment for all of these rare forms of mesothelioma will vary depending on what stage a patient has progressed to, but in most all cases the projected outcome is not favorable.

Other Mesothelioma Risk Factors

Asbestos exposure is the primary risk factor for mesothelioma. However, there are a few secondary factors that might increase the risk of mesothelioma. They include exposure to radiation, zeolite, simian virus 40 (SV40), and tobacco.

- (A) *Radiation. Thorium dioxide (Thorotrast), a substance used in x-ray tests in the past has reported links to pleural mesothelioma and peritoneal mesothelioma. The use of Thorotrast has been discontinued for many years due to this discovery.*
- (B) *Zeolite. Some mesothelioma cases in the Anatoli region within Turkey have been linked to Zeolite, a silica based mineral with chemical properties similar to asbestos found in the soil there.*
- (C) *Simian Virus 40. Some scientists have found the simian virus 40 in mesothelioma cells from humans and have been able to create mesothelioma in animals with the virus. The relationship between this virus and mesothelioma is still unclear.*

(D) *Tobacco. Smoking alone is not linked to mesothelioma, but smokers who are exposed to asbestos have a much higher chance of developing lung cancer (as much as fifty to ninety percent higher). Research indicates that lung cancer is the leading cause of death among asbestos workers.*

Stages of Mesothelioma

Staging is the process of finding out how far the cancer has spread. Staging of mesothelioma is based on imaging studies such as x-rays, CT scans, and MRI scans. The treatment and outlook for patients with mesothelioma largely depends on the stage (extent of spread) of their cancer. Since [pleural mesothelioma](#) occurs most frequently and has been studied the most, it is the only mesothelioma for which a staging classification exists.

The staging system most often used for mesothelioma is the Butchart system. This system is based mainly on the extent of the primary tumor mass, and divides mesotheliomas into stages I through IV.

Stage I: Mesothelioma is present within the right or left pleura, and may also involve the lung, pericardium, or diaphragm (the muscle separating the chest from the abdomen) on the same side.

Stage II: Mesothelioma invades the chest wall or involves the esophagus (food passage connecting the throat to the stomach), heart, or pleura on both sides. The lymph nodes in the chest may also be involved.

Stage III: Mesothelioma has penetrated through the diaphragm into the peritoneum (lining of the abdominal cavity). Lymph nodes beyond those in the chest may also be involved.

Stage IV: There is evidence of distant metastases (spread through the bloodstream to other organs).

Statistics

According to the World Health Organization, approximately 125 million workers worldwide are exposed to asbestos on the job, which results in at least 90,000 deaths every year. Recent reports show that an estimated 2,500 to 3,000 new cases per year of mesothelioma are diagnosed in the United States each year. Although mesothelioma is relatively uncommon,

projections show that its incidence is expected to rise over the next decade. Below is a list of industries with the largest number of employee deaths due to mesothelioma, along with the percentage of the total number of mesothelioma deaths in 1999, according to the National Center for Health Statistics:

- Construction – 14.2
- Non-paid workers, workers at home – 7.0
- Elementary and secondary school teachers – 3.7
- Industrial and miscellaneous chemicals – 3.5
- General government work – 2.4
- Agriculture – 1.9
- Nonspecific manufacturing 1.9
- Electric light and power – 1.9
- Railroads – 1.7
- Hospitals – 1.7
- Unreported industries – 4.3
- All other industries combined – 56

The high percentage (56%) of mesothelioma deaths among those who worked in “all other industries combined” shows that while there are very high-risk industries, such as construction, the majority of people who die from mesothelioma either work in smaller industries or industries not traditionally associated with asbestos exposure. School teachers, hospital workers and even homemakers are among this group exposed people.

The first diagnosis of mesothelioma on average occurs between 50-70 years of age. Mesothelioma affects men more often than women mostly due to increased occupational exposure. The disease is also less common in African Americans than it is in white Americans.

As mesothelioma is a disease that is difficult to detect in its early stages, often the disease is advanced at its first diagnosis. Accordingly, the average survival period using current treatment protocols is a little over one year. When fortunate enough to find the cancer early and treat it

aggressively, chances increase significantly of reaching the two year survival point. Approximately 20% of patients diagnosed with mesothelioma are able to achieve a five year survival rate.

The Centers for Disease Control and Prevention (CDC) has announced that asbestos deaths in the United States have skyrocketed since the late 1960s and will probably keep increasing through the next decade because of the past exposure to asbestos. According to CDC, 1,493 people died from asbestos in 2000, compared with 77 in 1968.¹

In the early 1970's the permissible exposure level of asbestos set by the Occupational Safety and Health Administration (OSHA) was 12 asbestos fibers per cubic centimeter of air. Thereafter, OSHA reduced the permissible exposure level to 10 fibers per cubic centimeter of air, and then to 5 fibers per cubic centimeter of air. In 1976, OSHA reduced the permissible exposure level to 2 fibers per cubic centimeter. Currently, OSHA limits the content of asbestos in joint compound to a maximum of 0.1 fibers per cubic centimeter of air. The current standard is 120 times lower than when OSHA first established permissible exposure standards.

Prognostic Factors

Because pleural mesothelioma has been better studied than [peritoneal mesothelioma](#), there is a lot more known about factors associated with prognosis for pleural mesothelioma. Younger age at diagnosis, performance status (functional status) and absence of weight loss are associated with a more favorable prognosis.

Different mesothelioma types usually originate in three different cell types: (1) epithelial cell type - has the most favorable prognosis; (2) fibrosarcomatous cell type - carries the worst prognosis and (3) mixed cell type - has an intermediate prognosis.

Asbestosis

Asbestosis is a non-cancerous lung condition that is marked by chronic irritation and inflammation of the lungs. It is caused by asbestos exposure and inhaling fibers. Asbestosis occurs after long-term, heavy exposure to asbestos, e.g. in mining, and is therefore regarded as

¹ The CDC reached its findings by reviewing the death certificates of nearly 125,000 people who had lung conditions linked to inhaling dust or fibers from minerals such as coal or asbestos.

an occupational lung disease. Those suffering from asbestosis are at an increased risk regarding several different types of lung cancer, including mesothelioma.

Upon exposure to asbestos and inhaling it, the body reacts to the needle-like fibers by trying to rid the lungs of them. This often adds to the inflammation and extreme irritation of the lungs. Over time, fibrosis (a thickening and scarring) develops and effectively reduces the ability of the lungs to function properly.

Companies That Manufacture Asbestos Products

Many of the asbestos companies are multi-billion dollar, multinational corporations with enormous assets and large amounts of insurance to pay asbestos claims. The following is a list of some of the major companies which manufactured or sold asbestos products:

- • *AC&S*
- • *A.P. Green*
- • *American Olean*
- • *Armstrong World Industries*
- • *Babcock and Wilcox*
- • *Bird Inc.*
- • *Bendix (Brakes)*
- • *Cleaver Brooks*
- • *Combustion Engineering*
- • *Chrysler (Brakes)*
- • *D&L-Tile International*
- • *Fiberboard*
- • *Flexitallic*
- • *Ford (Brakes)*
- • *Foster Wheeler*
- • *The Flintkote Co.*
- • *GAF Corp.*
- • *Goulds Pumps*
- • *Garlock*
- • *General Electric*
- • *General Motors (Brakes)*
- • *General Refractories*
- • *Georgia Pacific*
- • *Harbison Walker*
- • *I.H. France*
- • *Johns Manville*
- • *Kaiser Gypsum*
- • *National Gypsum*

- *Nicolet*
- *Owens Corning Fiberglas*
- *Owens Illinois*
- *Pittsburgh Corning*
- *Philip Carey*
- *Reynolds Metals Company*
- *Rapid American (Philip Carey Mfg. Co.)*
- *Unireoyal*
- *Westinghouse*
- *WR Grace (Zenolite)*
- *U.S. Gypsum*
- *Rutland Fire & Clay*
- *Robert A. Kearsbey Co*

Asbestos-Containing Materials and Products

Over 3,000 different types of products containing asbestos have been manufactured by hundreds of different asbestos companies. EPA Region 6 Provides a list of 46 materials which may contain asbestos:

- • *Pipe covering*
- • *Block*
- • *Insulating cement*
- • *Joint compound*
- • *Ceiling tile*
- • *Floor tile*
- • *Brakes*
- • *Clutches*
- • *Cloth*
- • *Fireproof clothes*
- • *Kent cigarette filters (1952-1956)*
- • *Grinding wheels*
- • *Refractory materials*

- • *Paint*
- • *Electrical wire*
- • *Electric motors*
- • *Cement pipe*
- • *Cement board*
- • *aprons*
- • *gloves*
- • *mitts*
- • *flexible duct connectors*

- ● *spray fireproofing*
- ● *packing*
- ● *gasket*
- ● *refractory cements*
- ● *insulating cements*
- ● *boiler insulation*
- ● *pipe insulation*
- ● *Boilers*

Asbestos Manufacturers' Knowledge of Its Dangers

Asbestos manufactures have been aware of dangers of asbestos exposure for many decades, but they chose to conceal any such information so that it would not cause concern in the workers and consumers. For instance, in the early 1980s, it came to light that Johns-Manville, one of the largest asbestos manufacturers, had been fully aware of the connection between exposure to asbestos dust and the development of serious respiratory disease for at least fifty years. During that fifty-year period, Johns-Manville not only failed to warn potential victims of the risks associated with its product, but it also actively concealed that information in order to safeguard company profits. As one particularly egregious act in a large-scale cover-up, the company routinely withheld x-ray results from periodic employee physical exams - refusing to inform their employees that many of them were suffering from serious respiratory diseases.

In a 1949 company memorandum, Dr. Kenneth W. Smith, the medical director of Johns-Manville, stated that the employees "have not been told of the diagnosis, for it is felt that as long as the man feels well, is happy at home and at work and his physical condition remains good nothing should be said." This unconscionable practice subjected the sick employees to additional exposure to asbestos, substantially contributing to the seriousness of their illness. As a result, many employees would not discover their illness until after retirement, when the statute of limitations on their workers compensation and tort claims had already elapsed.

This practice, however, placed Johns-Manville in a win-win situation. Not only did the company benefit from the additional years of labor by experienced employees, but it also increased the likelihood that they would escape all liability for their intentional misconduct. In a further attempt to conceal the dangerous nature of their product, Johns-Manville and other manufacturers persuaded scientists to delay publication of findings that would be detrimental to the asbestos industry, or to soften the impact of such reports by obscuring their results.

Asbestos Lawsuits

The first lawsuits against the manufacturers and companies responsible for asbestos related cancer were brought in 1929. Since then, asbestos exposure has given rise to hundreds of thousands of asbestos suits by those sickened by it for several decades. Many of these cases have resulted in large settlements for victims and the families of victims of mesothelioma from asbestos exposure.

Most of the suits have been filed against multiple defendants. The litigations often listed 10, 20 or more corporations that either produced asbestos or used it in products they manufactured. The asbestos manufacturers, however, manipulated the legal system in order to conceal the risks of asbestos. When asbestos victims finally realized that their respiratory diseases were caused by exposure to asbestos and sued the manufacturers, the companies always settled out of court -- eliminating the potential of publicly-accessible trial records. Moreover, as a condition of these out-of-court settlements, manufacturers demanded strict confidentiality and assurance from plaintiffs' lawyers that they would forego all future asbestos suits and withheld from other plaintiffs' lawyers any evidence that had been obtained.

The cases that actually reached trial encountered an additional hurdle in the form of a highly effective "state of the art" defense, which asserted that asbestos manufacturers could not be held liable for claims arising from asbestos exposure that occurred before 1965, when the results of an epidemiological study linking asbestos exposure to cancer and asbestosis was released. The manufacturers claimed that they had no prior knowledge of the risks of asbestos. This defense was later discredited by plaintiffs' lawyers who, working together, were able to show evidence which conclusively revealed that the companies had known about the dangers of asbestos since the early 1930s.

After this revelation, in order to avoid exposure to large compensatory and punitive damages awards, asbestos manufacturers resorted to settling most cases out-of-court. However, when some of the asbestos cases found their way to the court for trial, many of these companies filed for bankruptcy reorganization because of the asbestos cases filed against them. There is however, a suspicion that the Chapter 11 bankruptcies by some of these companies have been just a ploy.

An example of such companies is W^R Grace. W^R Grace was a major asbestos producing company that filed for bankruptcy. W^R Graced owned and operated a vermiculite

mine near Libby, a small town in Montana, since the 1960s. In 1999 a report on the startling number of the town's residents had died or were suffering from asbestos-related diseases including mesothelioma in a Seattle paper brought the issue to national attention. Grace announced that it would donate \$250,000 a year "for as long as necessary" to provide independent health screening to anyone who wants it. Grace said it also would provide medical coverage to anyone diagnosed with an asbestos-related disease. It also said that Grace would do "whatever is required" by the EPA to remove the hazard. However, a few months later, the EPA announced that Grace told the agency it was "not interested in signing a consensual cleanup agreement" to decontaminate the site because it did not agree to the analytical methods used by the EPA.²

The federal government filed suit against Grace in March 2001 to recover its investigation and cleanup costs under the Superfund law. In 2003, the federal District Court in Montana awarded the EPA more than \$54 million for cleanup costs incurred by the EPA during its first year of attempting to clean up the heavily contaminated town. But that award has not been paid because of Grace's bankruptcy.

W.R. Grace filed for Chapter 11 bankruptcy in 2001 because of a "sharply increasing number of asbestos claims." However, in 2002, the Justice Department intervened in a bankruptcy proceeding for the first time ever, alleging that before Grace asked for Chapter 11, it concealed money in new companies it bought. The Justice Department said it was a "fraudulent transfer" of money to protect itself from civil suits. Just before the bankruptcy trial was to begin, Grace returned almost \$1 billion to the bankruptcy court. The company currently has annual sales of about \$2 billion, more than 6,000 employees and operations in nearly 40 companies.

Even though they knew about the health dangers of asbestos exposure, the asbestos producing companies and those using asbestos in their manufactured products worked hard to keep OSHA and NIOSH from setting stricter limits for workers asbestos exposure. Delay tactics commonly used by industry groups included lobbying, lawsuits and stalling in filing requested information. Consequently, it took more than two decades for OSHA to set the "permissible

² Shortly afterwards, W.R. Grace bought back the mine that it had sold in 1990 and subsequently banned the EPA from the premises.

exposure level" for asbestos in the workplace at 0.1 fiber per cubic centimeter over an eight-hour period, a level that NIOSH first recommended in 1976.

Wrongful acts of the asbestos companies are not just limited to the lack of warning to their workers. It also extends to the consumers of their products. These companies have resisted and fought against asbestos label in their products, fearing that a warning would hurt sales. For instance W. R. Grace sold millions of bags of home attic insulation that contained asbestos, but the company never warned the public. Ford Motor Company to this day falsely denies the presence of any asbestos in the automobile parts it uses or manufactures.