Congressional Research Service, The Library of Congress, ASBESTOS INFORMATION, Washington, D.C., October 29, 1981.

90% of all the asbestos used in the US is chrysotile. Asbestos diseases usually have a latency period between 15 and 35 years. Yet there have been rare cases under ten years. Smoking and asbestos exposure act synergistically on lung cancer risk. Mesothelioma accounts for 8-11% of asbestos worker deaths. There is no data available to that will allow for the establishment of a TLV for asbestos exposure. There is no "safe" level of exposure. Indirect or bystander exposure on the job is enough to induce asbestos-related disease. School exposure to in-place asbestos is becoming a bigger problem.

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

ASBESTOS INFORMATION

F. Angelyn Wells
Analyst in Life Sciences
June 16, 1980

Updated by
Michael M. Simpson
Environmental Health Fellow
Life Sciences
Science Policy Research Division
29 October 1981

PREFACE

This report is intended to provide answers to the most frequently asked Congressional inquiries on the subject of asbestos. The majority of information cited in this report was obtained from the following sources:

1. New York Academy of Sciences. Health Hazards of Asbestos Exposure. New York, vol. 330, 1979. 811 p.

2. Sittig, Marshall. Hazardous and Toxic Effects of Industrial Chemicals: Asbestos. New Jersey, Noyes Data Corporation 1979. p. 41-47.

3. U.S. Department of Health Education and Welfare. National Institutes of Health. National Cancer Institute. Asbestos: An Information Resource. Washington, [DHEW (NIH) 78-1681] May 1978. 105 p.

4. U.S. Department of Health, Education, and Welfare. National Institutes of Health. National Cancer Institute. Questions and Answers about Exposure to Asbestos: Report. Washington, April 1978.

Additional information on specific aspects of the asbestos issues discussed in this report may be obtained from the sources listed above, or those listed in the Appendix to this paper.

CONTENTS

I. WHAT IS ASBESTOS?

Asbestos is a generic term which describes six fibrous minerals, members of a family called silicates, which may occur as compact masses, or relatively long, silky fibers. Those minerals recognized as asbestos are: 1) crysotile (white asbestos); 2) actinolite; 3) amosite (brown asbestos); 4) anthrophyllite; 5) crocidolite (blue asbestos); and 6) trenolite. All of these minerals may occur in a nonfibrous form, in which case they are not classified as asbestos.

Asbestos is a virtually indestructible substance that is resistant to fire or chemical action. It is, however, susceptible to mechanical damage, and can break or flake and separate into submicroscopic fibers when pressure is applied. Additionally, this substance can be readily put into physical suspension, i.e., for spraying or use in paint. Finally, asbestos fibers are very aerodynamic and if liberated into moving air, they may remain suspended for long periods.

Most of the asbestos fiber used in the United States (about 90%) is imported. Nearly all of that imported is crysotile fiber which comes from Canada. Commercially, crysotile is the most important form of asbestos. The Republic of South Africa accounts for some 3% of the U.S. imports of crocidolite and amosite fibers, and a number of other countries supply the remainder. A substantial portion of the Canadian output is produced there by U.S. companies that manufacture asbestos products.

Asbestos that is naturally present in the environment in minute quantities is referred to as "background" asbestos. An increased health risk is posed by the release of asbestos into the environment in excess of this background concentration.

II. HOW IS ASBESTOS FIBER USED IN THE UNITED STATES?

The high tensile strength, flexibility, heat and chemical resistance, and favorable frictional properties of asbestos fiber make it adaptable to a large number of uses.

The U.S. Bureau of Mines states that there are more than 2,000 discrete uses of asbestos; others such as the Asbestos Information Association and Canada's Department of Energy, Mines and Resources, suggest that there are upwards of 3,000 uses.

In 1965, approximately 74% of the asbestos was utilized by the construction industry, while 26% was used in the non-construction industries.

Depending on the length and other characteristics of the fiber, asbestos can be:

- carded, spun or woven;
- used as structural reinforcement of materials such as cement, plastic and asphalt; or
- laid and pressed to form paper.

Some selected asbestos products and their end uses are provided in Table I.

TABLE I. SELECTED ASBESTOS PRODUCTS AND THEIR END USES

Floor Tile	Gaskets and Packings	Friction Products	Paints, Coatings and Sealants	Asbestos-Reinforced Plastics	Asbestos Cement Pipe
Office floors Commercial floors Residence floors	Valve components Flange components Pump components Tank sealing components	Clutch/transmission components Brake components Industrial friction materials	Automotive/Truck body coatings Roof coatings and patching compounds	Electric motor components Molded product compounds for high-strength/weight uses	Chemical process piping Water supply piping Conduits for electric wires

Asbestos Textiles	Asbestos Paper	Asbestos Cement Sheet
Packing components Gasket components Roofing materials Commercial/industrial dryer felts Heat/fire protective clothing Clutch/transmission components Electrical wire and pipe insulation Theater curtains and fireproof draperies	Gas vapor ducts for corrosive compounds Fireproof absorbent papers Table pads and heat protective mats Heat/fire protection components Molten glass handling equipment Insulation products Gasket components Underlayment for sheet flooring Electric wire insulation Filters for beverages Appliance insulation Roofing materials	Ducts, vents for corrosive chemicals Chemical tanks and vessel manufacturing Portable construction buildings Electrical switchboards and components Residential building materials Molten metal handling equipment Industrial building materials Fire protection Insulation products Small appliance components Electric motor components Laboratory furniture Cooling tower components

Source: Asbestos Information Association/North America/1978.

The Consumer Product Safety Commission (CPSC) decided May 30, 1980 to order approximately 1,200 companies to report detailed information on how they use asbestos in their consumer products. The CPSC General Order will be issued and become effective in mid-July, and represents the latest activity in the Government's effort to eliminate non-essential uses of asbestos. The CPSC has already banned the use of asbestos in dry-wall patching compounds, as articifical ash in gas burning fireplaces, and in consumer clothing; has forced the recall of hairdryers; and is expected to ban the use of the fibers in asbestos paper products.

III. HOW MUCH ASBESTOS FIBER IS USED IN THE UNITED STATES?

Industrial use of asbestos in the United States dates from about 1880, when the mining of the Quebec crysotile deposits began. Gradual increases in production and use occurred during the next 50 years, followed by accelerated use, until recently, when such use has declined.

In 1965, approximately 532,300 tons (74%) of asbestos was used in the construction industry, while some 187,400 tons (26%) was used in non-construction industries. From 1970-1975, the total amount of asbestos fiber used in the United States averaged 800,000 tons annually, but since 1975 such consumption has declined sharply. According to the U.S. Bureau of Mines, the 1979 asbestos consumption was estimated to be 592,000 tons, 4% below that of 1978 and 18% less than the 1965 total.

IV. HOW DOES ASBESTOS CAUSE DISEASE?

Asbestos fibers too fine to be seen by the human eye may become airborne during various industrial processes and may be inhaled and/or ingested. Because of their size and shape, asbestos fibers easily penetrate body tissues. Because of the durability of these fibers, they may remain in the body for many years after entry.

Asbestos-induced disease is not likely to appear until 15-35 or more years after first exposure.

Typically, the first 10-15 years after exposure are free of signs and symptoms. Early changes in lung tissue may appear in x-rays after 10-15 years, but may not be accompanied by other significant symptoms. Some investigators have, however, reported evidence of impaired lung function in workers with less than 10 years exposure to asbestos. A study at one asbestos plant showed that some workers who were exposed for only a month or two developed asbestos-related diseases many years later.

V. WHAT DISEASES MAY BE CAUSED BY ASBESTOS EXPOSURE AND WHAT ARE THEIR SIGNS, SYMPTOMS, TREATMENTS AND RISKS?

Persons heavily exposed to asbestos are at high risk for four serious diseases: 1) asbestosis; 2) lung cancer; 3) mesothelioma; and 4) gastrointestinal cancer.

Asbestosis is a chronic lung disease found in persons exposed to asbestos. It is irreversible and progressively disabling. The most prominent symptom of this disease is shortness of breath on exertion. Scientists do not believe that asbestosis necessarily leads to lung cancer, but the presence of the disease indicates that a person was exposed to asbestos. Most deaths from asbestosis are due to superimposed respiratory infections such as pneumonia and bronchitis, rather than to direct effects of the disease itself. These infections usually can be treated, but it is important to get medical attention early. Asbestosis accounts for 10% of the deaths among asbestos workers surveyed in epidemiological studies.

Lung cancer is initially diagnosed by chest X-ray. The diagnosis may be confirmed by means of biopsy (an examination of suspect tissue under the microscope). The symptoms of this disease include a cough, or a change in the cough habit, chest pain, and occasionally blood-streaked sputum coughed up from the lungs. Treatment of lung cancer depends on the type and amount of tissue affected; it may be treated by surgery, drugs, radiation, or combinations of these treatments. As with most cancers, the treatment must be tailored to the individual. Among some groups of asbestos workers, 20% of all deaths are caused by lung cancer. Cigarette smoking and occupational asbestos exposure have each been shown to increase the risk of an individual developing lung cancer, but together these two factors may act to produce a risk of developing the disease that is much greater than the sum of their separate risks.

Mesothelioma is an extremely rare cancer in members of the general population, but it is more common among asbestos workers. It is a cancer which exclusively affects the lining of the pleural (lung) or peritoneal (abdominal) cavities. The first pleural symptom may be shortness of breath or pain in the wall of the chest which is aggravated by deep breathing. Another sign may be abdominal pain which can vary from vague discomfort to severe spasms. Radiology is sometimes helpful in detecting mesothelioma in both the chest and abdomen. However, precise diagnosis is difficult and requires an exploratory operation to provide tissue for microscopic examination. Effective treatment is not yet available. Research is underway in the United States, Great Britian, and France to improve the treatment of this disease. Mesothelioma accounts for 8-11% of asbestos worker deaths.

Gastrointestinal cancer can usually be detected radiologically. Ultrasound is also a successful method in certain cases. Gastrointestinal cancer symptoms are as varied as the site and disease form, however, general symptoms may include diarrhea, cramps, and the passage of mucous and/or blood in excrement. Surgery is curative in many cases (chemotheraphy is generally indicated in cases of inoperability), and pharmacological treatment is also frequently used. An excess risk of developing cancers of the digestive system attributable to occupational exposure to asbestos has been suggested by a number of epidemiological studies; however, the percentage of workers within this cohort who are affected by gastrointestinal cancer has not been identified. A major problem with these studies has been the inclusion of peritoneal mesothelioma cases among all observed cases, making it difficult to document an increased risk for other digestive system cancers.

VI. HOW MUCH ASBESTOS IS HAZARDOUS TO HEALTH?

The answer to this question is not known. There are data that show that the lower the exposure, the lower the risk of developing cancer. However, excessive cancer risks have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or "safe" level of asbestos exposure.

When an asbestos criteria document was first published by the National Institute of Occupational Safety and Health (NIOSH) in 1972, that agency recommended a standard of 2.0 asbestos fibers/cc of air based on a count of fibers greater than 5 micrometers in length. This standard was recommended with the stated belief that it would "prevent" asbestosis and with the open recognition that it would not "prevent" asbestos-induced neoplasms.

On December 2, 1975, the Occupational Safety and Health Administration (OSHA) requested NIOSH to re-evaluate the information available on the health effects of occupational exposure to asbestos fibers, and to advise OSHA on the results of this study.

NIOSH stated in 1976 that the standard should be set at the "lowest level detectable utilizing the best available analytical techniques" (an approach consistent with NIOSH'S most recent recommendations for other carcinogens). It was believed that such a standard would also prevent the development of asbestosis, which was not accomplished under the 1972 standard.

Phase contrast microscopy (the best available analytical technique) permitted that "level" (recommended standard) to be 0.1 asbestos fibers/cc based on a count of fibers greater than 5 micrometers in length. This recommended level is intended to: 1) protect against the non-carcinogenic effects

of asbestos; 2) materially reduce the risk of asbestos-induced cancer (according to NIOSH, only an absolute ban can assure complete protection against the carcinogenic effects of asbestos); and 3) be measured by techniques that are valid, reproducible, and available to industry and official agencies.

On April 17, 1980, NIOSH and OSHA recommended that the current standard of 2.0 asbestos fibers/cc of air be reduced to 0.1 fibers, the lowest level which NIOSH contends can be measured accurately by current methods. They have also called for the elimination from the workplace of all nonessential uses of asbestos, and they reiterate that all forms of asbestos are equally dangerous, thus finding no basis for regulating one type of asbestos fiber differently than any other type of fiber. Other changes directed toward the protection of worker health were also outlined in the April 1980 recommendation [see: Job Health and Safety Report (news journal), April 22, 1980, p. 69].

VII. WHO MAY BE MOST AT RISK OF DEVELOPING ASBESTOS-RELATED DISEASE AND WHAT ARE THE ROUTES OF EXPOSURE TO ASBESTOS?

A. Occupational Exposure

Numerous studies indicate that exposure to asbestos in settings, like the workplace (where the exposure is concentrated), may significantly increase the risk of incurring the four serious asbestos-related diseases discussed under Section V of this report.

Risks of developing disease due to asbestos exposure have not been clearly defined for all of the occupational groups known to experience significant exposure (e.g., asbestos miners and manufacturers; shipyard workers; construction workers; and workers in automotive brake lining repair). Definitive data are only available for heavily exposed insulation workers and for workers who manufacture the asbestos insulation materials. Epidemiological evidence confirms that both these groups experience markedly increased rates of asbestos-associated disease.

Asbestos exposure problems are no longer associated exclusively with the worker who directly handles the substance, as investigators previously believed. For example, workers from a variety of trades who have been employed in shipyards, in or around areas contaminated by asbestos dust, are reportedly beginning to show signs of X-ray abnormalities typical of asbestos exposure. These include painters, electricians, carpenters, machinists, boilermakers, and welders, who may not even be aware of having been indirectly exposed to the substance.

The total number of workers exposed to asbestos since the beginning of World War II, is estimated to be between 8 and 11 million. Of these, an estimated 4.5 million were shipyard workers who were exposed during the peak war years, 1940-1944. These workers constitute one of the single largest

occupational groups known to have experienced asbestos exposure. Since there were few regulations protecting worker safety, coupled with inadequate personnel registry practices during those years, this places this occupational group at "unknown" risk of asbestos-associated disease.

As a result of recent Government health and safety regulation, current asbestos workers without previous exposure can be expected to face smaller risks than those exposed in the past.

It is important to note that both cigarette smoking and occupational exposure to asbestos have been shown to individually increase the risk of lung cancer, but together, they act to produce a risk of lung cancer that exceeds the sum of their separate risks. According to the American Cancer Society, asbestos workers who smoke have a risk of developing lung cancer that is 8 times that of smokers in the general population.

B. Non-Occupational Exposure

The presence of asbestos in many U.S. schools is established. Estimates of the numbers of schools involved run from 5-15% of the total number of U.S. schools. As a result, many students, as well as teaching and administrative personnel, and in particular, maintenance and janitorial workers, may risk asbestos exposure.

The single largest source of asbestos fibers in schools are asbestos-sprayed ceilings, with asbestos sheeting or asbestos-wrapped pipes as other major sources. Many school activities may add to the presence of airborne asbestos by:

a) accidental damage (leaning or pushing against, hitting with books, rulers, etc.);
b) vandalism or roughhousing;
c) vibration (bells, lockers closing, gym activities, boiler activities); or

d) multi-floor construction, (since 2nd floor activity can lead to the flaking of the first floor's ceiling, etc.).

There is no reason to believe that children are not susceptible to asbestos contamination and some scientists have even expressed the opinion that children may be more susceptible. Industry officials have indicated that children are at least "as" susceptible. In either case there is potential danger, and whether children are more susceptible or not, they are more "vulnerable" to cancer formation if they become contaminated. This is because of the long latency period for asbestos-associated cancers, (i.e., a twelve year-old child is more likely to survive the 20-30 year latency period than a 30-40 year old man or woman).

Finally, it has been determined that the use of asbestos in many school settings is not necessary. There are reportedly acceptable and preferable substitutes. The Government has banned all further uses of asbestos in school construction, and has advised that action to abate identified potential hazards should be based on common sense evaluation of the danger and should not be indiscriminate. It should be borne in mind that the object of remedial action is not to remove all asbestos from schools, since such removal may itself generate excessive amounts of fibers. It is, however, to remove potentially harmful asbestos fibers and their source(s) from the schools. This may mean removal, but it may also be accomplished by isolation of the asbestos (see also Section VIII (D) of this report for information concerning a funding measure to provide Federal assistance in the detection and removal of asbestos materials from the nation's schools).

VIII. HOW IS THE FEDERAL GOVERNMENT CONCERNED WITH THE EFFECTS OF ASBESTOS EXPOSURE?

A. Research

The National Cancer Institute (NCI) and the National Institute of Environmental Health Sciences (NIEHS) are conducting or sponsoring research in the health hazards of asbestos. The National Institute for Occupational Safety and Health (NIOSH) is also responsible for research in the documentation of hazards, and operates an informaton service to answer worker question about occupational safety.

B. Regulation

The Occupational Safety and Health Administraton (OSHA), part of the United States Department of Labor, regulates worker exposure. The Environmental Protecton Agency (EPA) is charged with monitoring levels of asbestos in air and water. The Food and Drug Administration (FDA), part of the Department of Health and Human Services, is concerned with asbestos contamination of foods, drugs, and cosmetics, such as might occur during the manufacturing process. The Consumer Product Safety Commission (CPSC) is concerned with the use of asbestos in consumer products (see also Section II of this report for additional information).

C. Public Information Campaign

In April 1978, then Secretary of Health, Education, and Welfare Joseph A. Califano, initiated a systematic Government effort to notify physicians, workers and others at possible risk of the hazards associated with asbestos exposure. Such information is of special importance because the serious diseases associated with asbestos take such a long time to develop--from 15 to 35 or more years--and because recent studies have underscored that workers exposed in the past, especially those from the war years, may now be facing

immediate, serious health threats. This public information campaign has required the cooperative efforts of many agencies including the National Cancer Institute, National Institute of Environmental Health Sciences, and the Department of Defense.

D. Federal Assistance to Schools

A funding measure (S. 1658) to provide Federal assistance in the detection and removal of asbestos materials from the nation's schools was passed by the Senate May 22, 1980, and was unanimously approved by the House of Representatives May 30, 1980. The measure became Public Law 96-270 on June 14, 1980. The final regulations implementing the Act were announced as "34 CFR Parts 230 and 231" in the January 16, 1981 Federal Register (pp. 4536-4558). "These regulations establish procedures to make available Federal grants to assist local educational agencies (LEAs) and State educational agencies (SEAs) in the identification of asbestos hazards in school buildings and Federal interest-free loans to LEAs to correct those hazards." 1/ The regulations require that every SEA submit a State plan by December 15, 1980 detailing its identification program. Lawrence La Moure, overseeing the Asbestos Detection and Control Program, stated that as of October 28, 1981, no funds were requested or appropriated for the program, and eight SEAs had not submitted State plans. 2/

References: 1/ Federal Register, Vol. 46, No. 11; 16 January 1981; p. 4536.

2/ Personal communication with Lawrence La Moure; U.S. Dept. of Education; Room 2127 FOB-6; 400 Maryland Avenue S.W.; Washington, D.C. 20202. (202) 472-2951

IX. ARE THERE GOVERNMENT COMPENSATION PROGRAMS FOR VICTIMS OF ASBESTOS-ASSOCIATED DISEASE?

The Federal Government does not maintain a program to provide for medical screening or treatment of persons who claim to be suffering from asbestos-associated illnesses. These medical services must be provided by the private medical community. Individuals are generally responsible for meeting the expenses associated with such private services unless they are covered by either a private or governmental health insurance program. Persons covered by Medicare who have symptoms of asbestos-related disease will be reimbursed for the costs of appropriate diagnosis and treatment.

Individuals who suffer asbestos-related diseases might qualify for assistance under State compensation laws. The laws and the benefits vary widely among the States. They may provide for medical care expenses, benefits for permanent disability, and survivor benefits. To determine eligibility, a person should contact the State worker compensation program in their State.

If the exposure resulted from Federal employment, the individual may be covered by the Federal Employee's Compensation Act. Additionally, individuals presently employed in shipyards by private employers, may be covered under the Longshoremen and Harbor Workers Compensation Act. Information concerning eligibility for these two compensation programs may obtained by contacting the Office of Worker's Compensation Programs of the U.S. Department of Labor.

X. WHAT IS INDUSTRY'S POSITION REGARDING ASBESTOS-ASSOCIATED HEALTH HAZARDS?

The National Institute of Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) recommended on April 17, 1980 that the current standard of 2-million asbestos fibers/cc of air be reduced to 0.1 fibers, the lowest level which NIOSH has determined to be accurately measurable by current methods. Following the Government's announcement of this plan to reduce drastically the permissible levels of airborne asbestos in United States workplaces, the Asbestos Information Association (AIA) warned that the 20-fold reduction recommended by NIOSH could not be achieved at many work sites. In setting the new asbestos exposure standard, the Government has indicated that asbestos can be measured at these reduced levels, although the trade group asserts that it is unaware of available technology which would provide such accurate measurements.

Historically, the asbestos industry has opposed every Government proposal to lower the recommended occupational standard for asbestos exposure on the grounds that the dangers of asbestos are minimal, and that to lower the standard would mean severe economic dislocation and unemployment [See: Job Safety and Health Report (news journal), May 6, 1980, p. 74].

The Asbestos Information Association (AIA) feels that the new recommended standard represents--in practical effect--a ban on the use of asbestos, and a move which may harm the U.S. economy. The AIA urges NIOSH and OSHA to avoid resorting to extreme regulatory measures without first examining the consequences of their actions, both for workers and for society as a whole.

APPENDIX

SOURCES OF ADDITIONAL INFORMATION ON ASBESTOS

AFL-CIO, Industrial Union or Metal Trades Depts.
815 16th Street N.W.
Washington, D.C. 20006

American Cancer Society
Suite 315
1825 Connecticut Ave. N.W.
Washington, D.C. 20009

Asbestos Information Association
1835 "k" Street, N.W.
Washington, D.C. 20006

Asbestos Information Committee
10 Wardour Street
London, W1v 3HG
England

Asbestos Research Council
P.O. Box 18 Cleckheaton
West Yorkshire, BD19 3UJ
England

Center for Science in the Public Interest
1757 "S" Street, N.W.
Washington, D.C. 20009

Cancer Information Service
Toll-free Telephone Source of Information:
1-800-492-1444

Consumer Product Safety Commission
"Hot-line" regarding potential hazards of commercial products:
1-800-638-2666

Department of Defense
Public Correspondence
Directorate for Management
Washington, D.C. 20301

Johns-Manville Corporation
Health, Safety and Environment Dept.
Ken-Caryl Ranch
Denver, Colorado 80217

National Cancer Institute
Office of Cancer Communications
Bethesda, Maryland 20014

Quebec Asbestos Mining Association
5 Place Ville Marie
Montreal 113, Quebec, Canada

Scientist's Institute for Public
Information
49 East 53rd Street
New York, New York 10022

U.S. Enviornmental Protection Agency
Public Information Center, PM-215
401 "M" Street S.W.
Washington, D.C. 20460

U.S. Dept. of Health and Human Services:
National Institute of Occupational
Safety and Health
(Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnatti, Ohio 45226)

U.S. Dept of Labor:
Occupational Safety and Health
Administration
Washington, D.C. 20210