STATEMENT OF

Dr. Anthony Robbins, Director
National Institute for Occupational Safety and Health
Center for Disease Control
Department of Health, Education, and Welfare

BEFORE THE
Subcommittee on Labor Standards
House Committee on Education and Labor

May 1, 1979

I am pleased to be here today to discuss the existence of asbestos-related diseases among American workers. Accompanying me from NIOSH are Dr. James A. Merchant, Director of the Division of Respiratory Disease Studies, Dr. Kenneth Bridbord, Director of the Office of Extramural Coordination and Special Projects, and Mr. Richard Lemen, Assistant Chief of the Industry-wide Studies Branch.

The Work-Relatedness of Disease

Occupational disease is increasingly recognized as a major public health problem in this country. Although specific work-related diseases have been known for hundreds of years, the insidious health effects of workplace exposures continue to be discovered. This is in part because occupational diseases, particularly cancers, may have a latency period of 20 to 40 years after the initial exposure occurred. They frequently may also be difficult to distinguish from diseases found in the general population. Often neither the individual worker nor his doctor is aware that a disease is developing until it is too late to affect its outcome.

Much of the research we do at NIOSH is to identify relationships between disease and occupational exposure. Evidence of a relationship is obtained by epidemiologic studies documenting that workers and other human populations exposed to particular agents tend to have a significantly greater than normal risk of contracting certain diseases. Evidence confirming these relationships may also be obtained by laboratory studies on experimental animals. Evidence of disease in the individual may be established by analyzing a worker's medical, family,

occupational history and conducting a thorough physical examination, including laboratory tests.

Occupational diseases can be classified according to three different categories: (1) those that are caused solely by occupational factors; (2) those in which occupation is one of the causal factors; and (3) those in which occupation affects the course of a preexisting disease.

In spite of the complex issues involved, we believe it is possible to develop reasonable diagnostic criteria for most known occupational diseases. In the NIOSH publication "A Guide to the Work-Relatedness of Disease" we suggest an approach for developing such criteria. This approach requires answering two important questions: 1. Does the worker have evidence of disease compatible with known effects of occupational exposures? 2. Has the worker received sufficient exposure to cause the disease? When the necessary evidence is presented in a logical sequence, the major issues are identified and the basis for any presumption defined, it should be possible to determine whether or not a disease is work-related.

NIOSH is working with the Department of Labor on a comprehensive study of all occupationally related respiratory diseases. The report, which will be available in July 1979, will assess data used for determining whether a certain respiratory disease is of occupational origin.

Asbestos

Workplace exposure to asbestos is probably the number one occupational health problem in the United States, both because of the vast number of workers exposed and the potential for very severe and debilitating disease--including asbestosis, mesothelioma and lung cancer.

It is estimated that since the beginning of World War II, as many as 8 million workers have been exposed to asbestos. Over one million currently work where exposure to asbestos may be a problem. Of the remaining workers, 4.5 million are estimated to have worked in shipyards during World War II.

Asbestos has been termed "the mineral with a thousand uses," which suggests the degree to which the substance pervades modern life. By actual count there are more than 3,000 uses for asbestos, and this versatility is reflected in the variety as well as the size of the workforce exposed.

There are several commercial forms of asbestos used in the manufacture of various products. They mainly fall into two broad categories, the amphiboles and the serpentines. Although their physical characteristics vary somewhat, there is evidence that all of these commercial forms of asbestos are carcinogenic. Both NIOSH's Revised Recommended Asbestos Standard and the International Agency for Research on Cancer (IARC) Monograph on Asbestos have reviewed the scientific

literature on different fiber types and conclude that all forms of commercial asbestos are carcinogenic.

Workplace Exposures

Workers are exposed to asbestos while mining, milling, and transporting the mineral and while manufacturing and working with products which contain the substance. These products include protective clothing, mailbags, padding, conveyor belts, pipes, roofing shingles and gutters. It is also used in manufacturing special paper products, including millboard, fine quality electrical papers, friction materials, such as gaskets, and automotive clutch and brake linings, as well as insulation for pipes and boilers and bulkhead linings for ships.

Many types of workers risk exposure to asbestos during a typical workday. Construction workers are especially vulnerable. Figures from 1976 show that three fourths of all asbestos used was in the construction industry. In the automotive industry, servicemen, mechanics, and body repairmen are potentially at risk.

Persons peripheral to these specific occupations and industrial processes must also be considered susceptible to exposure. Maintenance personnel must often repair machines in asbestos-contaminated work spaces or work directly with products containing asbestos. Secretaries and executives of asbestos plants are at risk even though far removed from the actual work areas. Families of workers can be exposed to asbestos brought home on workers' hair, clothing, or lunchboxes.

Asbestos-Related Diseases

Exposure to asbestos significantly increases the risk of contracting three serious diseases: asbestosis, lung cancer and mesothelioma. Other causes of excess death that have been associated with asbestos exposure include gastro-intestinal cancer and laryngeal cancer.

It is not known how asbestos causes disease. There has been speculation that surface properties, fiber size, and metallic content of the fibers may influence the carcinogenic properties of the substance. The speculation, however, remains to be proven. What is known is that fibers too fine to be seen by the human eye become airborne during various industrial processes and may be inhaled and subsequently swallowed.

Asbestos comes from a Greek word meaning "inextinguishable." The etymology aptly describes an especially vexing property of asbestos: its ability to remain in the body, to be, in a sense, "inextinguishable" after it has been inhaled or ingested. As much as 50 percent of inhaled asbestos fibers remains lodged in the lungs where it is almost impossible for the body to dispose of it.

Our best information about the increased risk associated with asbestos exposure is based on NIOSH and other HEW supported studies of workers heavily exposed to asbestos before the Government began to regulate the substance in the late 1960's and early 1970's. Current

workers without previous high exposure can be expected to face smaller risks of asbestos-related disease than those exposed in the past.

## Asbestosis

Asbestosis is a relentlessly progressive lung disease caused by inhalation of asbestos fibers. Cases of asbestosis were first documented in England in 1906 and in the United States in 1930. Generally seen among heavily exposed workers, asbestosis is distinguished from other dust diseases of the lung by characteristic interstitial fibrosis, frequently associated with pleural thickening or pleural calcification. X-ray examination also reveals small irregular opacities in the lower and middle lung fields. The pulmonary fibrotic changes develop slowly over years and may progress even though the individual has been removed from exposure. As the disease progresses, the individual becomes susceptible to incidental lung infections and to death from respiratory ailments, like pneumonia. Pulmonary hypertension is frequently seen in cases of advanced asbestosis and the patient may die from cor pulmonale (right-sided heart failure).

Numerous epidemiologic studies have associated the disease with occupational exposure to all commercial forms of asbestos in a wide variety of trades. Characteristic x-ray changes for asbestosis with a history of occupational exposure is generally sufficient to establish an occupational relationship.

Lung Cancer

The association of lung cancer and asbestos exposure was first suspected in the United States in 1935. A study in the United Kingdom in 1955 showed a ten-fold excess risk of lung cancer in asbestos textile workers employed before 1930. Subsequent epidemiologic evidence has repeatedly reconfirmed the association between lung cancer and exposure to asbestos, and it is estimated that up to 20-25 percent of workers, both cigarette smokers and non-smokers, heavily exposed to asbestos in the past die of lung cancer. The latency period for lung cancer is about 20 to 30 years after first exposure. It is not uncommon to find lung cancer in patients with asbestosis, although the presence of asbestosis is in no way a prerequisite to developing lung cancer in an asbestos-exposed worker.

Lung cancer is diagnosed by chest x-ray and confirmed by biopsy or surgery. Some studies at doses lower than those generally accepted as necessary to cause asbestosis have shown an increased risk of lung cancer. Lung cancer is rarely treated successfully. It generally spreads rapidly and kills the patient in a short time.

Because of the striking increased risk for lung cancer among exposed workers who also smoke, both smoking and asbestos must be considered as contributing factors in the etiology of disease. Lung cancer in a non-smoker exposed to asbestos on the job must be strongly suspected to be an occupationally related disease.

Mesothelioma

Mesothelioma is a cancer which is rarely found except in people with a history of asbestos exposure. The disease was first suspected to be related to asbestos exposure in 1943 and confirmed in 1960. It affects the pleura, a membrane lining the chest cavity, or the peritoneum, a similar membrane lining the abdominal cavity. This cancer, too, does not respond to treatment and the patient generally dies soon after a diagnosis is made. The common first symptoms of mesothelioma are shortness of breath or pain in the wall of the chest which is aggravated by deep breathing. Abdominal pain may also occur. These symptoms generally increase in severity as the tumor increases in size and its rapid growth impinges on vital organs in the chest and abdominal areas. X-ray techniques are of some help in diagnosing mesothelioma, but precise diagnosis is difficult and may require exploratory surgery of the chest or abdomen.

Mesothelioma in a worker exposed to asbestos is almost certainly an occupationally related disease. NIOSH is designing a mesothelioma tumor registry to study the etiology of the disease and to identify other possible causes in persons with no history of asbestos exposure.

A NIOSH epidemiologic study of workers employed in an asbestos manufacturing plant reveals some interesting trends in asbestos-related diseases in this country. The first mortality study reported in 1973 a statistically significant excess of deaths among both men and women workers due to lung cancer, asbestosis, and heart disease. In males an

excess of suicide was also shown. However, the workers were only followed for vital status through 1967.

A follow-up mortality study, which reported on the vital status of these same asbestos workers through 1975, again showed an excess of deaths due to lung cancer, asbestosis, heart disease, suicide, and a new observation, mesothelioma. The more recently observed occurrence of mesothelioma among these workers is not surprising, because of its long latency period.

Mortality statistics from this research suggest that the incidence of asbestosis at this plant has peaked and leveled off, and that lung cancer has also peaked and is beginning to level off. Mesothelioma, on the other hand, is just beginning to be observed among workers in this study population.

NIOSH Research

NIOSH and its predecessor organizations in the Public Health Service have been involved in asbestos research and disease prevention programs since the 1930's. The research programs have included efforts to measure and characterize asbestos fibers found in the work environment, to quantify the extent of disease among asbestos workers through epidemiologic studies and to support these epidemiologic studies with toxicologic experiments using a variety of asbestos forms. We also conduct research on control technology for asbestos, such as a recent

project to assess vacuum cleaning methods for collecting asbestos wastes.

The NIOSH program on asbestos has included a variety of public education and service functions. The Institute has supported worker education programs for asbestos workers in the San Francisco Bay Area and in Tyler, Texas. In collaboration with the National Cancer Institute, we are supporting a contract with the American College of Radiology to develop a syllabus on the recognition and diagnosis of asbestos-induced disease. The syllabus will include a set of radiographs which will be used to train physicians. Together with Johns Hopkins University, we developed a proficiency examination for certifying physicians in the radiographic identification of dust-induced diseases.

We continue to aid management, labor, and various Federal, State, and local agencies in solving asbestos related problems with technical guidance or training programs. Most recently NIOSH has agreed to assist the Consumer Product Safety Commission by testing hair dryers which contain asbestos.

## Occupational Standards for Asbestos

As evidence of its importance as an occupational hazard, asbestos was the subject of the first criteria document developed by NIOSH. This document served as the basis for the first new standard promulgated by the

Occupational Safety and Health Administration (OSHA) after the Occupational Safety and Health Act was passed.

The standard, promulgated in 1972, was intended primarily to prevent asbestosis and reduce the risk of contracting asbestos-induced cancer. It provided for an exposure limit of 5 fibers greater than 5 microns in length per cubic centimeter of air until July 1976, when the limit was to be reduced to 2 fibers per cubic centimeter.

The current standard for occupational exposure to asbestos permits a maximum of 2 asbestos fibers larger than 5 microns in length per cubic centimeter of air. This is not because fibers shorter than 5 microns do not pose a health hazard, but because shorter fibers are difficult to detect by the economically accepted method of analysis, phase contrast optical microscopy. The current limit actually provides for a broad range of exposure to asbestos. This is because the relative proportion of airborne fibers longer than 5 microns may vary from 1 to 50 percent of the total asbestos in a particular air sample. Thus, a work environment may be in compliance with the Federal exposure standard and still offer the possibility of exposure to rather large amounts of asbestos.

Even when one considers only the fibers 5 microns or larger, the total number of fibers a worker can inhale in a permissible occupational environment can be quite large. The average worker inhales 6-8 million cubic centimeters of air per working shift. In an atmosphere which complies with the standard, this could mean inhaling up to 16 million

"permissible" fibers per day in addition to the asbestos particles less than 5 microns long.

In 1976, NIOSH evaluated the studies published on asbestos since the criteria document had been transmitted. By then there was evidence that chest x-rays of British asbestos workers were continuing to show abnormalities despite exposures within a 2 fiber limit.

Based on this and other evidence, NIOSH recommended that OSHA further lower the standard to 0.1 fibers per cubic centimeter, the lowest concentration at which fibers could be reliably monitored by phase-contrast microscopy. In transmitting the revised recommendations to OSHA, NIOSH made the following comment:

> "Because it is not possible to specify a safe exposure level for a carcinogen, only a ban on the use of asbestos can ensure complete protection against this mineral's carcinogenic effect. Therefore, emphasis should be placed on prohibiting the occupational use of asbestos in other than completely closed operations and on substituting other products whenever possible. Asbestos should be replaced, where technically feasible, by substitutes with the lowest possible chronic toxicities."

If we are committed to assuring that workers and the general public are protected from asbestos exposure, additional research and service programs will be required. We have been participating on the asbestos subcommittee of the Department's Committee to Coordinate Toxicology and Related Programs to develop proposals for asbestos research initiatives.

Such research and service efforts should be directed toward evaluating and controlling current exposures, conducting a worker and medical education program on asbestos-related disease, and assessing the health implications of substitute materials. NIOSH has recently discussed with other subcommittee members the following suggestions for projects that might be supported by various components of HEW:

- A study to establish the essential uses of asbestos to assist with the goal of minimizing human exposure;

- A study to document the "life cycle" of asbestos from mining to disposal, describing all aspects of potential human exposure;

- A special program to support research in certain areas of health effects and control technology. This program should be particularly directed toward identifying and controlling existing exposures and evaluating the toxicity of substitute materials;

- A national reference laboratory for microparticle analysis and mineralogy to characterize materials and exposures and provide consistency in sampling procedures;

- o A public and medical information program on the management of asbestos-related diseases, including the basis for diagnosis, the effects of smoking, and the prompt treatment of respiratory infections; and

- o Creation of asbestos field teams with engineering, industrial hygiene and medical personnel to provide technical assistance to State, and local governments and to the public.

Sufficient research has already been conducted to establish the connection between asbestos-related diseases and workplace exposures. Moreover, the diagnostic criteria for identifying asbestos diseases are well established. Consequently, once diagnosis reveals asbestosis, mesothelioma, or lung cancer, and occupational exposure has been established, the disease can be presumed to be work-related. Sufficient research has also been conducted to conclude that asbestos is so hazardous that less toxic substitutes should be used whenever possible so that future generations of workers will not have to suffer dehabilitating or fatal asbestos-induced disease.

In discussing diseases which affect large numbers of people it is easy to lose sight of the individual in the statistics. I would like to read from a recent letter written in an unsteady hand by a physician who has been assisting us for several years in a mortality study of asbestos workers.

"You sent me a request for the records of three deceased patients. I have retired from medical office practice since June, since then discovered I have mesothelioma, was physician for Raybestos-Manhatten a few years ago and worked there during my college days." Abruptly we are reminded of the human suffering behind the statistics and the critical need to intensify our efforts to reduce exposures to toxic substances such as asbestos.

Mr. Chairman, my colleagues and I will be pleased to answer any questions you or other members of the Subcommittee may have.