

and gastrointestinal cancers.

- How does asbestos cause disease?

The answer is not known. Asbestos fibers too fine to be seen by the human eye become airborne during various industrial processes and are inhaled and subsequently may be swallowed. Scientists believe that the most harmful fibers are so fine that an electron microscope is needed to see them. Because of their size and shape, asbestos fibers can penetrate body tissues. Because of their durability, they remain in the body for many years after entry.

- How much asbestos exposure is hazardous?

The answer is not known. In the case of asbestosis and lung cancer, the risk increases with increasing amount of exposure. Asbestos-induced disease is not likely to appear until 15 to 35 or more years after first exposure. The time between first exposure and the appearance of disease appears related both to the amount and duration of exposure; more intense

exposure sometimes results in asbestos-related disease within 15 years. However, one study of workers in an asbestos plant showed that some workers who were exposed only a month or two have developed asbestos-related diseases many years later. Typically, the first 10 to 15 years after initial exposure are free of signs or symptoms. Early X-ray changes may appear in lung tissue after 10 to 15 years, but may not be accompanied by other significant symptoms. Some investigators have reported evidence of impaired lung function in workers with less than 10 years of exposure to asbestos.

- What specific diseases may increase in risk through exposure to asbestos on the job?

Asbestosis—This is a chronic lung ailment that can produce shortness of breath and lung damage. The disease results from inhalation of asbestos dust;

Lung cancer—There is a close association between asbestos exposure and increased occurrence of lung cancer;

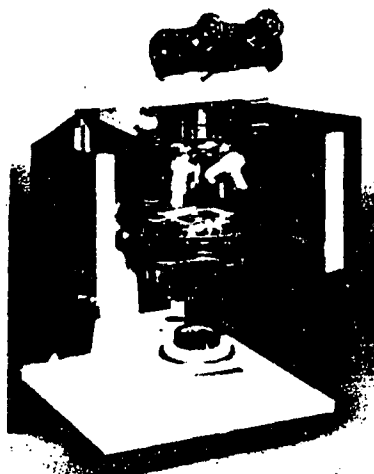


Figure 1 shows the special microscope developed to examine asbestos fibers, which have been exposed to a magnetic field in order to align the samples.

Mesothelioma—A cancer that involves the thin membrane lining the chest and abdomen. Most mesotheliomas can be traced to prior asbestos exposure;

Other cancers—Several studies have indicated a link between asbestos exposure and increased occurrence of cancers of the esophagus (food tube leading to the stomach), colon, stomach, and rectum.

- What are the signs and symptoms of asbestosis?

Asbestosis is a chronic lung disease whose signs and symptoms result from permanent changes in lung tissue due to asbestos exposure. The earliest and most prominent sign is shortness of breath on exertion. It rarely becomes apparent until at least a decade after first exposure. The disease process usually has to be rather advanced to produce shortness of breath. A dry, crackling sound (*rales*), coming from the lungs during inhalation, is the most characteristic physical sign of asbestosis. Clubbing of the fingers is sometimes found, usually later in the disease. A bluish discoloration of the skin and the lining of the mouth and of the tongue also may occur in the later stages of the disease. A physical exam with X-rays will show diffuse scar-



Figure 2 shows the computerized image analysis system that automatically detects and counts individual asbestos fibers within each sample.

ring of the lungs as asbestosis develops, and lung function tests will show impairment of the maximum volume of air a worker can inhale.

- Does asbestosis lead to lung cancer?

Scientists do not believe asbestosis necessarily leads to lung cancer, but the presence of this disease does indicate that a worker received considerable asbestos exposure and has a greater risk of developing asbestos-associated cancers than an unexposed person. Both types of disease can be caused by the same environmental agent, and the development of each may be independent of the other.

- What are the symptoms of lung cancer?

A cough, or a change in cough habit, is found in most lung cancer patients. Chest pain is the second most common symptom. It usually is felt as a persistent ache unrelated to cough and is commonly experienced on the side on which the tumor is located. Blood-streaked sputum, coughed up from the lungs, is the initial symptom of a small per cent of lung cancers.

- How is lung cancer diagnosed?