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Kenneth W. Smith and Hugh Jackson, "The Asbestos Industry: Certain Health Experiences Among Asbestos Worke…
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Fuel fabrication plants—that is, the manufacture of fuel elements for reactors and the chemical processing of source materials and special nuclear materials for them—are coming on the fuzy and lusty basis. Probably in another year it will be possible to review these plants which at the present time do not involve too many persons; in a year or two there may be enough lives exposed so that the insurance industry will want to know more about them.

Having a paper written for me by the AEC in much better form than I could give it to you, I will now introduce the guest speaker, with whom I have been acquainted for a number of years.

Dr. Smith graduated from McGill University, and after spending some time in the profession, became the chief medical officer of the Johns-Manville Corporation, Canadian Division. In 1943 he was promoted to Medical Director of all the Johns-Manville plants in both the United States and Canada.

I can speak for his experience and his knowledge of the types of exposure in which you are interested, because I have been privileged to work very closely with Dr. Smith and his associate, Mr. Hugh Jackson, who jointly carry out the Industrial Health Program of the Johns-Manville Corporation.

I think we are fortunate [illegible] and both Johns-Manville and Dr. Smith [illegible] to participate in this meeting and to bring [illegible] such data as are available to [illegible] organization of this [illegible] has been a joint project of Dr. Smith and Mr. Jackson's co-workers. Here to present these [illegible] Dr. Kenneth W. Smith.

The Asbestos Industry—
Certain Health Experiences Among Asbestos Workers

BY KENNETH W. SMITH, M.D., AND HUGH JACKSON

In this presentation I shall try to outline certain health experiences which we have seen in asbestos workers, not only in my own company but in many other associated companies.

While asbestosis is a well recognized occupational disease, there are relatively few people in the working populations of the United States and Canada who are exposed to asbestos dust, and actually, very few ever develop the disease. It will be shown that the lives of the asbestos workers are not shortened by their occupation, and also that work in these trades does not predispose the individual to other pulmonary diseases of nonoccupational nature.

The word "asbestos" is generally used to describe several fibrous magnesium silicates which are entirely different in their chemical composition and in their physical properties. There are several types of these fibers. The most important are the chrysotile, amosite, and crocidolite. Deposits of these various types of fibers are found throughout the world. The largest deposits are in eastern Canada and Africa.

These asbestos fibers are highly resistant to heat and some are resistant to acids. They have great tensile strength and large surface areas. Because of these properties, as well as their filamented structure, the industrial use of these fibers throughout the world is increasing. The textile industry has used these fibers for generations to produce blankets, clothing, threads, ropes, tapes, braided tubing, and fibers.

In recent years, however, there has been an increasing use of asbestos in the insulation, building, and friction material trades. In addition, the fiber can be found in millboard, shingles, pipe covering, floor tiles, brake linings and brake blocks, cements, putties, and extensively in plastics.

Historically the material has been used for many years. Those who are biblical students will recall that in the third chapter of Daniel the three men, Shadrach, Meshach and Abednego were thrown into the fiery furnace by Nebuchadnez-

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ner, the king of Babylon. They emerged from the fire completely unharmed, and archaeologists today tend us to believe that they were protected from the flame by a blanket of woven asbestos fiber. Thus we can see that the mineral has been used for many centuries, but it was not until 1935—thirty years ago—that a definite occupational pulmonary disease was associated with the inhalation of this fiber.

As previously indicated, the industry is finding many new uses for the fiber when mixed with other materials. It is an established fact that when asbestos fiber is mixed with silica or diatomaceous earth or other potentially toxic dusts, the pulmonary changes resulting from the inhalation of these mixtures are not typical of asbestosis. The X-ray pattern is different; the clinical course of the patient is changed, or the susceptibility to intercurrent infection is increased or decreased.

Thus, in making a diagnosis of occupational pulmonary disease, it is highly important to obtain a detailed occupational history; not only the job title, but also a complete list of raw materials used in the particular job, so that asbestosis, silicosis, or the mixed pneumoconioses can be differentiated.

We believe that there are fewer than 13,000 people in the United States and Canada who are employed today in mines and mills where their potential exposure is only to asbestos fiber. In the industry the various mining, milling, and manufacturing operations are those which are capable of being isolated. In asbestos there seem to be fifty variants in [illegible] which commercially used in sufficient quantities [illegible] period of many years, a typical pulmonary disease will develop. It has been demonstrated that this disease is not due to the chemical, but rather to the mechanical action of the fiber.

The fibers are deposited in the terminal bronchioles of the lungs. The [illegible] coating the fibers is [illegible] what is known as the asbestos body. This appears to be a defense mechanism of the lung.

Many individuals who have these asbestos bodies in their sputum have had only intermittent exposures to the dust and have absolutely no evidence of the disease. So it seems more appropriate to use the term "asbestos bodies" rather

than "asbestosis bodies," since [illegible] no exposure to the fiber has ever necessarily influencing them.

If increasing quantities of the [illegible] are continually inhaled, the tissue reaction progresses into a generalized, diffuse fibrosis or scarring appears throughout the lower lobes of the lungs. With additional exposure this fibrosis may spread to the other lobes of the lungs, resulting in a pulmonary embarrassment and eventually cardiac failure.

The pulmonary fibrosis resulting from prolonged inhalation of the fiber will produce a very typical X-ray pattern which does not resemble that produced by any of the other known toxic dusts. The X-ray pictures should never be used to estimate the presence or extent of an impaired pulmonary function or disability. Many [illegible] with X-ray evidence of advanced asbestosis have been [illegible] to carry on their work and live very comfortable lives for several years.

There is no typical clinical picture of asbestosis. The disease is very slow and insidious in its onset, and very slowly progresses with continued inhalation of the fiber. The earliest signs of dyspnea and clubbing of the fingers are usually associated in the cases of asbestosis we see today.

An X-ray survey was made of [illegible] employees working [illegible] asbestos mill where the ore was [illegible] crushed, separated and graded, packed and then shipped. Operations in this plant required the employees to [illegible] through various jobs so that it was impossible to [illegible] any X-ray changes to a particular job or to a specified dust concentration. At the same time, it could be assumed [illegible] all members of the group had been exposed to varying [illegible] concentrations of the dust.

The X-rays of these employees were divided into three groups: essentially normal; those with [illegible] but not typical of any disease; [illegible] all of the 708 employees [illegible] had normal X-rays. This is [illegible] employees, or 20 per cent of the [illegible] of service. Two men actually [illegible] forty years in varying dust concentrations [illegible] of any increased markings in their X-rays.

Fifty-two of the 708 employees showed some increase of all posthumous markings and [illegible] any [illegible]

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of asbestosis. Sixty-nine per cent of this group had more than ten years of service.

Of the original group of 708, only 7 had developed X-ray evidence which could be diagnosed positively as asbestosis. These men exhibited various stages of pulmonary involvement. All were working steadily at their jobs with no signs of disability. It is of interest to note here that none of the men developed X-ray evidence of asbestosis with under twenty years of exposure.

Medical literature has given considerable attention to occupational pulmonary disease, but very little has been reported on the occurrence of nonoccupational respiratory disease among employees in the dusty trades.

In order to determine the incidence of nonoccupational disease in a group of 1,261 men and women working in the asbestos industry, it was decided to study the claims submitted for sickness and accident insurance. All employees in the survey group participated in the plan operated by an independent insurance company. Indemnification was made only after the nature of the illness had been certified by the treating physician.

The study included claims submitted over a five-year period for such illnesses as the common cold, sinusitis, pharyngitis, grippe, bronchitis, pneumonia, asthma, and pleurisy. Occupational pulmonary diseases such as asbestosis were excluded from the report.

Of the 1,261 employees in the survey group, there were approximately equal numbers in the dusty and nondusty [illegible]. Of all claims filed for respiratory diseases, only 45 per cent were for employees who had a dust exposure. Not only did this survey show that the incidence of disease over the five-year period was approximately the same in each group; but it also established that there was no appreciable difference in the duration of illness in either group. Also, clinical observations for many years had given the impression that a dusty occupation in itself would not predispose a person to more nonoccupational respiratory disease than would a dust-free job.

Animal experiments and clinical observations have shown that asbestosis does not predispose a person to the develop-

ment of pulmonary tuberculosis. In fact, it appears as apparently healed tuberculosis heals. In two isolated one-industry towns in the Province of Quebec where asbestos was mined and processed, the incidence of tuberculosis over a period of many years was no greater than that of other isolated towns with comparable populations but without a dusty trade. In addition, the incidence of tuberculosis among asbestos workers was lower than that in the general population in these mining towns.

Conflicting opinions and different reports make it extremely difficult to confirm or deny conclusively the causal relationship of asbestosis and carcinoma of the lungs. Too often a conclusion is drawn from observations and experiences with different racial groups living in different parts of the world, under variable socio-economic conditions and working in diverse occupational exposures. To these variables I'd like to add the fact that there are the various types of asbestos fibers, which may have different effects on the lungs.

The Canadian experience with asbestosis has been limited to the chrysotile fiber. The majority of industrial processes in the United States use this fiber. Recently there has been some increase in the use of amosite and crocidolite. On the other hand, the British and other Europeans in Industries use greater quantities of the heavier fibers, amosite and crocidolite. Therefore, in trying to clarify the causal relationship of asbestosis in cancer, many variable facts should be clearly identified, especially the type of fiber used and whether or not other dusts, such as silica or arsenic, were present in the industrial or environmental atmosphere.

To amplify this point, I'd like [illegible] to describe the three types of asbestos commonly used today.

An electron micrograph of chrysotile asbestos [illegible] shows fibrils with sharp spicules which are rather fragile.

Amosite fiber is brownish yellow in appearance and found in Africa and Australia. Seen under the electron microscope at the same magnification as above, the fibers would appear longer, less sharp, and they actually are less brittle than the crocidolite.

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of asbestosis. Sixty-nine per cent of this group had more than ten years of service.

Of the original group of 708, only 7 had developed X-ray evidence which could be diagnosed positively as asbestosis. These cases exhibited various stages of pulmonary involvement. All were working steadily at their jobs with no signs of disability. It is of interest to note here that none of the more developed X-ray evidence of asbestosis arose under twenty years of exposure.

Medical literature has given considerable attention to occupational pulmonary disease, but very little has been reported on the occurrence of nonoccupational respiratory disease among employees in the dusty trades.

In order to determine the incidence of nonoccupational disease in a group of 1,311 men and women working in the asbestos industry, it was decided to study the claims submitted for sickness and accident insurance. All employees in the survey group participated in the plan operated by an industrial insurance company. Indemnification was made only after the history of the illness had been certified by the treating physician.

The study includes claims submitted over a five-year period for such illnesses as the common cold, sinusitis, pharyngitis, grippe, bronchitis, pneumonia, asthma, and pleurisy. Occupational pulmonary diseases such as asbestosis were excluded from the report.

Of the 1,311 employees in the survey group, there were approximately equal numbers in the dusty and nondusty [illegible]. Of all claims filed for respiratory diseases, only 15 per cent were for employees who had a dust exposure. Not only did this survey show that the incidence of disease over the five-year period was approximately the same in each group; but it also established that there was no appreciable difference in the duration of illness in either group. Also clinical observations for many years had given the impression that a dusty occupation in itself would not predispose a person to more nonoccupational respiratory disease than would a dust-free job.

Animal experiments and clinical observations have shown that asbestosis does not predispose a person to the development of pulmonary tuberculosis, nor does it aggravate an apparently healed tuberculous lesion. In two isolated asbestos mining towns in the Province of Quebec, where asbestos was mined and processed, the incidence of tuberculosis over a period of many years was no greater than that of other isolated towns with comparable populations, but without a dusty trade. In addition, the incidence of tuberculosis among asbestos workers was lower than that in the general population in these mining towns.

Conflicting opinions and dilatory reports make it extremely difficult to confirm or deny conclusively the causal relationship of asbestosis and carcinoma of the lung. Two of the common conclusions drawn from observations and experiences with different racial groups living in different parts of the world under variable environmental conditions and working in diverse occupational exposures. To these writers I'd like to add the fact that there are three types of asbestos fibers, which may have different effects on the lungs.

The Canadian experience with the asbestos has been limited to the chrysotile fiber. The majority of industrial processes in the United States use this fiber. It is usually there that some interest in the type of cancer was established. On the other hand, the British and other European literature was given considerable attention to the amphibole fibers, crocidolite and amosite. Therefore, in trying to study the causal relationship of asbestosis to cancer, many variables have to be carefully [illegible], especially the type of fiber used and whether or not other dusts, such as silica or [illegible] were present in the industrial or environmental atmosphere.

To amplify this point I'd like to take a few minutes to describe the three types of asbestos fibers commercially used today.

An obvious misnomer of the [illegible] is blue asbestos. Actually it is [illegible] sharp splashes which are rather brittle.

Amosite fiber is brownish yellow in appearance and is found in Africa and Australia. When under the microscope it resembles the same magnification as above. The fibers are of equal length, less sharp, and they actually are less brittle than the crocidolite.

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Crude chrysotile fiber found chiefly in Canada is greenish white in appearance. Electron micrographs show that this fiber is long, soft and silky.

I think that it is reasonable to assume that the short, sharp and brittle fibers such as crocidolite and amosite could cause much more extensive damage to the lung than could the long, soft, silky chrysotile fiber. Therefore, I think it is unfair to compare the experience of some of the European operations with our North American operations, using different types of fibers with different actions.

To amplify my statement that there are different occupational diseases having different X-ray pictures and different clinical patterns, I would like to describe the X-ray appearance of some of these diseases.

The X-ray in asbestosis shows a fine, diffuse, infiltration, bilateral in both lower lung fields. The heart outline is shaggy or completely obliterated. The nodular or conglomerate patterns of silicosis are not seen in asbestosis.

In silicosis the X-ray reveals a nodular infiltration which is bilateral and appears in all lung fields from apex to base. Conglomerate shadows may appear in any of the various lung fields. The honeycomb or ground glass appearance of asbestosis is not seen here.

The X-ray of tuberculous pneumoconiosis can show an appearance of all these markings, a very fine nodular or [illegible], and large confluent shadows usually [illegible].

[illegible] resulting from the inhalation of a mixture [illegible] show the same patterns and certainly are not typical of either of the inhaled dusts. In present-day welding environment a man might be exposed to mixtures of silica and metal oxides, such as silicates and silica. These would have many bizarre X-ray shadows showing [illegible] combinations of pneumoconiosis and of the pulmonary changes in the same individual.

Several years ago, anyone who installed insulation materials was called an asbestos worker, because asbestos was practically the only material used for this purpose. Today, however, there are mineral fibers, synthetic fibers, clays, cement, magnesia, and a host of other substances used in the insulating

trades. The majority of these materials are relatively non-toxic, and it is obviously incorrect to label the insulation installer today as an asbestos worker.

There are numerous articles in the medical literature today reporting the incidence of asbestosis or asbestosis and lung cancer among asbestos workers. The conclusions of the authors should not be accepted implicitly unless the report clearly indicates that the so-called asbestos worker was exposed only to asbestos fibers and not to a mixture of dusts.

One company in the group I am reporting has a retirement plan which has been in effect for eleven years. They have a total enrollment of slightly over 2[illegible] people; but, of course, this figure has varied slightly through the years. Since they started to use asbestos fibers just about 600 years ago, the following review of the pension plan will include employees who have had an exposure to the fiber over a long period of time.

In the past eleven years there were 1,185 employees who retired under the provisions of the pension plan. The average length of employment for this group was 16 years. Although we are unable to determine specific [illegible] many of these had extensive exposures to asbestos fiber. It is reasonable to assume that the majority had, since asbestos is used in nearly all of the product lines. Of the 1,185 there were 194 who retired for disability before reaching the age of 65. Only 6 of these had asbestosis.

This low incidence based on long-term contact with potential exposure would seem to indicate that the asbestos trade is not as hazardous as may have been believed in the past.

Conclusion

1. Asbestosis is a [illegible] disease and incidence in its onset. It takes many years of exposure to develop, it does not progress after exposure ceases, and there is very little disability until it is far advanced.
2. There are relatively few workers [illegible] only to this fiber in industry today.

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