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Malignancies in Asbestos Workers

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WITHIN recent years and months a considerable amount of evidence has appeared in the literature which indicates that asbestosis is directly related to the incidence of malignant tumors and cancer.¹⁻³

As early as ten years ago a Pennsylvania pathologist reported that he had seen at autopsies many cancer cases in persons who also suffered from asbestosis. The pathologist is on the staff of a hospital which receives most of the patients from a nearby town where a large asbestos producing plant is located. The findings of the pathologist have created concern in the asbestos industry and it was felt appropriate for the Pennsylvania Health Department to review the problem.

Exposures in the Plant

The following information was obtained from the files of the health department which has studied environmental exposures of workers in this plant on several occasions in the past 30 years. During this time there has been a tremendous improvement in dust conditions in all operations and dustiness has been held close to or below the present threshold limit.

The textile department used chrysotile, primarily, for many years. It was not uncommon for the milled fiber received by the textile plants to contain 30% or more of fines. The fiber of today is very much cleaner than that received prior to 1950. The use of light oil in the blending department began around 1955. This was helpful in improving conditions and minimizing dust. Prior to 1950 amosite was processed in small quantities for making thermal blankets. Although the processing of amosite never exceeded one card and the operations were at times intermittent, this operation was much dustier than from cards processing chrysotile. Crocidolite has never been handled in the textile department.

In the friction products operations extensive changes in the formulations have

Submitted for publication June 6, 1966; accepted July 1.

From Division of Occupational Health, Department of Health, Harrisburg, Pa.

Reprint requests to Division of Occupational Health, Department of Health, P.O. Box 90, Harrisburg, Pa 17120.

taken place over the past 30 years. Prior to 1945, coal tars and pitches were commonly used as impregnations in making brake linings, clutch facings, and packing materials. Since 1945, these have been essentially replaced by resins and other materials so that at present only a very small amount of tar and pitch is used in packing materials. A small amount of crocidolite is still used in making some packings.

The Study

Since asbestosis is a disease which, once established, progresses even after exposure to dust ceases, it was decided not to ask plant management for cases known to them. Instead, the record rooms of six hospitals which draw their patients from the area of the asbestos plant were checked for cases of asbestosis. Admissions only for the period between 1956 and 1964 were included. Seventy-five hospital records coded as asbestosis were located. Asbestosis was diagnosed in these people on admission, by x-ray, or at autopsy, or asbestosis was mentioned in the differential diagnosis.

After obtaining the 75 records, medical, occupational, and smoking histories were obtained for all these former patients. Many were deceased and their survivors had to be contacted. Other data were obtained from plant management. Seven either had not worked at the asbestos plant under study or the diagnosis had been changed. This left 68 asbestos workers who had worked at one time in the above-mentioned textile and friction materials plant. Further study of the records showed that 21 of these not only had evidence of asbestosis but also had suffered from malignancy. By the time of the

TABLE 1.—Number of Cases and Duration of Occupational Asbestos Exposure by Departments

Exposure Duration	Department			
	Textile	Friction	Textile and Friction	Unknown
Less than 10 years	1	0	1	1
10-20 years	3	3		
20-30 years	3	1	1	
30+ years	6		1	



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TABLE 2.—Summary of Cases Studied

Case	Birth	Death	Type of Tumor	Length of Employment in Asbestos	Type of Employment	Smoking	Remarks
1	1911	1962	Bronchogenic carcinoma, histologic type unspecified	1935-1957	Yarn twisting 1934-1962	12-15 cigarettes	
2	1906	1959	Squamous cell bronchogenic carcinoma	1923-1959	Weaver 1929-1959	1 pack/day	
3	1898	1958	Squamous cell bronchogenic carcinoma	1918-1928	Breakline weaver 1918-1928	No cigarettes	30 yr foundry work
4	1907	1961	Oat cell bronchogenic carcinoma	1927-1957	Weaving and later loom fixer	No cigarettes	
5	1895	1961	Squamous cell bronchogenic carcinoma	1947-1961	Laborer sweeper, picker bouse	1 pack+/day	Also cirrhosis of liver
6	1901	1956	Bronchogenic adenocarcinoma	Only 6 mo 1919	Weaver—later lath foundry worker	Cigars only	Probably not due to asbestos
7	1901	1957	Anaplastic bronchogenic carcinoma	8 mo only in 1923	Area unknown, later hotel operator 1923-1957 Linotype operator 1921-1923	No cigarettes	Probably not asbestos
8	1895	1956	Bronchogenic carcinoma, histologic type unspecified	1925-1937	Carding room, gardening for 18 yr thereafter	1 pack/day	
9	1897	1958	Squamous cell bronchogenic carcinoma	1922-1954	Weaver 1922-1954	Less than 10 cigarettes/day	
10	1906	1961	Alveolar cell carcinoma of the lung	1950-1960	Friction materials, laborer on lathe	Unknown	
11	1895	1960	Carcinoma of the lung, origin and type unknown	1926-1960	Inside driver in weaving room	No cigarettes	Diagnosis from hospital record no autopsy
12	1903	1956	Lung tumor, x-ray diagnosis	1919-1955	Loom fixer, machine shop foreman, toolmaker	2-3 cigarettes/day	
13	1907	1961	Anaplastic bronchogenic carcinoma	1928-1961	General foreman—spinning before last job	No	
14	1901	1961	Intra-abdominal adenocarcinoma, origin unknown	1934-1942	Most of the time in friction products, spinning 1932-1937, later upholsterer	1 pack/day	
15	1894	1956	Carcinoma of the colon	1922-1956	Weaver	5-10 cigarettes/day	
16	1884	1950	Lymphatic leukemia, chronicity unknown	6 mo only 1941	Sweeper and laborer June 12, 1941 Mechanics helper for 45 years for trucking company	No	Probably not due to asbestos
17	1901	1962	Malignant lymphoma	1926-1942	Carding room supervisor	No cigarettes, little pipe	
18	1888	1964	Chronic lymphatic leukemia	1938-1947	Laborer—handtrucker—supplied weavers with spools; farmer till 1937, sexton at church till death	Very few cigars only	8 coronaries
19	1877	1960	Acute leukemia, type unknown Carcinoma of throat, origin and type unknown	1922-1949	Shipping room only	5-10 cigarettes/day	1 asbestos
20	1895	1958	Multiple myeloma Carcinoma of prostate, metastatic	1935-1957	Weaver—loom fixer, textile foreman 1935-1947, packing mill 1947-1957	Pipe only	
21	1894	1957	Carcinoma of bladder	1917-1937	Supervisor friction mill 20 years 1917-1937, ice cream maker 20 years 1937-1957	1 pack+/day	

study all 21 had died. Ten of these cases have also been reported by O'Donnell in a

paper which appeared in *Cancer* in August 1966.⁴ Thirteen of these had lung cancer

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and eight had various other growths which included two abdominal cancers, one bladder cancer, two lymphatic leukemias, one acute leukemia, one lymphoblastoma, and one multiple myeloma. No cases of mesothelioma were in this group. There were four cases in former plant employees but these employees had been admitted to hospitals either prior to 1956 or after 1964 and because of that are not included in this study.

The diagnosis of the condition of these 21 patients had been established in 13 by autopsy, in four by operation, in two by biopsy, and in two by x-ray only.

The death certificates of all 21 were obtained. The malignancy diagnosis was reported on 15 death certificates. Six were signed out as follows: two as cardiac failure, one as coronary disease, and three as asbestosis. If death certificates alone had been utilized in this study, these six cases of malignancy would have been missed.

The smoking history of the 13 lung cancer patients revealed that five had never smoked, seven smoked, and in one case no smoking history was obtainable. Of the eight patients with other malignancies, three were cigarette smokers, two never smoked, and three were cigar smokers only.

Of the 21 patients with cancer, 13 had worked in the textile department of the plant only, for a sum total of 301 years. Four worked in the friction materials department for a total of 48 years. The department where one man had worked remains unknown and three others worked at various jobs which included both textiles and friction materials (Table 1).

Two of the 13 lung cancer and one of the lymphoblastoma patients had worked in the asbestos plant for a period of less than six months each, which is a rather short exposure. One wonders if this short exposure could have contributed towards their disease. Eighteen of these 21 patients had started work in the plant prior to 1940 and 12 had started work prior to 1920. Of the 21 patients with cancer 9 were between 50 and 60 and 12 were over 60 years of age (Table 2).

Comments and Conclusions

The incidence of malignancy in this selected group of hospital admissions with asbestosis was very high—21 out of 68. This is eight times higher than in the general

population 45 years of age and over, for the eight years of the study period.⁵

The incidence of 19% (or 16% if we do not consider exposures of less than one year) of lung cancer in this group of workers with asbestosis is comparable to that reported by Isselbacher¹ who summarized data of various authors and reported that of 603 persons with asbestosis, lung cancer was found in 83 (13.8%). It is also close to that reported in the literature review by Behrens⁶ who collected 44 cases of lung cancer (14%) in 309 patients with asbestosis.

Only three patients with these malignancies had their first exposure after 1940, when dust conditions had been much improved. A repeat study in the future may clarify whether this reduction of cancer occurrence in more recent employees is due to a latent period, to the age factor, or to the dust control measures instituted by the plant.

The patients with lung cancer were generally younger than those with cancers of other organs. Eight of those in the lung cancer group were under 60 and all eight of those in the other group were over 60 (Table 2).

Summary

A study of 68 hospital admissions with asbestosis from an asbestos textile and friction materials plant included 21 malignancies—13 of these were carcinoma of the lung and eight carcinomas of other organs. Eighteen of the patients had exposures to asbestos in their occupational environment for a period of 10 to 36 years. Only three patients had their first exposure after 1940.

Extensive dust control measures have been instituted by the plant.

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