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An Epidemiological Study of Lung Cancer in Asbestos Miners

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Ever since the pronounced increase in the incidence of lung cancer among males became apparent, there have been attempts to associate it with one or another of the various elements in the environment of man. The approach used by some workers has been to suspect one or several substances and then set about in an intensive search for lung cancer among persons who have had any exposure to those materials. In this connection, Smith [82] writes: "The tendency of authors reporting the coincidental occurrence of primary lung cancer with silicosis or with any other theoretical etiologic conditions, has been to emphasize the percentage relationship in extremely small series of cases, with control cases which are not in any way comparable."

It would seem inevitable that asbestos should come under scrutiny in this manner, because prolonged exposure to this material is known to cause a specific type of pneumoconiosis, and because persons who show this form of pneumoconiosis often come to autopsy and provide a ready source of material for study. It was in this way that reports of the simultaneous occurrence of lung cancer and asbestosis began to accumulate after the report of a case by Lynch and Smith [95] in 1935. Within the next 10 years, about 15 additional cases were reported, and in 1954 Merewether [76] reviewed all deaths from asbestosis recorded in England since March, 1924. Lung cancer occurred in 16% of these cases. Gloyne,[41] whose work is also frequently referred as establishing a connection between asbestosis and cancer of the lung, reported 1951 that cancer of the lung was pres in 14.1% of asbestosis cases examined him. In 1941, Nordmann and Sorg claimed to have produced lung cancer mice which they exposed to asbestos d

Since 1951, additional cases of cancer the lung coexisting with asbestosis h been reported, and, according to Huepe about 100 such cases had been reported to 1955. As a result, an association betw the two diseases appears to have been cepted by many authors, and several writ were using the term "asbestosis cancer" the lung. Werber,[89] in 1952, stated c gorically that in 7% to 17% of cases asbestosis, after a latent period of ab 1½ to 20 years, carcinoma becomes est lished in the lung.

On the other hand, not all authors cepted this alleged association with reservation. Saupe [80] in 1939 reported t he had discovered no cases of lung car among 620 cases of asbestosis which had examined; and in 1942, Holleb : Angrist [48] expressed the opinion that number of cases of asbestosis with h cancer was too small for statistical eval tion. In 1947, Wegelius [86] reported radiologically diagnosed cases of asbest among 476 workers in Finland, and fo no cases of lung cancer in this gro Goldblatt and Goldblatt in their section Merewether's latest book,[44] state: "But no stage in all these impressive researc was any clue obtained which might h offered any support to the possibility t asbestos could act as a carcinogen. Th

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Summary and Conclusions

and exposure to asbestos has been evident since the report in 1933 by Lynch and Smith of a case in which lung cancer and asbestosis were both present. As additional cases in which the two diseases coexisted were reported, a causal association appears to have been gradually accepted by many authors, although some workers considered the correlation to be inconclusive. The present study was undertaken in an effort to determine whether a causal relationship did, in fact, exist between exposure to asbestos and cancer of the lung.

Since most earlier studies had been limited to enumerating the lung cancers found in certain selected samples, such as cases coming to autopsy or death certificates in which asbestosis was mentioned, it was apparent that they could not fulfill the requirements of an epidemiological and statistical approach to the problem. The present study was, therefore, designed to meet the requirements of this method.

After a preliminary survey to explore the availability of reliable information, data were gathered on workers in the asbestos mines in Quebec, based on their medical records. A cohort was defined as a group of asbestos miners having at least five years of exposure and who were in the industry in 1950. Data relative to their characteristics were collected and their status at the end of a six-year period of observation was determined. In the case of those who had died, an exhaustive search of death certificates and insurance records was carried out in order to determine as nearly as possible the exact cause of death. Mortality rates from lung cancer for the general population of the Province of Quebec and its various counties and for the Dominion of Canada, as well as the United States were calculated from statistics collected in the appropriate places. Comparisons of the rates obtained for asbestos workers and for the other population groups were made according to accepted statistical methods.

Records were obtained on 6091 persons who fulfilled the criteria of the cohort. It was not possible to trace 133 of these the whole period, but 5771 of the remain 5958 were found to be still living in 1 or later. Of the 187 known dead, can of the lung was considered to have b reasonably proved in 9 and to be stron suggested in 3.

The members of the cohort were stud with respect to age, length of employme a weighted average of their exposure, a their smoking habits. It was found t 4673 were smokers within the definition that term as used in this study. Thirty-fo per cent of the cohort were more than years of age, and thirty per cent had be employed for longer than 20 years. Thi per cent had a weighted exposure wh placed them in the category of highest e posure.

The mortality rate for lung cancer, computed on the basis of nine "prove deaths among the cohort was 25.3 per 10 000. When the three "suspected" cases we added, the "total" rate for the cohort ro to 33.8. The importance of the suspect but unproved cases in determining the rates has been reiterated because it is like that such cases would not be included the statistics for the general population an because they influence the results so mar edly.

According to the findings in this study the mortality rate from lung cancer do not appear to increase with length of ex posure or with degree of exposure, a fa which presents strong evidence against th carcinogenicity of asbestos.

Comparison of the experience among th asbestos miners with that of various seg ments of the unexposed, comparable popu lation shows that the observed number o deaths among the miners is not significantl greater than the expected number. The rat for proved cases among the asbestos miner (25.3 per 100,000) compares well with th rate of 22.5 per 100,000 for the rest of th Province, and 20.6 per 100,000 for adu males throughout the Dominion of Canad It also compares satisfactorily with rate

of 37.2, 25.3, and 28.0 obtained from various sources for adult males in the United States.

Finally, in this matter of comparison, it would appear that the world-wide experience of persons exposed to asbestos dust is not worse with respect to lung cancer than that of the unexposed population.

The counties surrounding the asbestos-producing areas, in which it is presumed most of the asbestos miners live, have almost identical mortality rates with those of eight counties widely scattered through the Province, and are lower than those for the remainder of the Province, and much lower than the rate for Montreal.

Since 1940 there have been 19 cases in which the diagnosis of primary cancer of the lung may be considered to have been proved. Approximately half of these cases were associated with asbestosis. All but one died in the recognized "cancer-age" and at least one-third had only the lightest exposure (Category I) to asbestos dust.

On the basis of what are believed to be complete and reliable data, it seems fair to conclude that the asbestos miners in the Province of Quebec do not have a significantly higher death rate from lung cancer than do comparable segments of the general population.

Furthermore, the death rate from lung cancer in the areas contiguous to the asbestos operations is comparable to that in areas widely scattered throughout the Province of Quebec and is lower than in some urbanized areas within the Province.

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