

LUNG CANCER IN ASBESTOS MINERS

is no reliable criterion by which one can anticipate carcinogenicity and, as is well known, relatively minute changes in the structure of a chemical carcinogen are sufficient to diminish or eliminate carcinogenic action.

If asbestos is indeed to be regarded as a carcinogen, the need is felt to demonstrate some property which can be regarded as something more than inertness."

These authors advance the theory that, until some more experimental evidence of direct carcinogenesis by asbestos or a decomposition product of it can be obtained, asbestos might be considered as a "co-carcinogen" which only induces a further development of a preneoplastic condition brought about by something independent of the asbestos, such as an endogenous factor.

Thus the literature, while tending to support the thesis that asbestosis is in some way related to the development of lung cancer, is by no means unanimous. Altogether, it is perhaps more confusing than enlightening. A careful review shows that the majority of the reports are clinical and not epidemiological. They lack many elements necessary for the application of epidemiological techniques to their content, and most of the authors do not make claim to having done so. What has happened is that succeeding authors have drawn conclusions and generalized beyond the scope of the works which they quote. Nowhere, for example, have we found references to a *population* of asbestos workers, although several authors who have quoted the observed incidence of lung cancer in autopsies of *persons who also had asbestosis* imply that this incidence applies to asbestos workers, generally. We have likewise been unable to find any study which actually calculated the incidence of lung cancer among a population of persons who had asbestosis, and not just those who came to autopsy. With the exception of a paper by Doll,²⁸ none of those reviewed gave any data on exposure and dust concentrations, and even Doll's paper merely mentions

"scheduled" areas, by which is meant, "those areas where processes are carried on which were scheduled under the Asbestos Industry Regulations of 1931 as being dusty."

There is, furthermore, a complete lack of definition of terms as used in the published literature. For example, the term "asbestosis," as used, may refer to changes observable only by microscopic examination of the lung tissue, or it may mean a radiologically detectable condition.

Most of the published reports obviously included women among their cases, but some of them do not give the number or proportion of women involved in the study.

There is also a lack of uniformity as to what type of exposure most studies have dealt with. Of 99 cases enumerated by Hueper⁵⁸ in 1955, only 10 appear to have originated in the United States, and 7 in Canada. Some of the earlier reports apparently included asbestos miners, but it can be assumed, since 82 of the 99 cases had originated in England, and since no asbestos mining operations are carried on in that country, that most of the reported cases have involved workers in the textile or fabricating industries.

Such factors as smoking habits, family history of cancer, length of time in the industry, and age of the individual case are also notably absent in the majority of these reports.

With this understanding of the limitations of the existing literature with respect to epidemiological generalization, it may be of value to consider in somewhat more detail some representative earlier publications, a few of which were referred to briefly above.

One of the most detailed studies and one which deserves the most serious consideration is that reported by Doll²⁸ in 1955. This study reviews causes of death among asbestos workers based on coroners' records. It also attempts to estimate the risk by studying records of men who worked for at least 20 years in exposed situations.