

Carcinogenicity of Amosite Asbestos

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Few data exist concerning the comparative neoplastic potential in man of the several kinds of asbestos. In particular, there has been no evidence concerning whether the amosite variety is carcinogenic. The matter is of practical importance, since amosite use in the United States has sharply increased. The mortality experience of a group of 230 men previously employed in an amosite asbestos factory was studied during the years 1960 through 1971. Total deaths were more than twice the number anticipated: 46.4 were expected, and 105 occurred. Some 14 deaths were due to asbestosis. Both lung cancer and mesothelioma were found in considerable excess. Two or three deaths from lung cancer were expected, and 25 occurred. There were five deaths from mesothelioma. Occupational exposure to amosite asbestos can be associated with serious cancer hazard; its continued industrial use requires rigorous control.

Possible differences in the disease potential of the several common, commercially available varieties of asbestos fiber (chrysotile, amosite, crocidolite, anthophyllite) have been sought, since the use of asbestos might be guided accordingly.¹ Experimental studies were undertaken to seek such information. These have not indicated any critical differences; mesothelioma can be produced easily by intrapleural inoculation of various types of asbestos.² There is less information concerning experimental lung cancer.³

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Few data exist concerning the comparative neoplastic potential of the several kinds of asbestos in man. Some information is available for chrysotile,⁴ crocidolite,⁵ and anthophyllite.⁶ However, there has been no evidence to indicate whether or not the amosite variety is also carcinogenic.

In large part this has been the result of epidemiological difficulties. Since there is often admixture of fiber varieties under industrial circumstances, the experiences of employed populations are not always readily attributable to a single fiber variety. Diligent efforts have been made to investigate the occurrence of disease in the Transvaal in South Africa, the only area in which amosite is mined, and where populations exposed only to amosite could be identified. Environmental studies in this area, reported in 1964, showed no instance of mesothelioma in amosite miners and only isolated instances of carcinoma of the bronchus, although asbestosis was found.⁷ This survey has since been complemented by a study of miners in the area. No attempt was made to study the Bantu workmen who are in the majority, since labor turnover is very high, and "... records kept are such that follow-up of individuals over a period of time is impossible."⁸ The fate of white miners employed between 1954 and 1958 was investigated. Unfortunately, the records turned out to be imperfect and incomplete, since the white work force in these mines was unstable. Only 147 white miners could be followed at all, and only 20 of these were observed for more than 20 years after first exposure to asbestos. Among these 20, there was one instance of lung cancer and none of mesothelioma. Elsewhere, comment is made

removed and analyzed. They were invariably amosite.

5. We have extracted mineral fibers from the lungs of individuals in this cohort who had died. Large numbers of fibers were present. Electron diffraction and electron microprobe analysis showed them to be amosite,¹¹ except for the occasional chrysotile fibril expected to be present in the lungs of urban dwellers in this area.¹²

Results

The mortality experience of this group of workmen, 1960 through 1971, demonstrates that a serious health hazard was associated with this industrial use of amosite. Table 3 records expected and observed deaths.

Total deaths were more than twice the number anticipated: 164 were expected and 105 occurred. This excess death rate was limited to two categories: cancers of various sites and asbestosis.

Fourteen deaths were due to asbestosis, when virtually none was expected. That amosite can result in asbestosis has been previously recognized.⁷ In physiological studies of a select group of workmen at this particular factory from 1954, serious pulmonary insufficiency had been demonstrated.¹³

Both lung cancer and mesothelioma were also found in considerable excess. It was

anticipated that 2.4 deaths from lung cancer would eventuate; 25 occurred. The calculation of expected rates disregarded smoking habits, since the smoking habits of individuals not examined by us are not accurately known. In prospective studies from this point on, smoking habits will be taken into account.¹⁴

Mesothelioma caused five deaths: two pleural and three peritoneal. Each has been histologically verified in material obtained during operations in two instances and at autopsies in three. In one case, there had been prior chrysotile exposure; in four, only amosite asbestos exposure had occurred. Parenthetically, additional instances of mesothelioma have occurred among men working in this plant, other than in the cohort reported here.

It may be of interest that more deaths from cancer of the stomach, colon, and rectum have occurred than expected. The increase is only threefold, however. As with similar previous experiences, further observations are required before this association can be regarded as clearly established.¹⁵

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Field investigations were carried out by Dorothy Perron, Shirley Levine, Rayla Margolies, and Charles V. Nolan.

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