

Dust exposure and mortality in an American chrysotile textile plant

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ABSTRACT Three parallel cohort studies of asbestos factory workers were undertaken to investigate the effects of mineral fibre type and industrial process on malignant mesothelioma, respiratory cancer, and asbestosis. This report describes the mortality of a cohort of 2543 men, defined as all those employed for at least a month from 1938 to 1958 in a textile plant in South Carolina in which chrysotile was the only type of asbestos used. Of these, 863 men (34%) had died before 31 December 1977, one from malignant mesothelioma. Twenty one deaths were ascribed to asbestosis and 66 to cancer of the lung. Compared with the number expected from South Carolina, there was an excess of 30 deaths from respiratory cancer (ICD 160-164) in men 20 or more years after first employment (SMR 199.5). In men employed five years or more, no SMRs for this category rose above 300. Individual exposures were estimated (in mpcf × years) from recorded environmental measurements. Life table analyses and "log-rank" (case-control) analyses both showed a steep linear exposure-response that was some 50-fold greater at similar accumulated dust exposures than in Canadian chrysotile mining and milling. These findings agree closely with those from another study in this plant and confirm that mesothelioma is rarely associated with chrysotile exposure. Cigarette smoking habits did not greatly differ between the textile workers and the Canadian miners and millers. The far greater risk of lung cancer in the textile industry, if not attributable to other identified cocarcinogens, may be related to major differences in the size distribution of fibres in the submicroscopic range which are not detected by the usual fibre or particle counting procedures.

This study was planned in 1976 when it had become clear that there was a substantially lower risk of mesothelioma in workers employed in mining and milling chrysotile than in most other groups of asbestos workers.¹ As workers employed in the manufacture or use of asbestos products are usually exposed to amphibole fibres in addition to chrysotile the difference could well have been due to fibre type, as suggested many years earlier by Wagner *et al.*² There remained the possibility, however, that, for chrysotile at least, the explanation might also be related to the industrial process, with lower risks at the point of production than in manufacturing or use when the fibres are probably much finer as a result of mechanical forces. The experimental work of Pott, Stanton, and others (see review by Stanton³),

had already underlined this possibility; however, direct epidemiological evidence based on factory workers exposed only to chrysotile was too scanty to settle the matter. Accordingly we identified three factories, the one described here which used only chrysotile for textile manufacture, another which used only chrysotile for friction products, and a third which used chrysotile, amosite, and crocidolite in textile and various other processes. So far as mesothelioma is concerned the salient findings have been published⁴; they showed that this tumour was much more common in workers exposed to amphiboles, only one case being identified among 2341 deaths in the employees working only with chrysotile compared with 18 cases among 1429 deaths in those who had worked with mixed fibres.

In the meantime the chrysotile textile factory dealt with in this report had also been investigated by Dement and colleagues of the US Public Health Service (NIOSH).^{5,6} Their results on exposure-

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