PLAINTIFF'S EXHIBIT

UC-4088

Effects on Health of Exposure to Asbestos

Richard Doll and Julian Peto

This report was written at the request of the UK Health and Safety Commission. The authors tried to avoid going over ground which had already been thoroughly explored, and concentrated on two main questions:

1) The types of cancer which can be produced in humans by inhalation of asbestos fibres and
2) The quantitative evidence relating the intensity and duration of exposure to the effects observed, ie the dose-response relationship.

In considering 1) the authors reviewed the evidence on whether asbestos might cause cancer of the stomach and bowel, oesophagus, larynx, ovary, kidney and the lymphatic system. They concluded that any relationship between asbestos and cancer of the stomach, bowel, ovary and kidney was very unlikely. They did not feel that any relationship between asbestos and oesophageal cancer or lymphoma was indicated by the evidence, but the possibility could not be ruled out. But they did feel that the risk of the relatively rare cancer of the larynx should, like lung cancer, be regarded as increased in asbestos workers.

The remainder of the report is devoted to answering 2). Differences in effects of the three main types of fibres are considered first, and the authors conclude that crocidolite is more hazardous than chrysotile (with amosite somewhere inbetween) in comparable operations both as regards the mesothelioma and the lung cancer risk, although they do add that it does not necessarily follow that the hazard is less for the same fibre count, since data for crocidolite are not available. The discussion on whether chrysotile can cause mesothelioma is somewhat tortuous, and understandable only in the knowledge that Julian Peto nailed his colours to the mast of chrysotile's guilt some years ago, so the conclusion is that it can be associated with mesothelioma with some discussion on the possible responsibility of tremolite present as a contaminant.

There then follows a discussion on the meaning and value of earlier measures of airborne asbestos based on thermal precipitator and midget impinger readings and their relationship with later fibre counts by the membrane filter method. This provides quite a useful summary of the problems and uncertainties involved in any comparison between past and present measurements of exposure.

The final and major section of the report consists of estimations of the risk, in terms of dose-response, of a worker in the asbestos industry developing one of these main asbestos-related diseases.

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i Asbestosis. After reviewing previous attempts to calculate the dose-response relationship for asbestosis, the authors quote the conclusion of the Ontario Royal Commission that asbestosis will not be seen provided that lifetime occupational exposure does not exceed 25 f/cc years (f/cc years is equivalent to the average exposure in each year multiplied by the number of years worked). Doll and Peto agree with this conclusion and say that the threshold is unlikely to be exceeded in industrial conditions to be encountered in the future, so that asbestosis can be ignored in calculating long term health effects for asbestos workers.

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ii Lung Cancer. The authors review the evidence from their own study of the Turner and Newall textile factory at Rochdale and compare their results with those of the Quebec miners and millers and with studies of other factories which have combined mortality with estimates of individual exposures to asbestos. They list their assumptions and on the basis of these conclude that a man of 20 who works with chrysotile for 15 years at an average exposure of 0.25 f/cc incurs a risk of 0.3% of dying of asbestos-induced lung cancer (see table).

iii Mesothelioma. Calculations of the mesothelioma risk are based on Peto's model of risk calculation and also on the assumptions mentioned above that chrysotile alone in low cumulative exposures can cause mesotheliomas. On this basis it is concluded that a man of 20 working with chrysotile for 15 years at an average exposure of 0.25 f/cc incurs a risk of 0.1% of dying of mesothelioma (see table).

Predicted numbers of asbestos-induced deaths due to lung cancer and mesothelioma occurring before age 80 years among 1000 men in chrysotile textile manufacture exposed to a level of 0.25 f/ml^{-1}.

Age at first exposure (years)		Duration of exposure (years)			
		5	15	25	35
20	lung cancer	0.95	2.79	4.62	6.29
	mesothelioma	0.53	1.12	1.34	1.40
30	lung cancer	0.94	2.79	4.48	5.66
	mesothelioma	0.23	0.46	0.53	0.54
40	lung cancer	0.93	2.64	3.85	4.24
	mesothelioma	0.08	0.15	0.16	0.17

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The authors end by applying their dose-response calculations to exposures to be expected from asbestos in buildings. They calculate that the risk for someone working 40 hours/week for 20 years in an asbestos-containing building was approximately one per 100,000. They put this into perspective by saying that this is about the same risk as of smoking one tenth of a cigarette a day, or nearly one hundred times less than the risk for non-smokers of exposure to the cigarette smoke of others at home or at work for seven hours a week.

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Comments

The authors emphasise throughout the report the assumptions which have to be made to obtain their estimates, and the large uncertainty which must therefore be attached to their figures. Apart from this, however, their report is open to 3 major criticisms. Firstly, their assumption that a substantial risk of mesothelioma exists for factory workers exposed to low levels of chrysotile contradicts available evidence. Secondly, they base their risk calculations for mesothelioma on Peto's model, which is itself questionable. Thirdly, they dismiss, with a few uninformed and facile comments, the possibility (for which there is now very strong evidence) that the risk of asbestos-related lung cancer only arises when asbestosis is already present in the lung. The report contains some very valuable discussion of the problems involved in dose-response calculations of risks for occupational asbestos exposure, but the value of their conclusions is correspondingly reduced by their failure to meet these 3 criticisms.

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