

LETTER TO THE EDITOR

Response to Dr. Dunnigan's Commentary

It would be inappropriate and presumptuous of me to comment on testimony in litigation and the consequent outcome, as addressed in the commentary of Dr. Jacques Dunnigan (1988). A discussion of the question posed by Dr. Dunnigan is a most appropriate subject for an expanded dialogue in the Journal. Clearly, the role of chrysotile in the pathogenesis of mesothelioma is an important health and public policy issue.

Dr. Dunnigan summarized the relevant epidemiological information most appropriately. Succinctly stated, a substantial body of recent epidemiological evidence fails to establish an association of mesothelioma with exposure to commercially processed chrysotile, although a small number of cases have developed among miners and millers of chrysotile ores in Quebec, Canada [McDonald et al., 1980; Churg et al., 1984]. It is unclear whether the occurrence of mesothelioma in these workers is, in fact, unique to this asbestos mining region, for studies in Italy [Rubino, 1979], South Africa [Wagner, 1966], Soviet Union [Kogan et al., 1972], and China [Craighead, unpublished data] fail to demonstrate an increased prevalence of mesotheliomas among miners in these countries.

The contemporary literature suggests, but does not prove, that a contaminant of some chrysotile ores, tremolite asbestos, causes mesotheliomas in miners and millers in Canada [Churg et al., 1984; Pooley et al., 1986; Churg, 1986]. This claim is based largely on circumstantial evidence, i.e., the prevalence of mesotheliomas among persons environmentally exposed to tremolite in Cyprus and Greece [Yazicioglu et al., 1980; Wagner, 1986; Langer et al., 1987] and the occurrence of a few cases of mesothelioma among vermiculite miners in Montana [Amandus et al., 1985]. Of course, there are other possible explanations and the issue will remain unresolved in the absence of long-term epidemiological studies conducted on populations exposed to pure tremolite. Since knowledgeable scientists might disagree on this issue, it seems appropriate to maintain an open, objective posture, while additional information accumulates.

Animal studies are of little assistance in resolving the question. Although tremolite causes mesotheliomas in rats [Wagner et al., 1982], anthophyllite asbestos, fiberglass, and aluminum "whiskers" also induce tumors in animals [Stanton et al., 1972; Stanton, 1981]. These latter materials are not believed to cause mesotheliomas in man. The experimental work does demonstrate that a variety of fibrous materials

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possess the capacity to produce neoplastic responses in the body cavities of animals having the features of mesotheliomas in man [Craighead, 1987].

The mineralogy of tremolite is complex, for particulates vary considerably from nonfibrous to asbestiform in aspect ratio [Craighead, 1987]. If the Stanton hypothesis is correct [Stanton et al., 1972; Stanton, 1981], only those tremolite fibers with high aspect ratios would be expected to produce tumors in man. It is generally assumed that the cruder forms of tremolite are removed during the milling of chrysotile [Churg et al., 1987]. However, recent analytical studies indicate that tremolite fibers accumulate in the lungs of those who work with processed chrysotile [Pooley et al., 1986; Churg, 1986]. With possible exceptions, workers in these occupational groups have not developed mesothelioma. While the tremolite fibers are similar to tremolite in Canadian chrysotile ores, the concentrations in the lungs of workers are substantially lower than those found in the lungs of miners, millers, and residents of mining towns in Quebec. Assuming the correctness of these observations, the evidence argues either against a role for tremolite in the induction of mesothelioma, or for a threshold below which tremolite has no capacity to produce mesotheliomas (regardless of the aspect ratio and configuration of the fibers).

Commercial amphibole asbestos clearly is the major cause of mesotheliomas in the United States today [Craighead, 1987]. However, the issue of a mesothelioma threshold for amphibole asbestos is an important, unresolved matter. The EPA's claim that thresholds do not exist for asbestos, regardless of type, is a posture based on regulatory, not scientific considerations. The available data do not allow one to calculate a definable threshold but substantial circumstantial epidemiological evidence suggests that there are, in fact, thresholds below which mesotheliomas do not develop. In view of the exceedingly rare occurrence of an alleged mesothelioma in individuals working with processed, commercial chrysotile (and the background of exposure to commercial amphiboles in many of these cases) [Berry, 1986], I conclude that exposure to processed chrysotile has not been shown clearly to cause mesotheliomas. This conclusion is obviously contrary to widely publicized Federal policy, but it is clearly consistent with the existing scientific data. It is unfortunate that scientific considerations have not played a more important role in establishing public policy.

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