Fiber type

American Journal of Industrial Medicine 25:611–612 (1994)

PLAINTIFF'S EXHIBIT SA-529

LETTER TO THE EDITOR

Fiber Potency Vs. Importance

Key words: mesothelioma, chrysotile, tremolite, amphiboles, asbestos

INTRODUCTION

Drs. Hughes and Weill [1994] make the important point that fiber potency with regard to the induction of mesothelioma is distinct from fiber importance. We totally agree with them regarding this point. As noted in our paper [Roggli et al., 1993], the conventional wisdom regarding mesotheliogenic potency of the commercially valuable forms of asbestos, assuming equal exposures, is crocidolite > amosite > chrysotile. However, this ranking is based on the assumption of equal exposures, which in fact was not the case for asbestos workers in the United States in the past decades, as pointed out by Hughes and Weill. Our data indicate that exposures to amosite and tremolite-contaminated chrysotile were much greater among these workers than exposure to crocidolite. Hence, the ranking of *importance* of fiber type in production of mesothelioma among these workers is different from the ranking of fiber *potency*. We thank Drs. Hughes and Weill for clarifying this point.

Our conclusions regarding the approximately equal *importance* of chrysotile and crocidolite in the production of mesotheliomas in the United States is based on two assumptions implied in our article: 1) it is mainly fibers 5 μm or greater in length that are important in the pathogenesis of mesothelioma, and 2) it is the fibers that accumulate in the lung that are responsible for disease [Wagner and Pooley, 1986; Churg, 1988]. Since approximately equal numbers of chrysotile and crocidolite fibers with these dimensional characteristics were found in our study, it follows from the above assumptions that these two fiber types are of roughly equal importance in the causation of U.S. mesotheliomas. This finding also reflects the facts that chrysotile exposure was far greater than crocidolite exposure among U.S. asbestos workers, and that chrysotile (unlike crocidolite) tends to break down in the lungs into short (<5 μm in length) fibers that are more readily cleared. Some authors have suggested that the disparity in mesotheliogenic *potency* between chrysotile and crocidolite may be due to the role of contaminating tremolite as the causative agent in chrysotile-induced mesotheliomas [Churg, 1988; McDonald et al., 1989] since tremolite accounts for no more than 1% of chrysotile dust. However, the recent study by Bégin et al. [1992] indicates that it is by no means clear that tremolite is the causative agent in chrysotile dust-induced mesotheliomas among Québec miners and millers.

Address reprint requests to Dr. Victor L. Roggli, Department of Pathology, Box 3712, Duke University Medical Center, Durham, NC 27710.
Accepted for publication July 28, 1993.

No quantification of fiber concentrations by fiber type was included in our report [Roggli et al., 1993] so no comparisons with a control or reference population as suggested by Hughes and Weill were possible. We have analyzed fiber types and numbers by scanning electron microscopy in 120 cases of mesothelioma to date. In eight of these cases, asbestos body counts and asbestos fiber counts for each fiber type were not distinguishable from those of our comparison population as previously reported [Roggli, 1991; Roggli et al., 1992]. In about 20% of the cases, there was a concentration of chrysotile fibers 5 μm or greater in length which exceeded that of our comparison population. However, all of these cases also had elevated levels of commercial amphiboles, and no cases of mesothelioma had elevated levels of chrysotile only. Nonetheless, five cases had elevated levels of tremolite as compared to our reference population in the absence of detectable excesses of either amosite or crocidolite. These five mesothelioma cases will be reported separately (Srebro and Roggli, in preparation).

Thus, although we agree with Drs. Hughes and Weill regarding the distinction between fiber potency vs. fiber importance, we cannot agree that our conclusions regarding chrysotile are unjustified, based on the current study [Roggli et al., 1993] and the unpublished observations noted above.

Victor L. Roggli, MD
Department of Pathology
Durham VA and Duke University Medical Centers
Durham, North Carolina

Philip C. Pratt, MD
Department of Pathology
Duke University Medical Center
Durham, North Carolina

Arnold R. Brody, PhD
Department of Pathology
Tulane School of Public Health and Tropical Medicine
New Orleans, Louisiana

REFERENCES

Bégin R, Gauthier J-J, Desmeules M, Ostiguy G (1992): Work-related mesothelioma in Québec, 1967–1990. Am J Ind Med 22:531–542.

Churg A (1988): Chrysotile, tremolite, and malignant mesothelioma in man. Chest 93:621–628.

Hughes JM, Weill H (1994): Potency versus importance in fiber pathogenicity. Am J Ind Med 25:609–610.

McDonald JC, Armstrong B, Case B, Doell D, McCaughey WTE, McDonald AD, Sébastien P (1989): Mesothelioma and asbestos fiber type: Evidence from lung tissue analyses. Cancer 63:1544–1547.

Roggli VL (1991): Mineral fiber content of lung tissue in patients with malignant mesothelioma. In Henderson DW, Shilkin KB, Langlois SLP, Whitaker D (eds.): "Malignant Mesothelioma." New York: Hemisphere, pp 201–222.

Roggli VL, Pratt PC, Brody AR (1992): Analysis of tissue mineral fiber content. In Roggli VL, Greenberg SD, Pratt PC (eds): "Pathology of Asbestos-Associated Diseases." Boston: Little, Brown & Co., pp 299–345.

Roggli VL, Pratt PC, Brody AR (1993): Asbestos fiber type in malignant mesothelioma: An analytical scanning electron microscopic study of 94 cases. Am J Ind Med 23:605–614.

Wagner JC, Pooley FD (1986): Mineral fibres and mesothelioma. Thorax 41:161–166.