

EXPOSURE TO TREMOLITE FIBERS OF NATURAL ORIGIN IN EL DORADO COUNTY, CALIFORNIA

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In this paper we describe our studies of the El Dorado, California, naturally occurring tremolite asbestos. In the process of doing a day's fieldwork, with minimal visible dust, one of the authors (MG), a geologist and physician, documented his exposure to tremolite fibers. These fibers were recovered in purulent sputum the next morning in the setting of a brief and mild dust-induced bronchitis. A laryngeal washing of 400 cc, taken 3 months later, showed retained tremolite fibers in the process of oxidation and splitting, with a fiber concentration too high to measure without diluting the sample. The tremolite in samples from several field sites was analyzed by PLM, SEM, TEM, and SEM electron microprobe of polished sections. Sputum and washings were analyzed by PLM and by SEM and TEM, respectively. Crystallographic data indicate an oxidation/cleavage mechanism of fine fiber formation, resulting from progressive splitting along cleavage traces in massive to coarsely fibrous tremolite. High resolution TEM showed continuous double chains between conjoined fibers prior to splitting. In weathered samples, retained fiber, and fiber produced by hydrogen peroxide oxidation of crushed, optically continuous, fresh samples, longitudinal fiber surfaces were eroded irregularly by oxidation, cutting across cleavage planes and producing an amorphous oxidation product that sometimes clung to fiber surfaces. Oxidized fibers are highly electrostatic, linking in chains in undercoated environmental surfaces, and in "snowflakes" that periodically fall and cover residential dwellings after a light summer rain on hot, dry, tremolite-laden soil. Fiberization, emergence of flexibility, and spontaneous inter-fiber rotation were observed with progressive fiber splitting. The oxidized tremolite is itself highly oxidizing, suggesting mechanisms for induction of purulent response and oxidative carcinogenesis. TEM and HRTEM data are presented comparing tremolite samples from this locality with tremolite known to be carcinogenic in human epidemiological and experimental animal studies. Together, all these data indicate a potential risk of substantial exposure and consequent health risks from this naturally occurring asbestos for the population of the area. Of special concern are even low level exposures to infants and children as a result of development and subsequent disturbance of the exposed tremolite.

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