

Health effects and amphibole-asbestos in Libby, Montana, U.S.A.

M.E. Gunter

Department of Geological Sciences, University of Idaho, Moscow Idaho, U.S.A., mgunter@uidaho.edu

Since November 1999, the small town of Libby, Montana, has been at the center of the most recent and highly publicized asbestos issue in the U.S.A. A now-closed vermiculite mine operated within 10km of town and mined vermiculite from an altered alkaline-ultramafic intrusion. The ore was reported to contain up to 5% amphibole-asbestos. The amphibole, originally called tremolite, is actually winchite with small amounts of richterite, based on both XRF and electron microprobe analyses. Interestingly, winchite and richterite are not regulated mineral species of asbestos in the U.S.A. The experience at Libby should lead to the regulation of all species of amphibole-asbestos.

Health studies conducted on the miners in the 1980's showed elevated levels of asbestosis, lung cancer, and mesothelioma. Two recent studies conducted by the Agency for Toxic Substances and Disease Registry on Libby residents showed approximately 18% of the town's population has "pleural abnormalities," and eleven deaths were attributed to asbestosis with no increase in either lung cancer or mesothelioma rates. Currently, the United States Environmental Protection Agency is conducting on-site cleanup in Libby.

One of the developing major issues is the commercial product Zonolite that was manufactured from the vermiculate ore by heating it in vertical flow-through ovens for a few seconds to 1,000 °C. One of the main uses of Zonolite was as pour-in attic insulation. It is estimated that the product, which has been reported to contain as much as 1% amphibole-asbestos, was used in approximately 10 million American homes. The current estimate to remediate these homes is \$10 billion.

The major outcomes of our ongoing research on the Libby amphiboles are: 1) that non-fibrous and fibrous amphibole coexist over centimeter scales in the deposits in near equal amounts, 2) there does not appear to be a significant difference in the chemistry of the non-asbestos and asbestos samples, 3) the morphology of the amphiboles appears to grade from low aspect ratio fragments exhibiting (110) faces, to longer high aspect ratio fragments exhibiting (100) faces, to fiber bundles and masses, and 4) we found no amphibole or amphibole-asbestos in a bag of Zonolite. The major health issue is whether low-level exposure to Zonolite in home attics poses a significant cancer risk. The answer to this would seem to be no, based on the higher-level, longer-term exposures in Libby where there was not an elevated risk of lung cancer or mesothelioma.