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Naturally Occurring Asbestos in Southern Nevada: Interpretations for Distribution and Human Exposure

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Rock, soil and dust in southern Nevada and northwestern Arizona contain naturally-occurring amphibole asbestos. Mesothelioma data are strongly suggestive for environmentally-caused asbestos-related disease: although rates of malignant mesothelioma in Nevada are similar to the mean USA rate, there are increased percentages of cases in young individuals and women in southern Nevada, compared to the USA as a whole. In addition, a new toxicology study using mice, found that the amphibole fibers from northwestern Arizona were as much or even more toxic than those in Libby Montana for chronic immune dysfunction and lung and pleural fibrosis. The primary exposure route for these fibrous amphiboles is through inhalation. The asbestos minerals occur in areas frequently disturbed by activities such as off-road driving, hiking, horseback riding, and construction, which create dust and cause fibers to become airborne. Samples were analyzed using scanning electron microscopy and energy dispersive spectroscopy; additional rock samples were analyzed using wavelength dispersive electron probe microanalysis; additional soil samples were analyzed using polarizing light microscopy and transmission electron microscopy using the Fluidized Bed Asbestos Segregator preparation method. The source of the fibrous amphiboles are plutonic and metamorphic rocks. The fibrous amphiboles can be grouped into two general categories: calcic amphiboles (actinolite, magnesiohornblende) and sodium-bearing amphiboles (winchite, magnesioriebeckite, richterite). The calcic amphiboles occur throughout southern Nevada, whereas the sodium-bearing amphiboles occur in northwestern Arizona and are also found in specific locations in southern Nevada. Wind and water erosion, transport, and deposition over millions of years have resulted in widespread contamination of soils and sediments containing mixed calcic and sodium-bearing fibrous amphiboles. In a joint study with the US EPA, erionite/offretite, which had not previously been reported in this area, was found in 5 of 6 soil samples in and around Boulder City. The bedrock source(s) of the erionite/offretite is currently unknown, although numerous rocks in this region have the potential to contain these zeolite minerals. Wind directions in this region are primarily bimodal N-NE and S-SW with the strongest winds in the spring coming from the S-SW. There is evidence of wind deposition of fibrous amphiboles into soils at least 35 km away from their original bedrock sources and into areas lacking bedrock sources for fibrous minerals. The arid climate in this part of the Mojave Desert greatly increases the potential for wind erosion and therefore human exposures. These results suggest that the Las Vegas Basin has, at times, received mineral fibers through wind transport. The Las Vegas metropolitan area currently has a population of over 2 million people.