

Relationships between respiratory diseases and quartz-rich dust in Idaho, U.S.A.

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ABSTRACT

Quartz—one of the most abundant minerals in the Earth's crust—has been deemed a human carcinogen by the International Agency for Research on Cancer (IARC), with the main threat to humans being lung cancer through inhalation of dust particles. Currently, the United States Environmental Protection Agency (EPA) has required communities to monitor PM10 (particulate matter less than 10 micrometers in diameter) levels, with the concern that higher levels of PM10 have been linked to increased respiratory disease rates. This hypothesis can be tested by an analysis of mortality data for groups that have received high lifelong exposures to quartz-rich PM10 (e.g., farmers). Idaho is a very dusty state with a large agricultural community and can serve as a model to test this hypothesis.

A database was constructed of PM10 levels statewide and of all the deaths attributed to respiratory diseases in Idaho from 1969 to 1994. For the Moscow, Idaho, PM samples, quartz composed approximately 10% of the PM10, with the remainder being 30% feldspar and 60% Mount St. Helens volcanic ash. The PM2.5 samples contained no detectable mineral matter. Statewide, the quartz component for the PM10 samples ranged from 7 to 16%. Analysis of the database indicates that Idaho residents, in general, have below-average lung cancer rates when compared to the U.S. population and that Idaho farmers are at no greater risk of dying from lung cancer than non-farmers. These conclusions are based upon age- and smoking-adjusted standard mortality ratios (SMRs). No correlations or trends between PM10 levels and respiratory diseases could be found in the general population. Data for chronic obstructive pulmonary diseases (COPDs) are more difficult to interpret because of fewer deaths and the inability to compensate for the effect of smoking in the induction of these diseases; however, it appears that Idaho has a higher rate of COPDs when compared to the U.S. populations and that farmers have a higher rate of COPDs than non-farmers.