

Silica

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Exposures to Silica Mixed Dust and Cohort Mortality Study in Tin Mines: Exposure-Response Analysis and Risk Assessment of Lung Cancer

The results suggest that silicosis is a prerequisite for silica-related lung cancer. Risk of lung cancer did not vary with cumulative dust exposure if there was no silicosis. There was no correction for the effects of smoking.

A cohort of 7,837 tin miners, from 4 mines, was followed up from 1973 to 1994. Exposure assessment was based on hygiene measurements which began in the 1950s and took account of the introduction of control measures which became effective in 1958.

Mean cumulative exposures in this cohort were in the region of 55 mgm^{-3} years, total dust. Respirable crystalline silica comprised around 4% of total dust in each mine.

Exposures to total dust were grouped as follows: No (<0.1), Low (0.1 -29.99), Medium (30 - 69.99) and High (>70) mgm^{-3} years. With this classification we would expect around 10% to 20% of medium and high exposure people to have silicosis. Standardised mortality ratios (SMRs) for these two groups were 15.9 and 78.9 respectively, and the silicosis rate was 20% as expected.

Risk of lung cancer was significantly increased in the low, medium and high exposure groups: 2.65 (20) 2.66 (25) 3.33 (71) respectively; numbers in parentheses indicate number of cases. Correction for smoking history was not available, but it was noted that smoking rates were around 70% in all 4 mines.

Risk of lung cancer was much higher in those with silicosis and varied according to geology [respirable crystalline silica was present in the same proportion in all 4 mines, so some other mineral would be suspected].

In those with silicosis the risk of lung cancer varied with exposure; a clear rise in risk was detected once exposure to total dust exceeded 70 mgm^{-3} years.

In those without silicosis, the risk of lung cancer did not vary with cumulative exposure to total dust but was higher than the national average (SMR = 1.96, not corrected for smoking).

Comment

The study lends support to the contention that silicosis is a prerequisite for silica related lung cancer.

Geological variation in lung cancer risk suggests different minerals may be among the factors leading to increased risk in those with silicosis.