

Emphysema severity directly linked to coal dust exposure

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Coal dust exposure is directly linked to severity of emphysema in smokers and nonsmokers alike, according to new research from the National Institute for Occupational Safety and Health (NIOSH).

"In this study we have shown that coal mine dust exposure is a significant predictor of emphysema severity," said Eileen Kuempel, Ph.D., a senior scientist at NIOSH and lead author of the study.

The findings, which were reported in the August 1 issue of the American Thoracic Society's [American Journal of Respiratory and Critical Care Medicine](#) (*AJRCCM*), highlight a health problem related to a growing industry. In the past 25 years, coal production has nearly doubled worldwide.

Dr. Kuempel and colleagues compared lung [autopsy](#) results from 722 individuals, including 616 coal miners from West Virginia and 106 non-miners from West Virginia and Vermont. Those from West Virginia were collected from consecutive autopsies from 1957 and 1973 at the Beckley Southern Appalachian Regional Hospital as part of a black lung study. Those from Vermont were taken from consecutive autopsies performed at the University of Vermont between 1972 and 1978. Age at death, race, miner/non-miner status and smoking history were established where possible, and individual exposure to coal dust was estimated using work history data and job-specific dust exposure estimates.

Pathologists Francis Green, M.D., and Val Vallyathan, Ph.D., two of the coauthors on this study, examined sections of the lungs to determine the presence and extent of emphysema. A smaller subset of the study group had their lung tissue analyzed for dust content. Emphysema was graded for type and severity.

The researchers found that cumulative exposure to respirable coal mine dust was a highly significant predictor of emphysema severity after accounting for cigarette smoking, age at death, and race. Miners tended to be older at death than non-miners due to a higher proportion of accidental or other sudden deaths among the non-miners. Miners also smoked less on average, though differences were nonsignificant. However, emphysema in miners was significantly more severe than in non-miners among both [smokers](#) and never-smokers. Unsurprisingly, emphysema was also more severe among smokers than never smokers in both miners and non-miners. Coal mine dust exposure and cigarette smoking had similar, additive effects on emphysema severity in this study.

The lung tissue analysis corroborated these findings; the greater the concentration of coal dust in the lungs, the more severe the emphysema.

While the data were collected on miners who worked in the mines before the enforcement of the federal standard limiting legal coal dust concentrations to 2mg/m³ imposed in 1972, the study does have immediate relevance to current occupational safety standards. Even at the current federal standard, a full working lifetime's exposure would produce a cumulative exposure similar to the levels found in the autopsied miners.

"Based on our findings, exposure to respirable coal mine dust for a full working lifetime at the current 2 mg/m³ standard would increase the emphysema severity index by 99 points on average. This provides

additional evidence of the need to reduce dust exposures to 1 mg/m³ or less as NIOSH has recommended." said Dr. Kuempel. "Furthermore, miners in developing countries may be faced with exposure levels in excess of those reported here. Thus, the effects of dust that we report are relevant to current conditions in many countries, including the U.S."

A 99-point increase on the 1000-point emphysema severity index scale is equivalent to an approximately 10 percent increase in diseased lung tissue. Previous studies have shown that a 99-point increase in emphysema severity could mean the difference between "normal" and "abnormal" lung function or the worsening of existing lung function.

Coal mine dust exposure is now generally accepted as a cause of COPD, but this study will provide the basis for improved recognition of dust-induced COPD, its relationship to cigarette smoking, and may enhance efforts at prevention, diagnosis and medical management of occupational dust-related lung diseases, according to Dr. Kuempel.

"Coal employs over 7 million people worldwide, 90 percent of whom are in developing countries. Coal production has almost doubled in the past 25 years," notes Benoit Nemery, M.D., Ph.D., in an editorial in the same issue of the *AJRCCM*. "The environmental and climatic impacts of burning coal are, quite rightly, a source of concern. However, the direct consequences of extracting coal on the health of millions of coal miners must be an equal concern."

"Improving disease surveillance and awareness among healthcare professionals about the occupational components of COPD including emphysema can increase the effective detection and management of these diseases," said Dr. Kuempel.

Source: American Thoracic Society ([news](#) : [web](#))

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