

REVIEW OF CRITERIA FOR A RECOMMENDED STANDARD OCCUPATIONAL EXPOSURE TO RESPIRABLE COAL MINE DUST

A major goal of the 1969 Federal Coal Mine Health and Safety Act was to protect the respiratory health of coal miners in the United States. To achieve this goal limits on the amount of respirable coal mine dust which miners were exposed were set. The level chosen (i.e. 2 mg. per cubic meter of air) was felt adequate to protect the vast majority of miners from the development of significant coalworkers' pneumoconiosis over a lifetime of work. This standard was set, in part, as an extrapolation of information derived from experience in Great Britain.

Since the establishment of this standard, additional information and observations have become apparent in both this country and abroad indicating that the 2 mg. per cubic meter appears not to be adequate to protect against the development of significant pneumoconiosis, in that there continues to be an increased threat of the development of progressive massive fibrosis at this level. In addition, there has been convincing evidence from a variety of sources that coal mine dust exposure is capable of producing, in addition to pneumoconiosis, significant chronic obstructive lung disease. This chronic obstructive lung disease may, in fact, be independent of x-ray evidence of coalworkers' pneumoconiosis. Studies of lung function among United States coal miners demonstrates that the current dust standard in this country since 1970 is insufficient to protect miners from the development of chronic obstructive lung disease.

Because of the evidence that the current standard at the present limit of dust exposure in United States coal mines is inadequate for maximum protection of coal miners, NIOSH is justified and mandated to recommend changes in the exposure limit for coal miners.

Derivation of the Recommended Exposure Limit:

The data reported in the criteria for recommended standard adequately confirm that the current inadequate standard of dust exposure should be altered. Based on that data, the recommended standard of .9 mg. of respirable dust per cubic meter is reasonable.

Technical Feasibility of the Recommended Exposure Limit:

There was considerable discussion at the meeting concerning the technical feasibility of attaining the recommended dust level. There was opinion offered that this would be difficult, if not impossible in some long wall mining sections. There was discussion of the possibility of using some type of personal respirator protection under these circumstances.

Proposed International Definition of Respirable Dust:

There was general agreement that the proposed international definition of respirable dust be recommended as a criteria for sampling respirable coal mine dust and respirable silicon crystalline.

Improvements in the Coal Mine Dust Sampling Unit:

There was general agreement that improvements in the sampling device should be made, and there was support for the development of more than one type of device particularly in relationship to the estimation of crystalline silica.

Recommended Sampling Strategy:

There was general agreement that improvements in sampling strategies were essential for adequate estimation of dust exposure. There were recommendations for changing for sampling at higher levels of production than current regulations. Recommendations also for the inclusion of tamper-proof sampling devices, and most important, recommendations for increasing the number of NIOSH unannounced sampling and inspection of working faces.

Inclusion of Spirometry in the Medical Surveillance Program:

Current medical surveillance dictates only a chest x-ray at intervals for monitoring the health of coal miners.

There is a large body of medical evidence indicating coal mine dust exposure is capable of producing chronic obstructive lung disease independent of x-ray abnormalities. Therefore, in order fully to assess and monitor the health of coal miners, studies of pulmonary function in addition to x-ray monitoring should be provided. The x-ray is capable of detecting, to some extent, the development of coalworkers' pneumoconiosis. It adds no information concerning the functional status of coal miners. The x-ray may well remain abnormal for many years with no related symptoms and no related loss of lung function. The only means of detecting loss of lung function is objective testing of functional capacity. This is most easily performed by spirometry. Spirometric tests, therefore, would compliment the x-ray studies and provide a much more reliable estimate of the respiratory health status of coal miners.

Identification of individuals with impaired ventilatory function could identify miners at risk for the development of disabling lung disease and could also serve as an additional marker of the adequacy of environmental controls.

Discovery of pulmonary function values below normal or the finding of a significant decline in pulmonary function between successive tests should lead to a more thorough medical evaluation in order to verify the presence of reduced lung function, to determine the cause or causes of such loss of function, and to institute interventional strategies or possible therapeutic measures. There are obviously multiple potential causes for loss of ventilatory capacity aside from occupational dust exposure. These, of course, most prominently include cigarette smoking, occurrence of other types of lung disease such as bronchial asthma, or the occurrence of systemic diseases which could adversely affect lung function.

Interventional efforts such as smoking cessation could clearly benefit coal miners. (Please see: 1. Ingram, R. H., O'Cain, C.F., "Frequency Dependence of Compliance in Apparently Healthy Smokers Versus Non-Smokers" Bulletin of the Physiopathology of Respiration, 1971, Vol. 7, pp. 195-210. 2. McCarthy, D. S., Craig, D. B., and Cherniak, R. M., "Effect of Modification of the Smoking Habit on Lung Function", American Review of Respiratory Diseases, 1976, Vol. 114, pp. 103-113.) Treatment of such conditions as bronchial asthma or other possible systemic diseases could also aid on protecting coal miners' respiratory health.

The use of the history questionnaire could also identify individuals with significant respiratory symptoms might benefit from medical evaluation to determine possible occupationally related lung disease not apparent from spirometry, or to identify individuals with non-respiratory illness which should receive diagnostic evaluation and possible treatment.

Transfer of Miners with Evidence of Coalworkers' Pneumoconiosis or Chronic Obstructive Pulmonary Disease:

Evidence to date does not suggest significant prevention of the development of progressive massive fibrosis by transferring miners with early pneumoconiosis. It is not apparent, however, whether such early transfer may result in as rapid progression of the development of complicated pneumoconiosis or if such early transfer reduces the likelihood of pulmonary function impairment. One reason for the apparent failure to reduce progression of impairment probably rests with the fact that an active alveolar inflammation as a result of coal dust retention. (Please see: William N. Rom, etal, "Characterization of the Lower Respiratory Tract Inflammation of Non-smoking Individuals with Interstitial Lung Disease Associated with Chronic Inhalation of Inorganic Dusts", American Review of Respiratory Diseases, 1987, Vol. 136, pp. 1429-1434. Herbert Susskind and William N. Rom, "Lung Function in Coal Miners

Assessed by Uptake of ^{67}Ga -Citrate and Clearance of Inhaled $^{99\text{m}}\text{Tc}$ -labeled Diethylenetriamine Pentaacetate Aerosol", American Review of Respiratory Diseases, 1992, Vol. 146, pp. 47-52.)

The apparent failure to prevent development of PMF underlines the importance of additional measures to prevent the development of pneumoconiosis by further dust reduction.

There is no clear scientific evidence available from the literature assessing the effectiveness of transfer of individuals with evidence of early chronic obstructive lung disease. It does, however, seem intuitive that removing an individual from continued environmental toxicity should be of significant benefit. Transfer option however, should be on a strictly individual basis and other measures such as smoking cessation should be stressed at least equally. It is customary medical practice to remove individuals with chronic lung disease from exposure to extremes of weather, dust, fumes, smoke, etc. Based on this rationale, miners with evidence of dust related decrement in lung function should be offered transfer option.