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MEDICAL SURVEILLANCE PROGRAM FOR COKE OVEN WORKERS

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ABSTRACT

In 1976 a federal regulation controlling worker exposure to coke oven emissions in the United States became effective. This regulation requires medical surveillance of workers with exposure to coke oven emissions. This medical surveillance system is discussed. The experience of one company which has had a coke oven worker medical surveillance program for six years is reviewed.

Sputum cytology is done as a part of the medical surveillance program. The procedure for doing the sputum cytology examinations on approximately 6 000 coke oven workers is described. Preliminary data from the sputum cytology examinations on this group of coke oven workers is also presented.

In 1971, through a mutual interest concerning the use of serum alpha-A--antitrypsin levels as a potential preplacement prognostic tool for those individuals more likely to develop pulmonary problems, there was begun a study on a group of steel workers in Southern California. Joining in this study were Charles Mittman, M.D. and his group in the Respiratory Disease Section of the City of Hope National Medical Center, who have long had an interest in antitrypsin deficiency and abnormal proteinase inhibitor phenotypes[4,6].

The initial study, in 1971, involved both coke oven workers and non-coke oven area steelworkers. The study method involved a respiratory questionnaire, a basic physical examination and chest X-ray, pulmonary function testing and blood samples for alpha-A-antitrypsin levels. The results of this study have been published elsewhere[7].

In 1975, induced sputum cytologic examinations were initiated as a part of the annual examination of this group of workers because of our interest in the use of sputum cytologic examination for earlier detection of lung cancer. It has long been recognized that the combustion or distillation products of coal are carcinogenic[1,2,3,9]. Two epidemiologic studies by Lloyd in 1971[5] and Redmond in 1972[10] confirmed an increase in the incidence of respiratory cancer in coke oven workers. Both studies showed an overall coke oven worker mortality rate

from respiratory causes two-and-a-half times that expected. When the job location of these workers was studied, it was found that top-side workers with the highest coal tar exposures showed a five-fold increased incidence of lung cancer when compared to other steelworkers. The studies also showed that this risk increased with years of job exposure to about double in individuals with five or more years of top-side coke oven exposure.

At the present time, we view routine sputum cytologic studies in asymptomatic persons as a research tool. However, sputum cytologic studies are now a mandatory part of the annual physical examination required by the United States Department of Labor, Occupational Safety and Health Administration. As a result of the experience we have gained in obtaining and processing the induced sputum samples and their cytologic interpretation, we have been joined in the study this year by two other large steel producers. This enlarged study will encompass annual sputum cytologic examinations on approximately eight thousand workers with approximately ten thousand sputum cytologic examinations to be performed annually.

The first year's examinations have just now been completed and the analysis of the findings is now being started. We do know from prior studies[8] that in addition to their potential value for earlier detection of lung cancers, sputum cytologic studies have potential value as an index for individual susceptibility to lung damage and subsequent development of overt lung disease. The occurrence and quantity of specific cellular elements in the sputum will be correlated with various characteristics of the worker group, such as age, height, work history and smoking habits. Data from our previous studies indicate that the predictive potential for those individuals who will develop chronic obstructive lung disease are improved significantly when the sputum cytologic findings are taken into consideration along with these other factors. Such factors in the exfoliated cells in the sputum as the presence or absence of ciliated cells, metaplastic changes and the quantity of histiocytes and polymorphonuclear leukocytes suggest that the cellular response to the tracheobronchial irritants may be an index of individual susceptibility to lung damage and subsequent development of overt lung disease.

As increasing numbers of coke oven workers and other workers undergo the periodic medical examinations required by the Occupational Safety and Health Act, the cellular response changes and other indicators of increased susceptibility should enable criteria to be established for predicting reversible disease. Our findings suggest that the worker group is composed of individuals with a range of susceptibilities to the development of bronchitis and cancer of the lung. If these susceptible subjects can be identified during preemployment screening, or later through periodic examinations, then their work exposures can be modified by job transfer, specific protective devices, institution of therapy, or the use of anti-smoking counselling.

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