

Respiratory Morbidity Among Processing and Mill Workers

A Cross-Sectional Survey in Three Tire-Manufacturing Plants

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Three hundred seventy workers in three tire-manufacturing plants were studied to determine the presence of respiratory morbidity among workers with relatively low current exposure to respirable dust (range, 0.04 to 0.70 mg/m³). Workers in the processing, milling, and less dusty areas of the plants were divided into three groups on the basis of their current and past exposure to respirable dust. Significantly more eye irritation ($p < .01$) was found among workers in the milling areas. Workers in the milling areas who were current cigarette smokers had significantly ($p < .05$) more chronic bronchitis and loose or productive objective cough than all other current cigarette smokers. The mean forced expiratory volume in 1 s (FEV₁), when corrected for age and height, decreased significantly ($p < .01$) with increasing duration of cigarette smoking. The mean FEV₁ and the forced vital capacity (FVC), when corrected for age, height and cigarette smoking, were the lowest in the group with the lowest dust exposure and highest in the group with moderate dust exposure (the milling areas). The measurement of the difference in flow at 50% of FVC on air and on a helium-oxygen mixture is a sensitive test for small-airway obstruction in the laboratory. In the field, however, the helium-oxygen flow difference did not vary with duration of cigarette smoking as expected, and there was no significant variation by exposure category.

Several previous studies have been conducted of respiratory morbidity among rubber workers¹⁻³, and most have dealt with exposure to respirable particulates. The processing area where green rubber and chemicals are weighed, mixed and added to Banbury mixers was in the past quite dusty. In a cross-sectional study by Fine et al.,¹ 65 processing workers from three rubber plants were compared with 189 controls from the same plants. Processing workers had significantly decreased lung function when

compared with controls. Workers in the mill area where the output from Banbury mixers is milled also are exposed to respirable particulates, mostly fumes of various composition.^{4,5} These workers were not included in our earlier respiratory morbidity studies.

Since several of the U.S. rubber manufacturers and the United Rubber Workers Union initiated joint sponsorship of this research program in 1970, conditions have improved in the processing and mill areas of many rubber plants we had previously surveyed. The present study was undertaken to determine the current prevalence of respiratory morbidity among workers in the processing and milling areas of three rubber plants.

Methods and Procedure

All of the 284 male workers (exposed) in the processing and mill areas of three tire-manufacturing plants who had been employed at least six months were chosen for survey. One hundred fifty-five workers in the warehouse, tire-building, and laboratory areas of the three plants who had been employed at least six months were chosen as the comparison group. We selected the comparison workers to match in age the processing and milling workers. The exposure to respirable particulates of the comparison group was known from previous studies to be very low.^{4,5}

Twenty-nine (10%) processing and mill workers were not surveyed because 20 workers were ill, four refused, and five were on vacation. Similarly, 21 (13%) of comparison workers were not surveyed. An additional 11 mill and processing workers and eight workers in the comparison group were eliminated from the analysis because of incomplete data collection.

Questionnaire — A standardized questionnaire was administered to each subject by one of four trained interviewers. The questionnaire was a modified version of the British Medical Research Council Questionnaire,⁶ and consisted of questions concerning previous occupation, medical history, acute and chronic respiratory symptoms, and a detailed smoking history. Objective cough was also ascertained and recorded as dry, loose, or productive. Chronic bronchitis was defined as a daily cough for at least three months per year for more than two more years.

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Dr. MARK: Dr. Greene, are there any radiographic hallmarks of bronchocentric granulomatosis?

Dr. GREENE: The radiographic findings and clinical background of the patients that Liebow¹³ originally designated as having bronchocentric granulomatosis were variable. When the clinical situation and radiologic findings are suggestive of ABPA, with mucoid impaction, thickened bronchial walls, and coalescent lesions, the diagnosis of bronchocentric granulomatosis may be considered, but I don't know any way to make that diagnosis on the basis of radiologic findings.

ANATOMICAL DIAGNOSES

Bronchocentric granulomatosis.

Bronchiectasis, with mucoid impaction.

(Asthma).

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