



occupational health studies

NEWS LETTER

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INTRODUCTION

In this issue of the newsletter, we review the results of three separate studies which have been reported by the Occupational Health Studies Group - a mortality study; a disability retirement study; and a sickness absence study.

On October 22, Dr. Tony McMichael, physician-epidemiologist, presented a research paper to the annual meeting of the American Public Health Association in New Orleans. Dr. McMichael reported on a study of the association of leukemia and related cancers to specific job categories within a group of rubber industry workers. We have included a summary of his paper in this issue.

Also included in this issue of the newsletter is a report on the health testing of rubber workers that is taking place at the Firestone Pottstown plant.

A PROPORTIONAL APPROACH TO THE STUDY OF MORTALITY

In a study of the causes of death among workers from various rubber products manufacturing plants, the proportions of deaths due to specific causes were compared with proportions of deaths from the same causes in the general population and among workers from other selected industries. Deaths of white male wage and salary workers, ages 45-74 years, occurring during the period 1963-1972 were included in the analysis. The groups studied were from tire plants, industrial products plants, chemical plants, and other rubber products plants.

Among the causes of death examined, the ratios for cancers of various types showed the greatest elevation over what would have been expected for groups who had worked in tire plants. Cancer of the blood and lymph forming tissues were most noteworthy; the ratios appeared to be elevated in the groups from tire plants but not in those from other plants. Further investigation is underway to learn whether an environmental cause for these cancers can be identified. The ratios for cancers of the respiratory and digestive systems were also above expected among the tire plants, but the elevations were not as consistent as were those for cancers of the blood and lymph forming tissues.

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In the groups from industrial products plants, the ratios for cancers of the digestive system and cirrhosis of the liver were greater than expected. For groups from chemical plants and those involved with the manufacture of other rubber products, elevated ratios for deaths from circulatory conditions were demonstrated. The groups from chemical plants also showed a higher ratio for deaths from respiratory cancers than expected.

Over the next several months investigations will continue in our efforts to identify any environmental causes which may be associated with excesses of deaths from various diseases.

A PROPORTIONAL ANALYSIS OF DISABILITY RETIREMENT IN A TIRE PLANT

Disability leading to early retirement is desired by neither a worker nor his employer. The identification of types of injury and illnesses which lead to disability retirement is fundamental to the search for means to reduce such disability. In one study just reported, the nature of disabilities for all male wage workers who retired on disability between 1963 and 1972 from a major tire plant were analyzed. The disability retirement experience of these workers was compared with the experience of workers in other industries and in the rubber industry as a whole. The three conditions which appeared more frequently than would be expected, based on the comparison groups used, were diseases of the skin, respiratory disorders, and musculoskeletal conditions. Musculoskeletal disabilities were most prevalent in the older age group (55-64) while the respiratory disabilities were most prevalent in the younger age group (45-54). Higher than expected ratios for skin disabilities were seen among men of all age groups. Arthritis of the joints predominated among the musculoskeletal disabilities. Dermatitis was most prominent among the skin conditions. No single specific cause predominated among the respiratory disabilities. There appeared to be a causal association between excess skin and musculoskeletal conditions and the environment of the plant. The possibility does exist, however, that some of the observed excesses when compared with other kinds of industries, may be due to the scarcity of light duty jobs within the tire industry. Persons who, because of some dysfunction, might be shifted to less arduous tasks in some industries may be retired from tire manufacturing. Such seems especially likely in the case of musculoskeletal conditions. It is possible, also, that some of the skin disabilities which have occurred may be related to ethnic background or climatic conditions. These alternative explanations are now being investigated, and the disability experience in tire plants in other parts of the country is being studied for further comparisons. In addition, disabilities identified in this study are being related to the plant environment in an effort to identify conditions of work with which they might be associated.

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A PROPORTIONAL ANALYSIS OF SICKNESS ABSENCE IN A TIRE PLANT

A study of absence from work because of sickness among workers in a large tire manufacturing plant has been done. The population studied was comprised of male wage employees who were active on January 1, 1965, plus a sample of

people terminated prior to that time. All sickness absences since 1944 were recorded, and diagnoses were obtained on a 50% sample. An episode of respiratory disease known to have occurred in the 1960's was clearly evident in the results of the study. Sickness absence episodes demonstrated a steady increase in frequency from 1965 to 1972. This is viewed as more likely a result of improving or evolving social factors rather than of more intense or deteriorating biological factors. Generally, sickness absence because of respiratory conditions have shown a proportional decrease since 1964. Two-thirds of all sickness absences were attributable to accidents, respiratory, digestive, musculoskeletal, and cardiovascular conditions, ranked in that order from most to least frequent. This order of ranking tended to remain constant from 1964 to 1972.

THE ASSOCIATION OF LEUKEMIA AND RELATED CANCERS TO SPECIFIC JOB CATEGORIES
WITHIN THE RUBBER INDUSTRY - Tony McMichael, M.D., Ph.D.

A study of workers from one Akron tire plant revealed an excess of deaths from cancers of the lymphatic and hematopoietic tissues. The excess was greatest within the active working age-range, 40-64, and was most elevated for leukemia (a three-fold excess) and lymphosarcoma and Hodgkin's Disease (a two-fold excess). Analysis of proportional mortality rates at other plants revealed a similar, albeit smaller, excess.

To investigate the relationship of these types of cancer to specific work-environment exposures, a case-control study was carried out. Eighty-eight cases of death with a cancer of lymphatic and hematopoietic systems (leukemia type cancers), 1964-1973, in all plants, were compared with a group of 264 controls (i.e. rubber workers who died of some other non-cancer cause), to determine if any significant differences existed in the types of jobs these two groups of workers had in the rubber industry.

The controls were individually matched (three controls per case) with the cases on age, race, sex, and plant, in order to eliminate any differences in work-history between the two groups (i.e. cases and controls) due to these characteristics. In this way, any remaining differences in work-history could more confidently be related to the presence or absence of cancer.

Work-histories were coded according to the Occupational Title (OT) classification system developed by Occupational Health Studies industrial hygienists. The essential classification criterion is to group individual jobs according to process type and materials handled. This classification system sometimes combines, sometimes subdivides, and sometimes both combines and subdivides existing company department job-groupings.

The initial comparison of cases and controls, in terms of the 70 individual Occupational Titles, yielded few significant differences in work-history. For six of the OT's, the proportion of cases with some work experience in that OT exceeded the proportion of controls by one-half. The greatest difference was for the Tire Repair Occupational Title.

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To facilitate the subsequent statistical analyses, and to take account of the evidence from other research suggesting an association between benzene exposure and leukemia, the 70 individual OT's were then grouped into ten OT Groups (OTG's) - three solvent-exposure OTG's and seven non-exposure (to solvents) OTG's. (The specific chemical compound benzene, identified here, should not be confused with the commercial solvent benzine, which is different and ordinarily consists of a mixture of aliphatic hydrocarbons.) Preliminary analysis of OTG differences between all 88 cases and all controls identified no significant differences. However, when the analysis was restricted to the 17 cases of lymphatic leukemia and their matched controls, a significant difference was observed in the amount of time spent in the solvent-exposure OTG's. On an average, each individual case spent about 7 years more in these job areas than did each control - i.e. an average of approximately 11 years per case versus 4 years per control.

On the other hand, there was no evidence of a significant association between solvent-exposure jobs and death from lymphosarcoma and Hodgkin's Disease, nor from myeloid leukemia.

On closer examination of the job patterns of the lymphatic leukemia cases and their controls, the greatest difference was for jobs in the Tire Repair Occupational Title. Further, the exposure of each of the four cases who had worked in this area was wholly since 1945. This may possibly indicate the presence of some leukemogenic chemical (perhaps a solvent) that has been used in significant amounts since around 1945.

While this study has demonstrated a significant association between lymphatic leukemia and jobs in the solvent-exposure OTG's, it is not possible (because of the fewer number of cases available) to yet discount an association of lymphosarcoma, Hodgkin's Disease, and myeloid leukemia with work-environment exposure. Further study is necessary.

HEALTH TESTING AT POTTSTOWN

The reporting early this year of angiosarcoma of the liver among vinyl chloride (VC) workers has implicated VC monomer as a potential carcinogenic hazard. As a result, the National Institute for Occupational Safety and Health (NIOSH) and the Center for Disease Control (CDC) selected the Pottstown Firestone plant as a pilot plant to study the following:

- 1.) The best diagnostic laboratory procedures for detection of liver disease as well as other functional disorders
- 2.) The identification of workers with liver or other medical abnormalities which might be related to either VC or PVC (polymerized VC)

Because UNC's Occupational Health Studies Group had already begun a study of the total population of this plant, UNC, NIOSH, and CDC agreed to collaborate

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in an examination of workers. In October, 1974, 535 workers were given a battery of health tests lasting approximately 2 hours and 15 minutes per worker. These tests consisted of a routine chest X-ray, questionnaire, breathing tests, and a complete physical examination. In addition, blood, urine, and sputum were collected for analysis. Those who worked over 10 years in the chemical plant were, in addition, given hand X-rays and a liver-spleen scan, a common clinical test for diagnosing liver and spleen disease. One hundred seventy rubber workers who had not worked in the chemical plant were included in the testing for comparison purposes. The Occupational Health Studies Group also conducted breathing tests on 50 workers before they began a work shift and after they finished that shift to determine if there was an acute effect of the work experience on their breathing.

The Occupational Health Studies Group is planning to health test several hundred more rubber workers in February and March.



Mr. John Gamble of the Occupational Health Studies Group administers pulmonary function tests to a rubber worker as Dr. Mario Battigelli, industrial-physician for the study group, examines the results.

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PERSONNEL NOTES

There have been several recent additions to the environmental laboratory staff. Mrs. Carolyn Bishop is a new research technician who holds a B.S. degree in biology. Two other recently appointed research technicians, Mrs. Jean Cantrell and Mr. Joe Williams, hold degrees in microbiology and chemistry, respectively. In addition, three graduate students are working in the laboratory. Mr. Tim Martin and Mr. John Roberts are graduate students in the Department of Environmental Sciences and Engineering, and Dr. Roger Grimson, who is working on quality control in the laboratory from a statistical point of view, is a post doctoral student in the Department of Biostatistics.



Dr. Roger Grimson



Mr. Tim Martin

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Mrs. Carolyn Bishop



Mrs. Jean Cantrell and Mr. Joe Williams



Mr. Robert Holbrook



Mr. Wayne Gerber



Mr. John Roberts

Mr. Wayne Gerber has joined the Occupational Health Studies staff as a research assistant for the Firestone team. Mr. Gerber has a B.A. degree in psychology and is presently coordinating activities concerning the Pottstown questionnaire.

Mr. Robert Holbrook is a new epidemiologist working with the Firestone and General teams. Mr. Holbrook is a UNC degree candidate for the Master of Science in Public Health and is currently working on the bladder cancer study.

Dr. Mars Longley, industrial hygienist with the Goodyear research team since the beginning of the project, has left the Occupational Health Studies Group. Dr. Longley has accepted a position with Standard Oil of Ohio as manager of industrial hygiene and toxicology. He will be greatly missed by our research group, and we wish him well in his new work.

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The Occupational Health Studies Newsletter is published and distributed by the Occupational Health Studies Group. We welcome your suggestions and response. All correspondence should be addressed to:

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