Morbidity and Mortality in Workers Occupationally Exposed to Pesticides

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Abstract. Utilizing cause-of-death information and responses to questionnaires addressed to survivors, mortalities and health impairments in a cohort of workers occupationally exposed to pesticides were compared to occurrences in workers not pesticide exposed, over the period 1971-1977. Seventy-two percent of 2,620 pesticide-exposed workers, and 75 percent of 1,049 “controls’, recruited in 1971-73, were accounted for either by returned questionnaire or mortality. Disease incidence rates were studied in relation to broadly defined occupational subclasses, and to serum concentrations of organochlorine pesticides (OCI) measured at the time of recruitment.

Death by accidental trauma was unusually frequent among pesticide applicators. Mortalities from cancer and arteriosclerosis were not detectably different from those observed in the controls. Among survivors, dermatitis and skin cancer were unusually common in structural pest-control operators. Internal cancer was no more frequent in the intensively pesticide-exposed workers than in the controls, but it appeared to occur at an unusually high rate in workers characterized as “possibly pesticide-exposed”.

There were apparent associations between high serum pesticide OCI levels measured in 1971-73 and the subsequent appearance of hypertension, arteriosclerotic cardiovascular disease, and possibly diabetes. This could imply a causal role of any of the pesticidal and other environmental stresses to which these workers were exposed.

The limitations of this type of followup study are discussed.

A national program to monitor the health status of persons occupationally exposed to pesticides (Simmons 1969) enlisted 3,669 volunteer participants in 13 states from 1971 to 1973. At least one set of vital, occupational, hematologic, biochemical, and blood organochlorine pesticide (OCI) data was assembled from each subject, and was filed in computer-retrievable form with the Health Effects Monitoring Branch (HEMB), Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency, Washington, DC.
the 3,669 subjects, 2,620 were engaged in occupations bringing them into contact with pesticides. The remaining 1,049 participants were individuals whose occupations did not involve handling of pesticides.

An analysis of the occupational, blood OCI, biochemical, and hematologic data collected over these years has been published (Morgan 1978). Briefly, certain subtle relationships of OCI concentrations to particular indices of liver function were suggested by the data, but no clear indications of health-damaging effects of prolonged pesticide exposure were borne out. The present report describes an effort to recontact these subjects in 1977 and 1978 for the purpose of inquiring into the occurrence of disease, injury, and symptoms from the time of recruitment to the end of 1977. In addition to assembly of morbidity data, known mortalities have been tabulated and analyzed according to underlying causes of death. Analyses have sought relationships between disease incidence rates and characteristics of pesticide exposure: primarily, the occupational circumstances, and the blood concentrations of particular OCI pesticides to which workers had been exposed.

At the time of recruitment, the study subjects were employed full time. Those identified as "pesticide-exposed" had been engaged in their respective occupations prior to 1971. They were recruited from the localities of the Community Pesticide Projects in Arizona, California, Colorado, Hawaii, Idaho, Iowa, Michigan, Mississippi, New Jersey, South Carolina, Texas, Utah, and Washington.

Because of the extreme qualitative and quantitative diversity of chemical exposures experienced by pesticide-handlers in agriculture and industry, no attempt was made to select a random sample of such workers. Even though this shortcoming detracts from the overall significance of this study, the assembled data do offer some insights into serious hazards in the pesticide-using occupations. In addition, the effort to extract useful information from this ambitious epidemiologic effort has made clear some essential guidelines for any similar investigations that are undertaken in the future.

Methods

The Original Cohort

To provide a cohort for continuing study, the Community Studies Projects recruited workers in various occupations that involved personal contact with pesticides. Following an initial interview, examination, clinical laboratory work-up, and blood analysis for pesticides, these individuals were recontacted and examined at three-month to yearly intervals, until the "long-term study" was terminated in 1973. Prior to that time, most of the collected data had been deposited in computer-retrievable form with HEMB. Although these data provided the basis for the following study, many informational errors had to be corrected by the State Projects, on the basis of original records, before the data were usable.

Twelve of the projects (Washington an exception) found it nearly impossible to recruit controls matched individually by age, race, sex, and work environment to such large numbers of study subjects—usually 100 to 300 workers per project. In fact, assembly of a control cohort did not commence until 1971, when it became apparent that pesticide-related health injuries were not so common that they could be demonstrated without a control cohort for comparison. Some of the controls ultimately chosen were engaged in physically demanding outdoor labor similar to that performed by pesticide-exposed subjects, but in several projects, controls included office workers,