CARCINOGENICITY OF CHRYSOTILE ASBESTOS: A CASE CONTROL STUDY OF TEXTILE WORKERS

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Chrysotile is the predominant type of asbestos used in the United States and thus represents the most important source of exposure to asbestos already in place. While the steepest exposure-response observed for lung cancer has been in workers exposed to chrysotile in textile operations, some argue that chrysotile is less carcinogenic than amphibole asbestos types. Mineral oil exposures have been hypothesized to be responsible for the highly elevated lung cancer risk seen in textile workers. A lung cancer case-control analysis among a cohort of South Carolina chrysotile asbestos textile workers was conducted. Only a modest reduction in the slope of the lung cancer exposure-response relationship was observed after controlling for mineral oil exposures. These data do not support mineral oil exposure as a plausible explanation for the elevated lung cancer risk seen in chrysotile asbestos textile workers. The possible role of longer, thinner, more carcinogenic fibers in textiles is one plausible hypothesis needing further investigation.

INTRODUCTION

Chrysotile is the predominant type of asbestos used in the U.S. historically and thus represents the most important source of exposure to asbestos already in place. The carcinogenicity of chrysotile has been the subject of considerable debate with some arguing that chrysotile is less carcinogenic than other asbestos types (Mossman et al., 1990). The major arguments most often presented in support of a reduced carcinogenic risk for chrysotile are as follows: 1) many chrysotile exposed cohorts

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2. Key words: Asbestos, Chrysotile, Cancer, Textile Workers
have been shown to have appreciable lung burdens of amphibole fibers, the so-called “Amphibole Hypothesis” and 2) extremely steep lung cancer exposure-response consistently observed in chrysotile asbestos textile workers is attributable to exposure to mineral oils used in textile processing. The possible role of exposures to longer, thinner fibers in textile operations has been suggested (Dement et al., 1983; Hughes and Weill, 1986; Dement and Wallingford, 1990).

This manuscript investigates the possible role mineral oil exposures in textiles through a nested case-control analysis of a cohort of chrysotile textile workers. In addition, data concerning the possible role of tremolite contamination of chrysotile are critically examined.

METHODS

In order to further investigate the possible role of mineral oil exposures in the South Carolina textile plant which used chrysotile, a nested case-control study has been conducted among the cohort studied by Dement et al. (Dement et al., 1983). This cohort comprised 1261 white males who were employed at least one month in textile operations between January 1, 1940 and December 31, 1965 with cohort follow-up through December 31, 1975. Cumulative asbestos exposures were estimated for each individual using historic exposure information in connection with detailed work histories (Dement et al., 1983). Cases for the current analyses include 35 lung cancer deaths generated by the cohort study. Four controls were chosen for each lung cancer case by incidence density matching on age at risk (Pearce et al., 1989a, Pearce et al. 1989b).

Mineral oil exposure for cases and controls was qualitatively assessed using historic descriptions of mineral oil use in each textile process in conjunction with detailed work histories. Mineral oil was added to the process following the preparation operation. The following quotes were taken from a 1930 industrial hygiene report from this plant (Metropolitan Life, 1930):

“As this mixture (asbestos and cotton) is discharged from the picker, it is sprayed with a light mineral oil.—The material is saturated with about 4% of oil at this point, but by the time it reaches the looms, the oil has diminished to less than 1%.”

Based on this information, textile operations were assigned to one of three qualitative mineral oil exposure groups as shown in Table 1. Cases and controls were assigned to the oil exposure group in which they were employed the greatest period of time. Stratified analyses were performed and Mantel-Haenzel summary odds ratios (Mantel and Haenzel, 1959) calculated in order to control for mineral oil exposure as a possible confounder in the association between cumulative asbestos exposure and