

Our continuing survey extends the observations of these authors and indicates that pleuro-pulmonary disease can occur under the conditions of nonoccupational exposure as experienced in the homes of asbestos workers. Of the household contacts with occupational exposure to asbestos, only 19 were aware that they were or had been working with asbestos. Individuals who reported having done brake repair work in the past, worked in shipyards, or performed general maintenance work involving pipe insulation, had the highest prevalence of abnormal x-rays (more than 50%). Of special interest is the group of household residents who entered the index worker's home shortly *after* his active employment period had ended. This group of 33 individuals did not show an increased prevalence of small opacities. However, they did have a statistically significantly increased prevalence of pleural abnormalities when compared to the urban New Jersey resident controls. It would appear that pleural changes are a better indicator of environmental asbestos exposure than are parenchymal small opacities.

The proportion of household contacts who had the more classic appearance of asbestosis, with both parenchymal small opacities and pleural abnormalities, was small (TABLE 6). This again indicates the importance of assessing pleural disease in nonoccupational settings.

The appearance of asbestos-associated disease has been shown to depend upon duration and intensity of exposure. The longer and more intense the exposure, the sooner the disease could be expected to appear and, conversely, the shorter and less intense the exposure, the longer the time (latency) before an increased prevalence of disease could be demonstrated. As in occupational groups, increasing duration of exposure was associated with a higher prevalence of abnormalities in our study group. The effects of duration of exposure and time since onset of exposure were most marked for the pleural abnormalities. Individuals with more than ten years of exposure had four times as much pleural thickening and three times as much pleural calcification as individuals with less than one year of exposure. There was less than a two-fold increase in the prevalence of combined small opacities between the two groups. Forty percent of individuals first exposed between 1941 and 1946 had an abnormal x-ray compared to only 22% for those exposed first between 1950 and 1954. The data presented here demonstrate the time dynamics for the appearance of radiographic abnormalities after household asbestos exposure. It appears that there is a longer period of latency between first exposure and appearance of radiologic abnormalities under the conditions of household asbestos exposure.

The observation that sons have twice the prevalence of radiographic abnormalities of daughters is an interesting one. One possible explanation for the difference would be that the sons had a longer duration of exposure. However, it can be seen from TABLE 12 that the sons and daughters had the same mean duration of exposure. Further investigation of these differences is being made. The observation that nearly one-half of the wives examined had abnormal x-rays is consistent with the hypothesis that the wives would have been most heavily exposed because they were responsible for the laundering of workclothes and resided in the household for the longest period of time.

Dyspnea, which is often the initial complaint of occupationally exposed asbestos workers, was present in 10% of individuals with parenchymal small opacities on their chest x-rays compared to only 4% of individuals with normal chest x-rays. No statistical association between dyspnea and pleural changes was seen although a similar trend was apparent. Dry rales, commonly heard in asbestotic patients, were also more prevalent among the household contacts with abnormal chest x-rays. Nine percent of the individuals with abnormal x-rays had rales present on physical examination compared to only 3% of individuals with normal x-rays. Rhonchi,

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