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Leading Work-Related Diseases and Injuries -- United States

The National Institute for Occupational Safety and Health (NIOSH) has developed a suggested list of the 10 leading work-related diseases and injuries (1). The first two categories, "Occupational Lung Diseases" and "Musculoskeletal Injuries," were recently described (1,2); a discussion of the third category, "Occupational Cancers (Other than Lung)," appears below.

OCCUPATIONAL CANCERS (OTHER THAN LUNG)

Cancer kills approximately 430,000 people in the United States annually; the American Cancer Society estimates that some form of cancer will develop in one-fourth of all Americans (3). It is the second leading cause of death and the second leading cause of lost years of potential life in this country (4). A high proportion of all cancers are thought to be caused by "extragenetic" factors, including behaviors (e.g., cigarette smoking, alcohol and drug use, and sexual activities) and toxic environmental exposures in the workplace and the community (5). Evidence for these relationships has been developed principally through epidemiologic and toxicologic studies. The main epidemiologic observations have included: differences in the incidence of cancer between groups with different exposures, changes in the incidence of cancer following migrations, changes in the incidence of cancer over time, etc. Toxicologic studies have led to the identification of specific agents that cause cancer in experimental animals (5).

A possible occupational origin for malignant disease was first recognized when an unusually high frequency of scrotal cancer was observed among London chimney sweeps in 1775 (6). Since then, several types of cancer have been associated with industrial agents or processes (Table 1) (7). Numerous other occupational agents--such as beryllium, cadmium, ethylene oxide, phenoxy-acetic acids, and chlorophenols--or processes--such as newsprint pressroom work--are suspected of being carcinogenic and are under investigation by NIOSH.

Although general agreement exists concerning the overall incidence of cancer, considerable controversy surrounds the proportion of cancer cases attributable to occupational exposures. Several characteristics of cancer contribute to the difficulty in making such estimates:

1. Latency in the development of cancer. Occupational cancer usually becomes evident long after initial exposure to the carcinogen; this interval may vary from 5 years to more than 40 years (9), making it difficult to characterize important exposures long past.
2. Influence of exposures to multiple carcinogens. Cancer victims may have been occupationally exposed to many carcinogens; interaction of these agents or interactions between them and other factors may greatly increase the risk of cancer (10).
3. Influence of behavioral factors. Cigarette smoking, alcohol drinking, and dietary habits also influence the development of cancer (11). Moreover, these factors--especially cigarette smoking--interact with chemical and physical agents in the working environment to increase the risk of cancer (12); e.g., exposure to asbestos interacts with cigarette smoking to greatly increase the risk of lung cancer. In addition, problems with the documentation of cancer and the

nature and extent of etiologic exposures obscure important epidemiologic associations:

1. Errors in diagnosis and classification of cancer. Unusual neoplasms are often misdiagnosed; even correct diagnoses may be improperly categorized according to the International Classification of Diseases (ICD); an example is mesothelioma (10).
2. Lack of meaningful occupational histories. In only a few states is information collected on the work histories of cancer victims; hence, for many cases, crucial associations with occupational carcinogens are not apparent.
3. Difficulty in assessing exposures quantitatively. Precise measurements of levels and duration of exposures have not generally been available (13). Consequently, the ability to delineate dose-response relationships has been very limited.
4. The frequency of specific types of cancers. The occupational etiology of a very rare cancer due to a specific agent (e.g., hemangiosarcoma of the liver due to vinyl chloride) is much more readily documented than the occupational etiology of a cancer type potentially caused by several factors (e.g., lung cancer associated with exposure to chromates).
5. The "dilution factor." Highly significant differences in the rates of cancer among small subgroups of a population may be overlooked because these rates affect the overall rate for cancer in the larger study population only slightly, if at all (8). Despite these difficulties, various attempts have been made to

estimate the proportion of cancers related to occupation. These estimates span a broad range, from less than 4% (5,14) to more than 20% (15). While these estimates are obviously imprecise, little doubt remains that occupational factors are significantly related to an increased risk of cancer. Moreover, in specific groups of workers exposed to specific carcinogens, the proportion who ultimately develop occupational cancer may be large. Of one group of workers distilling beta-naphthylamine who had more than 5 years of exposure, all reportedly developed tumors of the bladder (17); up to 11% of workers exposed to asbestos may ultimately develop mesothelial tumors (16). Reported by Div of Surveillance, Hazard Evaluations, and Field Studies, NIOSH, CDC.

Editorial Note

Editorial Note: Cancer caused by occupational agents, especially synthetic chemicals, is a problem of human origin, and should, therefore, be preventable. Substitution of noncarcinogens for carcinogens, enforcement of protective standards for exposure, design and application of

engineering controls, and use of personal protective equipment by exposed workers are major modes of prevention.

Although it is difficult to predict a trend for the future incidence of occupational cancer, the increased volume and diversity of synthetic chemicals manufactured since World War II (18) raise serious concern about the risks from exposure to these substances. However, improved control technology, governmental regulatory activity to reduce exposures, surveillance of disease and risk factors, and vigilant use of preventive measures will ultimately reduce occupational cancer.

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 - Additional references are available on request from the National Institute for Occupational Safety and Health, CDC.

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