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A Case-Control Study of Chemical Exposures and Brain Tumors in Petrochemical Workers

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The relationship between chemical exposures and deaths attributable to primary brain tumors among employees of a Texas petrochemical plant was investigated. Cases consisted of 21 deaths in which the underlying cause was confirmed as a primary brain tumor. Two control groups of 80 employees each were randomly selected from 450 decedents known to the company in June, 1979. Potential exposures while employed were compared between cases and controls for five known or suspect carcinogens. Exposure potentials were also compared for an additional 37 chemicals to which at least four cases were potentially exposed. Overall and 15-year latency analyses were performed. The proportion of cases exposed to the five potentially carcinogenic chemicals (including vinyl chloride) were lower than or consistent with the proportion of exposed controls. No statistically significant differences between the proportions of cases and controls exposed to the 37 other chemicals were found.

In mid-1978 a cluster of brain tumor cases (deaths) was identified among former employees of the Union Carbide Corporation (UCC) chemical plant in Texas City, Tex.[1,2] As a result of a formal employee request to the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH) and UCC initiated a two-pronged investigation to determine the likelihood of an occupational association with this cluster. The first prong of the investigation was a retrospective cohort mortality study of all employees who ever worked at the Texas City Plant and a comparison of their overall mortality experience (through December, 1977) with the mortality experience of a comparable segment of the U.S. population. The second prong of the NIOSH investigation was a case-control study to identify any exposure or work areas that were shared in common by the brain tumor cases.

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In addition to assisting NIOSH in data collection requirements for its studies, UCC also initiated studies independently of NIOSH. The purpose of this report is to describe results of an independent UCC case control study.

Purpose

The principal purpose of this study was to identify any occupational factors that could serve to distinguish the brain tumor cases from a randomly selected sample of all former UCC employees. Specifically, the study was intended to assess the likelihood that exposures to known or suspect carcinogens at the UCC Texas City plant could have been related to the occurrence of the brain tumors among the population of employees who ever worked at the plant.

A second purpose of the study was to attempt to replicate the results of the NIOSH case-control study using an independently selected comparison population. This was considered an appropriate objective, since the validity of these studies often depends on the adequacy with which the comparison populations selected for study represent the underlying population from which the cases were drawn. Since both the UCC and NIOSH studies selected samples of the UCC Texas City employee population to serve as "controls," both studies are subject to some degree of sampling error that could lead to spurious results. Although these studies are not totally independent, the chances that both studies will obtain the same spurious results are rather small; therefore, the results of the two analyses, taken together, should provide some assurance that a positive association between some chemical and the brain tumor cases will not be missed.

Methods

The methods used in this study involved comparisons between the proportion of brain tumor cases exposed to a particular chemical during employment at Texas City with the proportion of non-brain tumor controls exposed to the same chemical during employment at Texas City.

Carcinogens – The five known or suspected carcinogens that were studied in this investigation include benzene, ethylene dichloride, ethylene oxide, diethyl sulfate and