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SUBJECT: 8EHQ-1198-14311

I am writing to advise you that on 5 August, 1999 investigators from the University of Alabama at Birmingham School of Public Health (UAB) and Johns Hopkins University School of Hygiene and Public Health (JHU) presented preliminary results of a case-control study of primary intracranial tumors to employees of the BP Amoco Naperville Complex in Illinois. The BP Amoco Naperville Complex (BPANC) was formerly known as the Amoco Research Center in Naperville. This is the final phase of a five-part health investigation being conducted independently by researchers from UAB and JHU.

Since 1996, the researchers have completed four phases of the health investigation including a case series study, a site-wide cancer incidence study, a site-wide mortality study and a 500 building complex cancer and tumor incidence survey. The investigators have found that overall, people who have worked at the facility enjoy better health than the general US population. Specifically, employees of the facility have a substantially lower death rate (49 percent lower) for all causes of disease when compared to the general population, and substantial deficits of deaths from most major medical conditions including cardiovascular disease, respiratory disease and cancer.

While the rate of brain cancer is normal for the population of the entire site, it has occurred at an unusually high rate and in a unique pattern among chemical researchers in the 500 building complex. No other unusual patterns of cancer have been identified. The pattern that has emerged shows that all six people with glioma were chemical researchers in the 500 building complex - including five working on the third floor of the buildings' 503 wing. They worked at the center for an average of 17 years. All worked in the building during the mid-70s to early 80s, and many of the individuals worked with projects involving similar chemicals and agents.

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The following is a summary of the preliminary case-control study results that were verbally reported to employees by the investigators. I have also included specific actions recommended by the Naperville health investigation task force going forward.

In this final phase, the investigators conducted an exposure assessment and case-control study to evaluate the likelihood of a link between work at the facility and the unusual occurrence of six malignant (glioma) and six benign primary intracranial tumors among BPANC chemical employees who worked in the 500 building complex. The case-control study was designed to determine if potential exposures to specific agents are more common among individuals with primary intracranial tumors when compared to an age and gender-matched control group.

The exposure assessment used two databases to determine all subjects' potential contact with agents of interest – one based on work history interviews with each of the subjects (or a surrogate), and a second based on data gathered from historical project documents. The study identified approximately 6,000 chemicals or other agents and classified these into 30 general categories to refine the analysis. According to the investigators, this is the first time a study of this scale has ever been performed at a research center and it presented several difficulties because of the large number of agents to which the cases and controls had potential exposure.

Analysis of these databases indicates a statistically significant association between glioma and work activities involving low level ionizing radiation and relatively long-term use of *n*-hexane. However, because of the small size of the study and the possibility of exposure misclassification, the investigators believe that a firm conclusion about particular agents is not possible.

Additionally, BP Amoco monitors all employees exposed to radiation. A review of records since the site opened in 1970 indicates lifetime exposures to ionizing radiation for all employees are lower than the allowable exposure limit for one year. Radiation sources used on the site included level gauge detectors and small amounts of radiolabeled compounds used in experiments. The solvent n-hexane was phased out of most processes at the Naperville Complex beginning in the early 1980s because scientific evidence suggested that exposure to high levels could lead to peripheral neuropathies. There is currently no epidemiological or toxicological data that indicates hexane is carcinogenic in humans or animals.

In brief, the investigators conclude that on the basis of all phases of the investigation, occupational exposure at the facility may have contributed to the excess of gliomas among 500 building complex employees, but they feel the results fall short of identifying specific agents that led to the illnesses. Their conclusion is based upon a consistent pattern in work locations, dates of employment, work activities and similarities in exposures to chemical agents among the six people diagnosed with primary brain cancer in comparison to a control group of healthy 500 building complex workers. If the gliomas are work related, the investigators believe that it is possible that an agent that tracked with the use of ionizing radiation and/or n-hexane might be responsible. The reason why this agent may not have been identified is because some of the agent categories were broad, which could have obscured a true association.

The investigators also found that there are no unusual patterns in work location, dates of employment, work activities or exposures among any people diagnosed with any form of benign intracranial tumor or cancer (other than glioma), leading them to conclude that based on the information available, there is no scientific evidence to link any benign intracranial tumors or any other cancers to work at the facility.

The scientific community presently has little understanding of what causes brain cancer in humans, and there is no scientific evidence that links brain cancer to exposures of the types and magnitudes our employees may have experienced. However, we will retain independent experts to further assess employees' exposure to specific agents and share these findings with the scientific community and our industry to further the general understanding of the biological effects of these agents.

New actions and programs that we plan to continue at the facility include:

- UAB will publish findings to help understand if similar patterns are observed elsewhere,
- Ensure safe work practices are in place for the chemical categories and agents identified in the study,
- Engage independent experts to clarify the specific chemical exposures and intensity of exposures to ionizing radiation and *n*-hexane,
- Continue to monitor our population for further occurrence of brain cancer,
- Continue to offer voluntary medical examinations and counseling to employees,
- Retain a nurse and physician to administer the exam program and to deal with health concerns of the employees,
- Continue to dedicate funding to research institutions investigating the cause and treatment of brain cancer,
- Continue to share findings with local, state and federal health agencies.

In a letter dated 6 July, 1999, BP Amoco provided the EPA with a report on the first phase of the health investigation, the case-series study. We also informed the EPA that reports for the other four phases of the investigation were nearly complete. We expect that the reports for the mortality study and the cancer incidence study will be available in September, and the reports for the tumor incidence study of the 500 Building Complex and the case-control study of intracranial tumors in 500 complex employees will be available in November, 1999. As soon as we receive the reports we will forward copies to the EPA.

If you have any questions about the epidemiology investigation, please call me at (630) 420-4933. We will continue to develop our actions and research plan based on the information that UAB has verbally reported and will update the EPA on our actions when that plan becomes finalized.

Sincerely,

Michael Wells

Michael S. Wells, Ph.D.
Manager, Health, Safety & Environment, Chicago Region