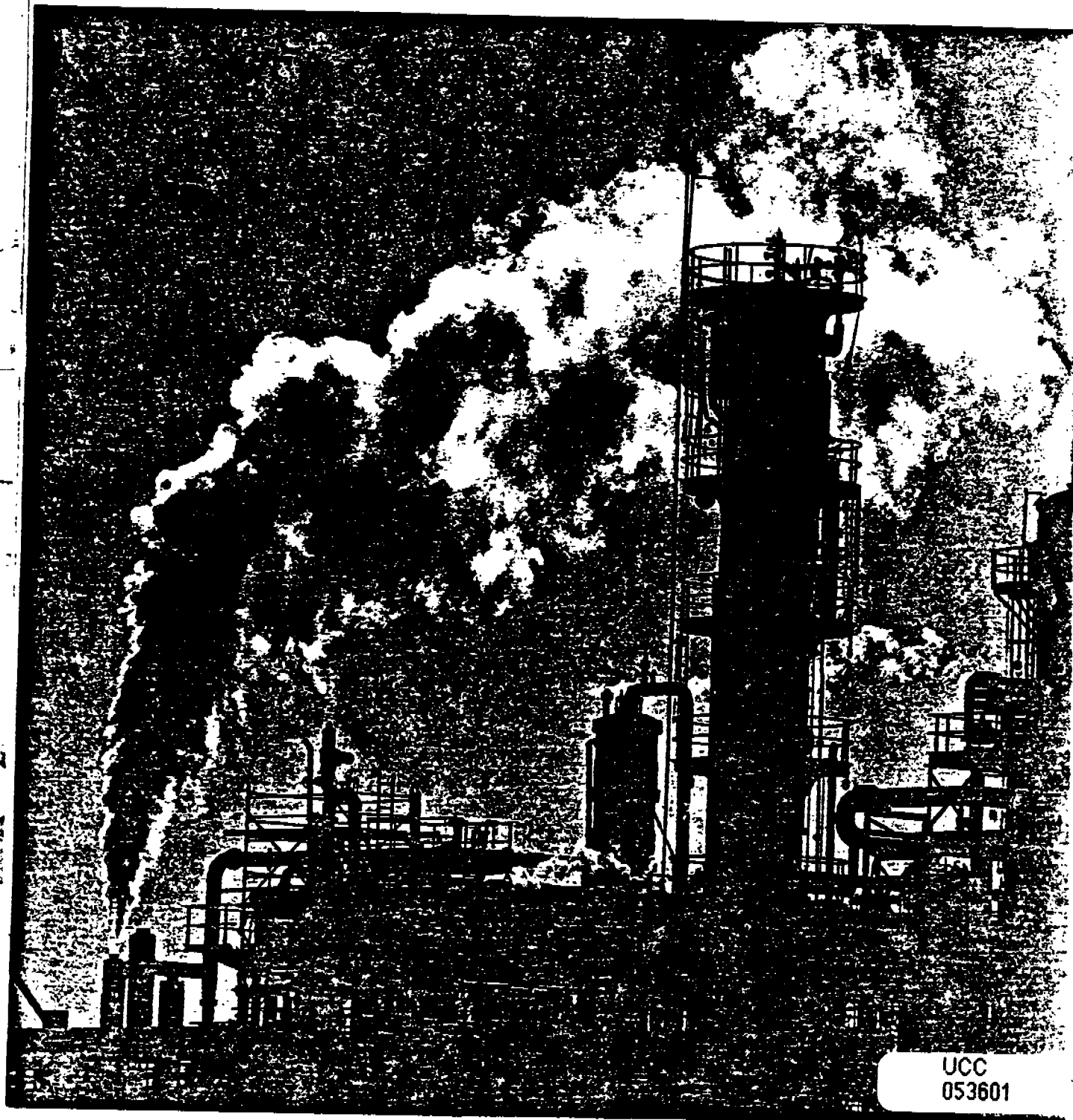


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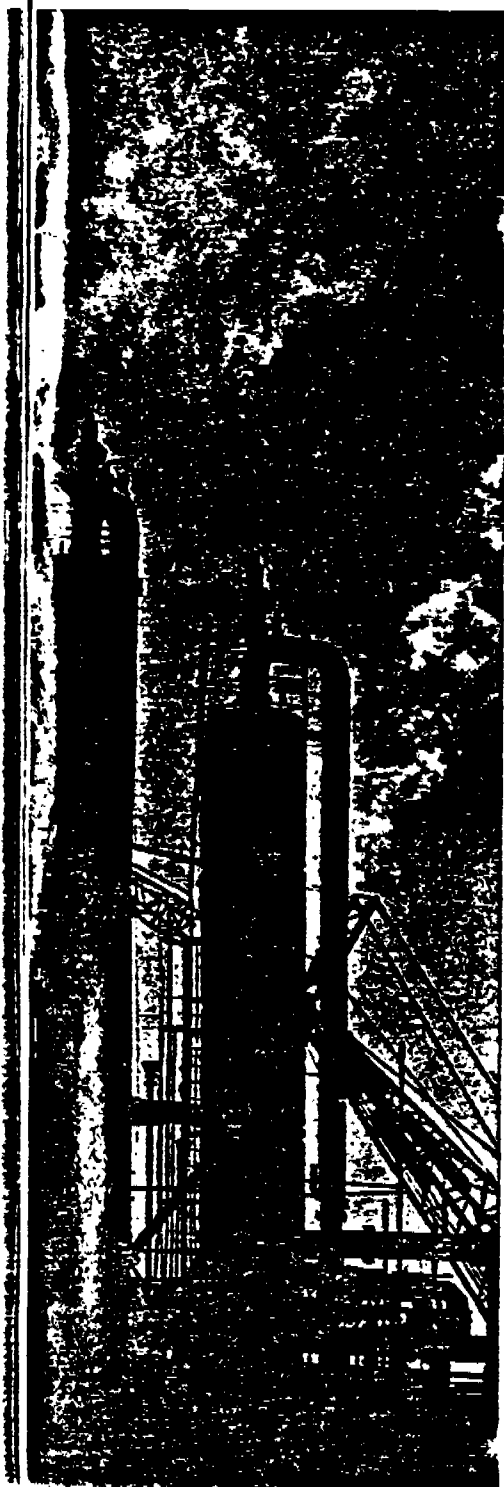
BRAIN CANCER



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PUZZLE

The search for a pattern in deaths among Texas chemical workers



The chemical worker calling the Clear Lake City, Texas, office of the Occupational Safety and Health Administration (OSHA) late in 1978 wanted some answers. He had a brain tumor, he told Richard Miller, an OSHA industrial hygienist. He knew of two fellow workers who had died of brain tumors, and he wanted somebody to investigate the Union Carbide plant (pictured at left) where they had all been employed.

Spurred into action by that call, federal investigators by last November had found 18 confirmed deaths from brain cancer among people who had worked at the plant over the last 40 years. Their studies seem to show that longtime employees of the plant are faced with an elevated risk of dying of brain cancer.

The Union Carbide plant in Texas City is just one of several factories being investigated along the Texas gulf coast, where dozens of plants refine oil and produce a wide variety of petroleum-based chemicals. At a fall conference sponsored by the New York Academy of Sciences, government researchers reported higher than normal rates of brain cancer in certain groups of workers at several of those plants. One of the grimmest pictures was painted by William Nicholson, an epidemiologist at Manhattan's Mount Sinai School of Medicine. He found in a study of members of the operating engineers' union that workers in chemical plants like Union Carbide's, compared with those in oil fields or in refineries, suffered an increased risk not only of brain cancer but of lung cancer and other kinds of malignancies as well. Some scientists at the meeting, particularly those from industry, disagreed with the validity of these findings.

How the brain cancer cases came to light is a dramatic story of epidemiology, the science of tracing the course of a disease in a population. After he received the worker's complaint, OSHA's Miller began his own investigation. He called local doctors, union officials, workers, families of workers,



Victor Alexander, an occupational health doctor, helped apply the science of epidemiology to brain cancer deaths in Texas

and plant and state officials, and came up with a total of four brain cancer deaths among former employees at the Union Carbide plant. The worker who made the original complaint was not among them. His cancer turned out to have begun elsewhere than in his brain (and he was still alive late in 1980).

In January 1979 OSHA's Clear Lake City office sent a memo on the Union Carbide findings to the regional office in Dallas, which passed it on to OSHA headquarters in Washington. There it immediately aroused the suspicion of Victor Alexander, an occupational health physician, and his colleagues. "Someone else could have said the four cases were within the limits of statistical variation," said Alexander. "But our prior knowledge influenced us. We knew that a number of potent carcinogens are used in the chemical industry."

Alexander decided to visit OSHA's regional office. While in Texas he went to Union Carbide to talk to the plant physician, David Glenn. Aware that Miller had been looking into the brain cancer problem, Glenn had already reviewed a collection of death certificates of 455 employees, primarily those who over



Richard Waxweiler and his colleague Sanford Leffingwell comb through files in the NIOSH office in Cincinnati

the years had died on the job or had become eligible for pension benefits. He had found ten brain cancer deaths, including the four that OSHA had uncovered. Thus the toll was more than doubled. "After we talked a bit, he showed me the list," Alexander recalls. "I must say that I was almost speechless."

That number of deaths was enough to persuade OSHA to ask a sister agency, the National Institute for Occupational Safety and Health (NIOSH), for assistance in a full-fledged epidemiological study. In February 1979 officials from both agencies met company representatives and union leaders, and agreed on a plan of attack. Their first step was to try to find out whether more employees had died of brain cancer. Matching state of Texas death records against the names of all the employees who had worked at the Union Carbide plant since it opened in 1941, the researchers had found three more brain cancer deaths by June.

Union Carbide, which cooperated fully with the government investigators, went to work on its own files, combing its employee records for medical and work-history information. That search turned up two more brain cancer deaths. In the meantime, three more employees had developed brain tumors. All have since died, bringing the total to 18.

No one contests the number of deaths. The task that now faces gov-

ernment and industry is to find out whether the victims got cancer from their jobs, and if so, how. For answers, researchers are tracing the fate of 8,850 past and present Union Carbide workers. This search, which Alexander calls "the real scut work of epidemiology," is necessary to establish whether the 18 deaths really represent a brain cancer rate higher than that of the general population. To determine what the expected number of deaths from brain cancer would be for the Union Carbide workers, scientists need to know not only the number of those employed and their ages but also the length of time they worked at the plant. The death rates are based on person-years (every year a worker lives after starting at Union Carbide counts as one person-year). To determine the actual number of deaths, the epidemiologists are trying to follow at least 95 per cent of the workers through an arbitrary cut-off point, the end of 1977.

Last summer, when the study was about 80 per cent complete, Richard Waxweiler of NIOSH reported some preliminary results: for the entire Union Carbide population at the Texas plant, the risk of brain cancer was about 50 per cent higher than could be expected on the basis of the employees' ages and total person-years. For those who had worked less than ten years, there was no excess risk; for those who had worked ten to 20 years, some excess risk

was evident; and for those who had been there 20 years or more, the risk was three times what it should have been. Waxweiler says these figures are just what one would expect with cancer, which can take 20 or more years to develop. "The weight of the evidence points to an occupational risk factor," he reports.

Finding a substance in the Union Carbide plant that might be responsible for the increased risk of brain cancer will be an even harder job. With this task in mind, the government scientists set up a second study, directed by NIOSH's Sanford Leffingwell.

For each case of brain cancer, researchers have chosen six other people, called controls, who closely match the victim in age, sex, race, date of hiring, and time worked at Union Carbide. Now they are studying the jobs of the controls and the jobs of the brain cancer victims, paying particular attention to each worker's exposure to chemicals, to see if any pattern sets the two groups apart. Because the plant's operation has changed dramatically over the years, chemical engineers must be brought in to tell the researchers about the components and by-products of out-of-date processes.

That investigation is more than half done, and so far there is no sign of any correlation between a specific chemical exposure and brain cancer. Though Leffingwell thinks something at the plant caused the deaths, he says that there is to date no proof that the apparent excess risk at Union Carbide is not the result of chance.

H. Michael Utidjian, Union Carbide's associate corporate medical director for toxicology and epidemiology, also makes this point. Utidjian emphasizes the failure so far to demonstrate a cause of the brain cancers. He is not convinced that they are the result of the work environment at Union Carbide. The cause of the deaths, he says, could be some factor in the community at large, rather than in the plant.

Whatever the outcome, the Union Carbide case has changed the epidemiologists' attitude toward brain cancer. Once so rare that it was ignored in surveys, the disease has become so notorious, says Alexander, that it would almost be epidemiological malpractice to ignore it. With this kind of attention, and time, the answers may emerge.

—James Gorman