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INVESTIGATION OF APPARENT INCREASED PREVALENCE OF BRAIN TUMORS IN A
U.S. CHEMICAL PLANT

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Presentation to WORKSHOP ON BRAIN TUMORS IN THE CHEMICAL INDUSTRY
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Table 1.

WORK HISTORY DATA FOR 18 PRIMARY BRAIN
CANCER CASES IN A TEXAS PETROCHEMICAL PLANT

<u>Case</u>	<u>Date of Hire</u>	<u>Date of Death</u>	<u>Age at Death</u>	<u>Length of Employment (years-months)</u>	<u>Job Title</u>	<u>Department</u>
1	12/16/40	05/15/64	51	3-6	Operator	Production
2	05/18/41	02/19/66	56	24-8	Operator	Production
3	07/29/41	05/18/76	66	31-8	Foreman	Maintenance
4	11/30/41	12/13/65	55	20-4	Operator	Production
5	07/09/44	10/28/79	59	35-0	Boilermaker	Structural Shop
6	09/18/44	05/21/74	55	0-1	Operator	Production
7	09/18/46	03/07/79	55	32-3	Laborer/Oiler	Maintenance
8	09/26/46	03/22/73	63	26-6	Operator	Production
9	09/21/48	07/02/75	49	2-1	Pipefitter	Maintenance
10	03/02/49	06/05/71	61	22-3	Operator	Production
11	01/25/50	01/13/68	66	16-7	Equip. Operator	Maintenance
12	10/19/50	05/14/74	59	17-1	Operator	Energy Systems
13	10/23/50	02/18/80	57	28-10	Operator	Production
14	09/19/51	01/08/74	52	22-3	Machinist	Machine Shop
15	04/27/53	10/03/56	33	0-1	Machinist	Maintenance
16	08/17/53	04/05/62	30	8-7	Weighmaster	Shipping
17	08/21/53	05/05/71	44	17-3	Operator	Production
18	10/30/53	12/21/78	49	24-8	Weighmaster	Shipping

Table II. CURRENT PLANT WORKFORCE BY COUNTY OF RESIDENCE

<u>County of Residence</u>	<u>Type of Employee</u>		<u>Total</u>	<u>Percent</u>
	<u>Hourly</u>	<u>Salaried</u>		
Galveston	1,389	609	1,998	90.0
Harris	44	110	154	6.9
Brazoria	41	15	56	2.5
Other	<u>7</u>	<u>4</u>	<u>11</u>	<u>0.5</u>
Total	1,481	738	2,219	100.0

Source: Data provided by company.

Table III.

DEATH CERTIFICATE AND MEDICAL RECORDS DATA FOR 18 PRIMARY
BRAIN CANCER CASES IN A TEXAS PETROCHEMICAL PLANT

Case	Race/ Sex	Residence	Place of Birth	Cause of Death	
				Death Certificate	Medical Records
1✓	WM	Galveston	Texas	Carcinoma of Brain	Glioblastoma (MR)*
2	WM	Galveston	Missouri	Malignant Brain Tumor	Meningioma (A)
3	WM	Harris	Texas	Brain Tumor	Glioblastoma (A)
4✓	WM	Galveston	Texas	Brain Tumor-Meningioma	Meningioma (MR)
5	WM	Galveston	Louisiana	Glioblastoma	Glioblastoma (SP)
6	WM	Galveston	Texas	Brain Tumor-Glial IV†	No Records Available
7✓	BM	Galveston	Texas	Glioblastoma	Glioblastoma (MR)
8✓	WM	Galveston	Texas	Glioblastoma	Glioblastoma (SP)
9	WM	Harris	Texas	Astrocytoma	Astrocytoma-Grade I (SP)
10	WM	Galveston	Texas	Malignant Glioma	Glioblastoma (MR)
11	WM	Galveston	New Mexico	Glioblastoma	Glioblastoma (A)
12	WM	Galveston	Norway	Glioblastoma	Glioblastoma (SP)
13	WM	Galveston	Texas	Glioblastoma	Astrocytoma-Grade IV†(MR)
14	WM	Galveston	Texas	Glioblastoma	Glioblastoma (A)
15✓	WM	Harris	Texas	Glioblastoma	No Records Available
16✓	WM	Galveston	Louisiana	Brain Tumor	Glioblastoma (A)
17✓	WM	Galveston	Texas	Malignant Glioma	Glioblastoma (SP)
18	WM	Galveston	Texas	Brain Tumor	Glioblastoma (A)

*Source: MR-Medical Records; A-Autopsy; SP-Surgical Pathology.

†Astrocytoma Grade IV and Glial IV are equivalent terms for Glioblastoma multiforme.

✓ - no issue

Table IV.

BRAIN AND OTHER CNS CANCER MORTALITY, 1950-1969:
AVERAGE ANNUAL AGE ADJUSTED RATES PER 100,000

<u>Location</u>	<u>White Male</u>	<u>White Female</u>	<u>Black Male</u>	<u>Black Female</u>
United States	4.4	2.9	2.3	1.5
Texas	4.3	2.9	1.9	1.5
Galveston County	4.5	2.9	2.5	2.1
Harris County	4.5	3.6	2.0	1.9
Brazoria County	3.1	3.9	1.2*	1.5

*Based on one case.

The range of U.S. rates for white males for states with >10 deaths from 1950-1969 was 3.1-5.4. The range of Texas rates for white males for counties with >10 deaths from 1950-1969 was 2.3-10.8.

Source: U.S. Cancer Mortality by County, 1950-1969, National Cancer Institute, DHEW Pub. No. (NIH) 74-615, Bethesda, Maryland, 1974.

Table V.

EXPERIMENTAL BRAIN CARCINOGENS

2- Acetylaminofluorene
 Acrylonitrile
 1-Aryl-3,3-Dialkyltriazenes
 Azoethane*
 Azoxyethane*
 Azoxymethane
 Butylnitrosourea
 Cycasin
 1,2-Diethylhydrazine
 Diethylnitrosamine*
 Diethyl Sulfate*
 Dimethylbenzanthracene*
 Dimethyl Sulfate*

Elaiomycin
 Ethyl Methanesulphonate
 Ethylnitrosobiuret*
 Ethylnitrosourea*
 1-Methyl-2-Benzyl-Hydrazine*
 Methyl Methanesulphonate
 Methylnitrosourea*
 Methylnitrosourethane (intraplacental)
 Procarbazine*
 Propane Sultone
 Propylene Imine
 Pyrrolizidine Alkaloids
 Vinyl Chloride

*Transplacental carcinogenesis.

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Table VI.

EPIDEMIOLOGICAL STUDIES:
CLUES TO HUMAN BRAIN CANCER ETIOLOGY

Aluminum Workers
Asbestos Insulation Workers
Anti-Convulsant Use
Farm/Rural Residents
Geographic Clustering
 Kentucky, Rhone Valley
Halomethanes in Drinking Water
Lead Smelter Workers

Machinists
Oil Refinery Workers
Pattern Makers
Petrochemical Workers
Rubber Workers
Toxoplasmosis
Vinyl Chloride Workers

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The brain-cancer incidence among workers in the plants in the last 24 years is twice the normal level in the general population, Dr. Richard Waxweiler of the National Institute of Occupational Safety and Health (NIOSH) said yesterday.

All of the victims are men. Few women work in the plants. Investigators from the two federal agencies involved—the Labor Department's Occupational Safety and Health Administration (OSHA) and the Department of Health and Human Services' NIOSH—have not yet been able to look in detail at other plants, though they have started some investigations.

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Louisville, and San Francisco, as well as one in Canada.

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Spokesmen for Dow and Union Carbide noted that the results so far are inconclusive. "We see no common thread that would suggest [that] exposure to any particular material or location in the plant" is involved, said James Hansen for Dow. "There is nothing so far to connect the workplace to the brain cancer."

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Tony Mazzochi of the Oil, Chemical and Atomic Workers Union said preliminary reports from other studies found higher-than-normal rates of brain and stomach cancers among petrochemical workers along the Texas Gulf Coast, and as a result the union and the National Cancer Institute are studying the entire industry. Eventually 80,000 workers will be checked, he said.

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But he said the fact that Dr. Eulah Bingham, OSHA director, "put together OSHA's first medical and scientific team" meant OSHA had a skilled team to go to the Union Carbide plant early last year and begin to study the brain tumors.

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WASH. Post 7/24/80

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Working with Texas doctors and health officials and with Union Carbide—a company that has been "highly and unusually cooperative," Alexander said—Alexander found 18 tumors among 9,000 people who had

worked at the Texas City plant since 1956, when the first victim died.

He then investigated "a second plant"—which he would not name—and found five brain tumor deaths. But two of these people had also worked at Union Carbide.

Statisticians at the famed M.D. Anderson Hospital and Tumor Institute in Houston then combed their computerized Texas death records for lists of brain cancer victims and their work records.

This led the investigators to the Dow plant, the site of 25 tumors among more than 30,000 workers since the early 1960s. Studies now are focusing on company records to determine where the men worked and what chemicals they were exposed to in the vast complex, which makes 200 different products, including antifreeze, chlorine, latex, ethylene, vinyl chloride and other industrial chemical building blocks.

Workers at Union Carbide's plant had jobs "all over the place," Waxweiler said. One of the few common denominators was that 13 of the 18 victims had worked there more than 15 years.

The Texas plant studies, and the studies of workers' backgrounds, are still not complete, federal investigators said.

But "we strongly suspect," said Alexander, that the cause of the tumors may be not a single chemical but "a chemical process"—exposure to all or some of the many steps that lead to a single chemical product. Or, he said it may be more than one process involving the 300 or so chemicals commonly found in a modern petrochemical factory.