



INTERNAL
CORRESPONDENCE

UNION CARBIDE CORPORATION OLD RIDGEBURY ROAD, DANBURY, CT 06817

To (Name) Dr. D.H. Glenn
Division D.L. Engle (c/o F.S. Provenzano)
Location F.S. Provenzano
Area K. Richards

Date February 15, 1983

Originating Dept. HS & EA

Area Epidemiology, P2

Copy to Dr. S.G. Austin

Subject

Attached are some additional materials which may be of some use regarding the brain tumor studies.


A.R. Schnatter

~~ARS~~/gc
Attachments

UCC
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1. Q. Doesn't the South Charleston data published by Dr. Marsh confirm the brain tumor risk associated with chemical plants?

A. No. Dr. Marsh's data constitute a "survey", not a scientifically valid "study". It is based on an incomplete data base and no conclusions can be yet drawn. Results will not be available for another year at least.

2. Q. Why didn't Union Carbide's study include all employees -- why did you exclude blacks and hispanics?

A. The original protocol called for a study of the largest employ e segment -- white males. We have done further studies including non-whites and the results obtained are the same.

3. Q. Does the study indicate an excess of brain tumors among plant employees?

A. A slight excess of brain tumor deaths was found in this study population; although we could not completely rule out the possibility of some association with occupations; there are many other explanations that are more likely.

4. Q. How do you explain the excess?

A. The most likely explanation is that this is a chance occurrence. The finding that we had 12 brain tumor deaths rather than 7 or 8 is not very significant, since we know that no population group will have exactly the same number of deaths for every disease as that predict d from the average U.S. population.

5. Q. How many of the brain tumor deaths occurred among salaried employe s?

A. All of the brain tumor deaths occurred among hourly employees. This is not surprising since the vast majority of plant employees are hourly.

6. Q. Why did UCC do its own studies and publish their findings?

A. We are as interested as NIOSH in finding out whether there is a problem here. We felt there was some good news to report based on our analyses. Earlier reports suggested that (1) we had an excess of a rare type of brain tumor (glioblastoma); (2) that the excess was 4 times that of the general population and (3) that vinyl chloride was the culprit. Our investigations revealed that we do not have a proportionate excess of glioblastomas; that the brain tumor excess -- if real -- is twofold not fourfold and that vinyl chloride is not suspect.

7. Q. NIOSH reported that the brain tumors were occurring among long-term employees. Doesn't this indicate that they are caused by occupation?

A. Most of the Texas City employees were either short-term or long-term employees. (They either stay 2 years or 20 years.) Our results indicate a slight excess of brain tumors among short-term employees as well as long-term employees -- which argues against that conclusion.

8. Q. Aren't there other findings of brain tumors in chemical plants and doesn't this indicate an occupational problem?

A. It is true that there have been allegations of excess brain tumors in other chemical plants but to-date none of these allegations have been proven in the studies that have been completed. Dow-Monsanto are now complete. There has been a great deal of attention in this area over the past few years -- if there were a real problem associated with chemical plants -- we would know about it by now.

9. Q. Is it possible that some chemical is responsible but that your study has not found it?

A. Anything is possible -- it is also possible that the diagnosis -- reporting of brain tumors is much better among our employees or all residents in this area than among the general population.

10. Q. Did your study take into consideration the fact that cancers take 10-30 years to show up?

A. Yes. This was considered in both studies. In the case control study we examined 35 chemicals to determine whether certain exposures were more frequent among employees who developed brain tumors than other employees. Only exposures more than 15 years prior to death were counted. We did not find any significant differences among cases and controls in these analyses for any chemical.

11. Q. Were there any groups of employees found to be at a greater risk of brain tumors than others?

A. Multiple subgroups were examined, and in some of these subgroups SMR's for brain tumors were both lower and higher than the plantwide average. For example, higher SMR's were found for older age groups, hourly employees, persons at risk between 1970 and 1974 and persons hired over age 35. Lower SMR's were found for younger employees, employees hired before their 25th birthday and those at risk prior to 1965. Because of the small numbers in these subgroups, it is extremely difficult to know what these results mean.

12. Q. Are employees who were hired before 1955 at a greater risk than employees hired after 1955?

A. Yes. Brain tumors generally occur in the 5th and 6th decade of life. Since employees hired after 1955 are on the average younger than 60, they have very little chance of developing a brain tumor. Employees hired between 1941 and 1955 are older; they are reaching the age category where the incidence of brain tumors is highest. Because they are also reaching this age in the 1970's and 1980's when major advances in medical radiographic diagnostic techniques are being introduced, these persons who have a brain tumor are less likely than in the past to have it go undiagnosed.

13. Q. Doesn't a twofold excess of brain tumor constitute a grave public health problem?

A. Any excess is of concern; however, it is important to put things in perspective. With vinyl chloride, we are talking about an excess risk of liver cancer of fourfold. With B-naphthalamine the excess risk of bladder cancer is on the order of 87 times that of the general population. Therefore, a twofold excess is rather small and because the number of cases are small, there is even more reason to interpret this with caution.

14. Q. How many cases have occurred at the Texas City plant?

A. There have been a total of 12 proven cases of brain cancer based on surgical and autopsy reports. There were another 3 that may have been cancer but we don't have conclusive proof. Another 3 and possibly 4 were diagnosed "tumors" that were not cancerous. Three others had a brain tumor diagnosis on the death certificate which was clearly in error. Two did not die from brain tumors. Another had a metastatic tumor from another part of his body.

Since 1979 there have been three other potential brain cancers, only one has been verified independently to date.

15. Q. The NIOSH study included 22 brain tumors, whereas UCC claims there are 12. How do you explain this large difference?

A. Regarding the numbers, the UCC study included 16 brain tumors among white male employees, 12 of which were malignant. The NIOSH study included 22 brain tumors because they studied both white and non-white employees and extended the study an additional two years. The original study protocol was restricted to white males who died in 1977 or before. Since reporting our original study, we have reanalyzed the data in the same way NIOSH did. Our results are similar to theirs, yet our interpretations of the data do differ in that we still find no evidence which strongly suggests an occupational problem.

Although 22 brain tumor deaths have occurred (based on death certificate diagnosis) between 1941 and 1979, only 12 of these are proven brain cancer cases. The other ten cases we are less certain about. Brain cancer is difficult to diagnose and is sometimes misdiagnosed on death certificates.

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JAN 27 1983

S. G. AUSTIN, Sc.D.

UNION CARBIDE CORPORATION OLD RIDGEBURY ROAD, DANBURY, CT 06817

To (Name) Dr. S.G. Austin
Division HS & EA
Location Epidemiology
Area P2 586

Date January 27, 1983

Originating Dept HS & EA

Area Epidemiology, P2 585

Copy to

Subject: NIOSH Texas City Case-
Control Study

Dear Susan:

I spoke with Dr. Leffingwell today about the progress of the case control study.

The final draft is now in the internal review process. Only minor revisions are expected at this point. Once the review process is complete, he will send us a copy to examine. This should take place in a few weeks.

When I asked him if any positive associations were found, he gave me a list (enclosed) of ten chemicals which were subject to intensive analyses. Vinyl Chloride is on the list simply because of the interest factor, the other chemicals emerged with elevated odds ratios. A few statistically significant ($\alpha = .05$, 1-tailed) associations were found, namely carbon dioxide, diethyl sulfate, diethylene glycol, and tetraethylene glycol.

He discounted the carbon dioxide finding as spurious and also said the other findings should not carry much weight considering the large number of statistical tests performed. The final draft will contain a statement to this effect.

Sincerely,

A. Robert Schnatter
BIostatistician

ARS/gc
Enclosure

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Ten Chemicals Analyzed In
Leffingwell's Case-Control Draft

(Maintenance Department Excluded)

<u>Chemical</u>	<u>Latency</u>		
	<u>0-14</u>	<u>15+</u>	<u>Ever</u>
Carbon Dioxide	*		
Diethyl Sulfate		*	
Diethylene Glycol	*	*	*
Ethanol			
Ethylene			
Isopropanol			
Methanol			
Tetraethylene Glycol		*	*
Vinyl Acetate			
Vinyl Chloride			

* Denotes statistical significance

ARS/gc
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TEXAS CITY QUESTIONS & ANSWERS

Question 1: How many brain tumors have occurred in Texas City employ s?

Answer 1: Using all available information, 22 confirmed cases have been found since 1941. This includes malignant and benign tumors. One of these cases is still living. However, the NIOSH and UCC cohort studies use death certificates as documentation for a brain tumor. Using this criteria, 24 brain tumors occurred. Another case is still living.

Question 2: Why did the NIOSH study report only 22 cases?

Answer 2: The NIOSH Study ended in 1979. Two cases which occurred after 79 were excluded.

Question 3: Why did UCC's study include only 12 cases?

Answer 3: The UCC study followed guidelines set down when NIOSH and UCC first started investigating the brain tumors. This included ending the study in 1977 instead of 1979. Because of this, three cases who died in '77 and '78 were excluded. This also included studying white males only, because fewer blacks and women worked at the plant, and their rates of brain cancer are more unstable than the white male rates. This accounted for three additional cases being excluded. [One more was already counted in 1979]. Four more cases were benign tumors, which UCC treated separately.

Question 4: Why did UCC treat benign brain tumors differently?

Answer 4: This is the norm in scientific investigations of this type. Benign lesions are usually not considered cancer, per se, and it is unlikely that malignant and benign tumors have the same underlying causes. Most packages which analyze this type of data treat all benign tumors as a separate cause of death.

Question 5: Do employees who work at Texas City longer have a greater risk of getting brain cancer?

Answer 5: Our analyses show that both short-term and long-term employees have an elevated risk, while persons who have intermediate lengths of employment are at lower risk.

Question 6: Why does this answer disagree with NIOSH's answer?

Answer 6: NIOSH chose length of employment groups differently, and the elevated risk in short-term employees was obscured by their methods. Also, we found that the risk with increasing age is stronger than the one for increasing employment; and this may be the reason for seeing an elevated risk with longer employment.

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- TC 7-10 Date 11/1/51 [unclear]
[unclear]
[unclear]
1. Q. Does the study indicate an excess of brain tumors among plant employees?
A. A slight excess of brain tumor deaths was found in this study population; although we could not completely rule out the possibility of some association with occupations; there are many other explanations that are more likely.
 2. Q. How do you explain the excess?
A. The most likely explanation is that this is a chance occurrence. The finding that we had 12 brain tumor deaths rather than 7 or 8 is not very significant, since we know that no population group will have exactly the same number of deaths for every disease as that predicted from the average U.S. population.
 3. Q. How many of the brain tumor deaths occurred among salaried employees?
A. All of the brain tumor deaths occurred among hourly employees. This is not surprising since the vast majority of plant employees are hourly.
 4. Q. Why did UCC do its own studies and publish their findings?
A. We are as interested as NIOSH in finding out whether there is a problem here. We felt there was some good news to report based on our analyses. Earlier reports suggested that (1) we had an excess of a rare type of brain tumor (glioblastoma); (2) that the excess was 4 times that of the general population and (3) that vinyl chloride was the culprit. Our investigations revealed that we do not have a proportionate excess of glioblastomas; that the brain tumor excess--if real--is twofold not fourfold and that vinyl chloride is not suspect.

5. Q. NIOSH reported that the brain tumors were occurring among long-term employees. Doesn't this indicate that they are caused by occupation?
- A. Most of the Texas City employees were either short-term or long-term employees. (They either stay 2 years or 20 years.) Our results indicate a slight excess of brain tumors among short-term employees as well as long-term employees--which argues against that conclusion.
6. Q. Aren't there other studies of brain tumors in chemical plants and doesn't this indicate a real problem here?
- A. It is true that there have been allegations of excess brain tumors in other chemical plants but to-date none of these allegations have been proven in the studies that have been completed. Many more are under way so that it may be another year before we have a broader perspective. There has been a great deal of attention in this area over the past few years--if there were a real problem associated with chemical plants--we would all know about it by now.
7. Q. Is it possible that some chemical is responsible but that your study has not found it?
- A. Anything is possible--it is also possible that the diagnosis--reporting of brain tumors is much better among our employees than among the general population.
8. Q. Did your study take into consideration the fact that cancers take 10-30 years to show up?
- A. Yes. This was considered in both studies. In the case control study we examined 35 chemicals to determine whether certain exposures were more frequent among employees who developed brain tumors than other employees. Only exposures that first occurred more than 15 years prior to death were counted. We did not find any significant differences among cases and controls in these analyses for 35 chemicals.

*Don't know
are now
complete*

9. Q. Were there any groups of employees found to be at a greater risk of brain tumors than others?
- A. As in all cohort studies multiple subgroups were found and examined, and in some of these subgroups SMR's for brain tumors were both lower and higher than the plantwide average. For example, high SMR's were found for older age groups, persons at risk between 1970 and 1974 and persons hired over age 35. Low SMR's were found for younger employees, employees hired before their 25th birthday and at risk prior to 1965. Because of the small numbers in these subgroups it is extremely difficult to interpret these results.
10. Q. Are employees who were hired before 1955 at a greater risk than employees hired after 1955?
- A. Yes. Brain tumors generally occur in the 5th and 6th decade of life. Since employees hired after 1955 are on the average younger than 60, they have very little chance of developing a brain tumor. Employees hired between 1941 and 1955 are older; they are reaching the age category where the incidence of brain tumors is highest. Because they are also reaching this age in the 1970's and 1980's when major advances in medical radiographic diagnostic techniques are being introduced, these persons who have a brain tumor are less likely than in the past to have it go undiagnosed.
11. Q. Doesn't a twofold excess of brain tumor constitute a grave public health problem?
- A. Any excess is of concern; however, it is important to put things in perspective. With vinyl chloride, we are talking about an excess risk of liver cancer of 400. ^{four-fold} With B-naphthalamine the excess risk of bladder cancer is on the order of 87 times that of the general population. Therefore, a twofold excess is rather small and because the number of cases are small, there is even more reason to interpret this with caution.

12. Q. How many cases have there been to-date?

A. There have been a total of 21 deaths attributable to primary brain tumors. There have been 18 deaths that NIOSH has classified as primary malignant brain tumors; 3 benign brain tumors. Two additional employees had death certificate diagnoses of primary brain tumor which were inaccurate.

Of the 18 malignant brain tumors, there is some question regarding the accuracy of the diagnoses for 4 where no surgical or autopsy investigation was performed.

Q. The NIOSH study included 20 brain tumors, whereas the UCC study only included 12. Doesn't this mean that NIOSH did a better study?

A. No. The quality of the study is determined by the design and analysis of data. We feel that the UCC study is of very high quality - we used some of the leading epidemiologists at Harvard and the University of Pittsburgh as consultants.

Regarding the numbers, the UCC study included 16 brain tumors, 12 of which were malignant. The NIOSH study included 22 brain tumors - 6 more than the UCC study. They did this by following the study cohort for an additional two years and including non-white male employees. The two year additional follow-up required some special assumptions that we did not make in the final study report. We did a similar analysis using an additional 3 year follow-up period for white males and found that 3 additional malignant brain tumor deaths occurred versus 1.5 expected. These additional cases did not add any new or useful information over and above that already seen in the initial report covering the time period 1941-1977, nor did they significantly alter the ratios of observed to expected deaths. For non-white males followed from 1940 through 1977 there was only one (1.0) malignant brain tumor death vs. 0.49 expected.

S. G. Austin/gt
11/11/81

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CC: DH Glenn-515
K. RICHARDS-Wa
S AUSTIN-500
A. VORESS-500

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APR 3 1983

Brain cancer

Gulf Coast research focuses on risk in industrial workers

By HAROLD SCARLETT
Post-Environment Writer

A massive two-year study is getting under way along the Southeast Texas and Louisiana coasts to determine if some industrial workers face a special risk of brain cancer.

If this proves to be the case, the study will then try to identify the specific chemicals or substances responsible so they can be controlled to protect the public health.

The study, the most extensive brain cancer research ever conducted, will cover a coastal belt stretching from the Houston area to New Orleans and northward to the Baton Rouge area. The study area has a heavy concentration of chemical, petrochemical and industrial industries.

It will encompass a population of about 5.5 million people, including 2 million in Texas, said Dr. Patricia A. Buffler, a principal investigator in the study.

Buffler is an associate professor of epidemiology at the University of Texas School of Public Health here, which will work with Louisiana State University on the study. Dr. Pelayo Correa will head the study for LSU.

The study, expected to cost \$1 million, is being funded with an initial \$800,000 research grant from the National Cancer Institute.

Brain cancer, a relatively rare disease, occurs in the general U.S. population at a rate of only about 4.5 cases in every 100,000 people.

Several separate studies at Houston area chemical plants in recent years have shown abnormal levels of brain cancer among plant workers. Those studies, however, failed to link the disease to exposure to any specific chemical.

These single-plant studies involved perhaps only 4,000 or 5,000 workers and around 12 to 15 cases of brain cancer, Buffler said. "That's not a very large number of cases to work with and really address the problem. There are not enough observations to be significant. It's like shooting BBs at a big target."

She said the new study will investigate about 500 new cases of brain cancer, all diagnosed between January 1980 and De-

cember 1984. The cancer victims, who may or may not work in industry, will be compared with a control group of 500 people who do not have brain cancer.

A comparison of the two groups will show whether the odds of getting brain cancer are higher for industrial workers.

Trained investigators will compile job histories of all 1,000 subjects and detail any occupational exposures to specific chemicals, Buffler said.

Buffler is hopeful the study of a large population group will definitively resolve the "still very equivocal" link between brain cancer and certain occupations and identify the specific chemicals or substances that are responsible.

Earlier studies by individual chemical companies showed abnormal levels of brain cancer among workers at the Dow plant in Freeport and the Gulf Refining and Chemicals plant in Baytown. In Texas, Buffler said, several major companies have agreed to work with the researchers in helping compile job and exposure histories.

The researchers, Buffler said, also will collect present and past addresses of the study subjects, and these will be compared with industries in specific census tracts to determine non-occupational exposures to pollution.

Water supply sources will also be checked as another possible route of chemical exposure, she said.

Buffler, a specialist in cancer epidemiology, and Correa of LSU are now winding up a lung cancer study covering much of the same area involved in the new study.

Results of another study by Buffler on the effects of Houston air pollution on asthmatics and asthmatics are to be announced in a series of April meetings.

The brain cancer study will cover 20 southern Louisiana parishes and six Texas Gulf Coast counties—Harris, Brazoria, Galveston, Chambers, Orange and Jefferson.

Results of the research are expected in the spring of 1985, but Buffler declined to speculate on what those results will be.

"I wouldn't be doing the study if there wasn't a suggestion (of a job link to brain cancer)," she said. "But I also wouldn't be doing the study if I already had the answers."

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The Houston Post
Sun, Apr. 3, 1983

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INTERNAL CORRESPONDENCE
Solvents & Coatings Materials Division

QC: ~~XXXXXX~~
J B Gowing
A G Voren
A A Lang

P. O. BOX 471, TEXAS CITY, TEXAS 77580

July 1, 1983

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JUL 6 1983

S. G. AUSTIN, Sc.D.

To: J. H. Barrett - CLC
Ken Chrisitan, MD - Monsanto Co.
Walter Conrad - Baker & Botts
William Fishbeck, MD - Dow Chemical
Norm W. Gaines - Danbury
Reuben W. Holland, Jr., MD - So. Chas
Roy Joyner, MD - Shell Oil
W. W. Kimmerer, MD - Galv. Co. Health Dist.
Lloyd King, MD - Amoco Oil
Ed Kramer, MD - Seadrift

Subject: EPI Study

The attached letter will be mailed to the Texas City Plant employees Tuesday, July 5, 1983. I appreciate your past interest. This would appear to complete the UCC-NIOSH-OSHA epi study that was initiated in 1978.

David H. Glenn, M.D.
Divisional Medical Director

DHG:mm
Attachment

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JUL 5 1983

N. W. GAINES

UCC
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UNION CARBIDE CORPORATION P. O. BOX 471, TEXAS CITY, TEXAS 77580

July 5, 1983

TO ALL TEXAS CITY UNION CARBIDE EMPLOYEES:

The National Institute of Occupational Safety and Health (NIOSH) has released the results of their Case Control Study as the final report of the joint UCC-OSHA-NIOSH epidemiology project.

This was a study of primary brain tumors among employees at the Texas City plant. In a "case-control" study, people who have had the disease (the "cases") are compared with a group of people who have not had the disease (the "controls") to determine how the cases and controls differ with respect to possible risk factors.

The cases consisted of 17 workers whose deaths resulted from gliomas (a specific type of brain cancer). Each case was compared to six controls for the following potential risk factors (both work and non work related):

- a) which chemicals they were exposed to
- b) how long they were exposed to each chemical
- c) when they were first exposed to each chemical
- d) where in the plant they worked
- e) what job titles they held
- f) which departments they worked in
- g) where they lived and how long they lived there

NIOSH concluded from the results of this comparison that chemical exposures in this plant could not explain the observed brain tumor excess.

A curious finding was that more of the cases than controls lived in LaMarque at some time. This could not be explained by the source of drinking water or the proximity of major chemical companies or the Texas City Wye dump area. The LaMarque association is not supported by preliminary results from an ongoing NIOSH sponsored study at a nearby refinery. Furthermore, LaMarque does not have a higher brain tumor death rate than Galveston County.

In summary, the brain tumor excess at Texas City cannot be explained by any of the chemical exposures or other factors considered in this study.

We will continue to follow the health of our employees and to ensure that our standards and practices provide more than adequate protection from known health hazards.


D. H. Glenn, M.D.
Divisional Medical Director
Solvents & Coatings Materials

FSP:DHG:mm


F. S. Provenzano
Plant Manager

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