



## Interoffice Communication

To Distribution  
From Mary Ann Chance, Medical Division  
Date January 3, 1984  
Subject BENZENE STUDY

Attached for your information and further distribution to appropriate departmental personnel is a communication distributed by Du Pont concerning recently completed benzene epidemiology studies at the Du Pont Repauno Plant and the Sabine River Works Plant. The Chemical Manufacturers Association has also included these plants in a study of seven chemical plants operated by six CMA member companies. The CMA press release is also attached.

*Mary Ann Chance*

Mary Ann Chance  
Coordinator  
Hazard Communication Program

ck  
encs.

### Members of the Corporate Safety and Industrial Hygiene Advisory Council:

|                                       |                                   |
|---------------------------------------|-----------------------------------|
| O. R. Barresi, Houston                | J. F. McGlone, Ponca City         |
| E. L. DeWhitt, Jr., Ph.D., Ponca City | H. A. McGuire, Houston            |
| A. F. Gallagher, Houston              | P. L. Meeks, Houston              |
| J. J. Hall, Ph.D., Houston            | R. W. Palmer, Houston             |
| J. W. Hamilton, Houston               | J. L. Pettry, Houston             |
| E. R. Howerton, Lake Charles          | S. F. Pitts, Lake Charles         |
| L. G. Hubbard, Houston                | J. L. Riddle, Ph.D., Ponca City   |
| W. D. Jenkins, Houston                | L. J. Van Zant, Ponca City        |
| R. L. Johnson, Houston                | C. L. Whetstone, M.D., Ponca City |
| M. A. Malloy, Houston                 | R. L. Wooten, Pittsburgh          |

### Ex-Officio Members:

W. W. Beam, Ponca City  
B. J. Boldt, Houston  
T. L. Thoen, Houston  
V. J. Massaro, Houston  
R. M. Tillman, Ponca City

### Extra Copies:

D. M. Allen, M.D., Ponca City  
W. D. Broddle, Ph.D., Ponca City  
T. J. Chester, M.D., Ponca City  
J. R. Drumwright, M.D., Ponca City  
J. E. Hertzog, M.D., Pittsburgh

*1-700*

*cc Darren Riffe, Labor Relations*

*1-100-1000*

*File - Benzene*



E. I. DU PONT DE NEMOURS & COMPANY  
INCORPORATED  
WILMINGTON, DELAWARE 19898

PUBLIC AFFAIRS DEPARTMENT

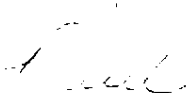
December 16, 1983

R. R. BONCZEK, ADMN  
B. W. KARRH, ERD  
B. W. CULPEPPER, ERD  
C. F. REINHARDT, CR&D  
G. A. HAPKA, LEGL  
J. F. MC ALLISTER, PAD  
C. H. EVANS, C&P  
D. C. HOCHSTETLER, LEGL  
J. W. RAINES, PPD  
R. D. INGALLS, PPD  
A. M. KAPLAN, CR&D  
T. J. NELSON, F&FP  
M. T. O'BERG, ERD  
J. C. OLQUIN, PD  
S. S. MILETI, PD

Attached, for your information, are two employee communications and questions and answers on the Repauno benzene study which will be released today. One employee communication (Attachment A) should be used companywide. The second employee communication (Attachment B) provides greater detail on the study and will be used primarily at the Repauno plant.

CMA will be announcing the findings of its benzene study today as well. A copy of CMA's press release is attached.

These employee communications have been reviewed and approved by R. C. Forney.

  
PAUL H. WYCHE, JR.

PHWjr/bp  
Attachments (4)

RECEIVED

DEC 16 1983

BRUCE W. KARRH, M.D.

DEC 17 1983  
GENERAL INV.

SAL 000019346

ATTACHMENT A

FINAL  
12/15/83

EMPLOYEE COMMUNICATION

RECENT BENZENE STUDIES

Du Pont's Medical Division has completed a health study of Repauno Plant employees and pensioners who have been exposed to benzene and it has found a small but statistically significant excess of leukemia and bladder tumors.

Although at high levels, benzene is considered a human leukemogen, there is no scientific evidence to date linking bladder tumors with benzene exposure.

The study, which included 884 employees and pensioners who were on the plant roll between 1946 and 1977, had two parts. One reviewed deaths and causes of death. The other considered the incidence of disease among people who were employees when they were diagnosed.

A 1979 Du Pont Medical Division study of deaths and causes of death at the Company's Sabine River Works plant did not show a statistically significant excess of deaths or incidence of cancer including leukemia and bladder cancer among employees potentially exposed to benzene.

In addition to the Repauno study conducted by Du Pont, the Chemical Manufacturers Association (CMA) recently completed a study of benzene workers which shows a small, but statistically significant excess of deaths from leukemia, but not from bladder cancer when compared to unexposed workers in the plants. The Repauno and the Sabine plant employees were included in the CMA study which reviewed causes of death among about 7,700 workers at seven plants in six companies.

For years, Du Pont has kept employee exposure to benzene well below the current OSHA standard of 10 ppm-8-hour time weighted average, and at levels at which adverse health effects are not likely to occur.

The Company will continue to monitor new information relating to benzene as it becomes available and will also further analyze the data from the Repauno and CMA studies. We hope this may provide a better basis for explaining the meaning of the data that has been gathered. We will continue to keep you advised of any developments relating to the toxicity of benzene.

# # # # #

PHWjr

ATTACHMENT B

FINAL

EMPLOYEE COMMUNICATION  
REPAUNO BENZENE STUDY

Preliminary results of a Du Pont study of Repauno plant employees who have had potential for exposure to benzene have shown a small, but statistically significant excess of leukemia cases and bladder tumors.

The epidemiology study included 884 employees and pensioners who were on plant rolls between 1946 and 1977 and had potential for benzene exposure. Incidence of disease among these employees was compared with incidence of disease throughout the Du Pont Company. About one case each of bladder tumors and leukemia would have been expected. Four cases of bladder tumors and three of leukemia were found. While there is evidence that, at high exposure levels, benzene is a leukemogen, there is no medical evidence linking bladder tumors with benzene exposure.

In addition, Repauno was included with one other Du Pont plant in a Chemical Manufacturers Association (CMA) sponsored mortality study of about 7,700 people at 7 plants in 6 companies. The CMA study shows a small, but statistically significant excess of deaths due to leukemia but no significant excess due to bladder cancer when compared to unexposed workers on the plants in the study.

The cases of leukemia and bladder tumors occurred in employees potentially exposed to benzene during plant operations in the 1950's, when possible carcinogenic effects were not well recognized and operating procedures and personal protection were less stringent.

Since the 1950's, the plant has taken a number of steps that have reduced potential exposure. Facilities have been modified by converting from batch to continuous operation, relocating controls from the operating area to a central control room, and installing a powered exhaust system. Procedures have been improved by adding elastomeric glove and respirator requirements.

In the past, benzene exposure limits were agreed upon by government and industry health experts. The limit was set in 1946 at 100 ppm and was subsequently lowered to 50 ppm in 1947, 35 ppm in 1948, 25 ppm in 1957 and finally 10 ppm in 1969. Federal regulation began in 1971 when OSHA adopted the current limit of 10 ppm for an 8-hour Time Weighted Average (TWA). Exposures at Repauno historically have been lower than these limits and currently are less than half the OSHA limit. Current exposures should not cause adverse health effects.

The plant is continuing its effort to further reduce potential exposures. For example, an open air nitrobenzene operation will start up early in the second quarter of 1984, and the plant will continue to require respiratory protection for tasks where exposures might represent a health threat.

The Company will continue to monitor new information relating to benzene as it becomes available and will also further analyze the data from the Repauno and CMA studies. We hope this further analysis may provide a better basis for explaining the meaning of the data that have been gathered. We will continue to keep you advised of developments relating to the toxicity of benzene.

CHEvans  
12/16/83  
Draft XIII

SAL 000019350

BENZENE QUESTIONS AND ANSWERS

Q1. WHAT IS AN EPIDEMIOLOGY STUDY AND WHAT IS MEANT BY STATISTICALLY SIGNIFICANT?

A1. An epidemiology study looks for links between diseases and pre-existing factors which could be causes. In industry, we look especially at chemical exposures as potential causes.

In these studies, the numbers of cases of a disease or deaths from a specific cause in one group of workers are compared with the numbers expected for a similar group in size, age, and sex if possible.

Differences between observed and expected numbers are tested by standard statistical methods. Small deviations in either direction are attributed to chance and are not considered statistically significant.

Q2. DO THE STUDIES INDICATE THAT THE RISK OF LEUKEMIA IS GREATER AT HIGHER BENZENE EXPOSURES SUCH AS EXISTED IN THE PAST THAN AT LOWER EXPOSURES?

A2. The CMA study does indicate a higher incidence of leukemia among those exposed to higher levels. We have not completed our own analyses of the Repauno data, but at this time such a relationship does not appear to exist.

Q3. WHAT IS THE OSHA STANDARD FOR EXPOSURE TO BENZENE AND HOW DOES IT COMPARE TO PLANT EMPLOYEE EXPOSURES TODAY?

A3. In the past, benzene exposure limits were agreed upon by government and industry health experts. The limit was set in 1946 at 100 ppm and was subsequently lowered to 50 ppm in 1947, 35 ppm in 1948, 25 ppm in 1957 and finally 10 ppm in 1969. Federal regulation began in 1971 when OSHA adopted the current limit of 10 ppm for an 8-hour Time Weighted Average (TWA). Peak exposures of 25 ppm are permitted for periods of up to 15 minutes. Personal monitoring at all Du Pont plants, including Repauno, has shown employee exposures to be well below this limit. Exposure levels at all plants are well below levels at which adverse health effects are likely to occur. (For Repauno use only: With the exception of the N.B. operator, all jobs monitored during the past three years have consistently been below 1 ppm exposure an 8-hr. TWA. Exposures of .07 to 5.4 ppm have been measured for the N.B. operator. However, actual exposure would have been less because respirators are worn during periods of peak exposure. The air monitoring reflects benzene content in the breathing zone but does not reflect air quality as breathed through a respirator.)

Q4. I HAVE HEARD DISCUSSION OF A POSSIBLE CHANGE IN THE OSHA STANDARD TO 1 PPM FOR BENZENE. IS THERE ANYTHING CURRENTLY BEING DONE TO FURTHER REDUCE BENZENE EXPOSURES ON PLANT?

A4. Based on air monitoring results at Beaumont where similar facilities exist, we expect the open air construction of the DHN N.B. process to be started up in the near future and it will reduce benzene exposure for the N.B. operator. In the interim, we will continue to do task related air monitoring to identify potential areas for improvement. If areas are identified where exposures should be reduced and reductions cannot be feasibly engineered (i.e., through procedure changes, additional ventilation or requirement modifications), increased use of respirators may be required.

Q5. WHY WERE THE 884 EMPLOYEES CHOSEN OUT OF THE 5,000 EMPLOYEES THAT WORKED AT REPAUNO DURING THE PERIOD STUDIED?

A5. Plant records indicated that they were the employees who worked in the benzene area.

Q6. HOW MANY OF THE EMPLOYEES WITH LEUKEMIA AND HOW MANY OF THOSE WITH BLADDER TUMORS ARE STILL WORKING AT THE PLANT?

A6. None of the potentially exposed people who had leukemia is still working at Repauno. One of the people with a bladder tumor is still working at the plant.

Q7. DO THE STUDIES INDICATE THAT CURRENT CONDITIONS ARE DANGEROUS TO IMMEDIATE OR FUTURE EMPLOYEE HEALTH?

A7. No. We believe our present procedures are more than adequate in ensuring the continued health and safety of our employees who may be exposed to benzene. In fact, employee exposure to benzene is significantly below the OSHA-approved level of 10 ppm, TWA 8-hour. We are continuing efforts throughout the company to minimize employee exposure to benzene.

Q8. ARE THERE ANY MEDICAL SCREENING TESTS THAT I SHOULD BE ROUTINELY GIVEN?

A8. The Company routinely gives blood tests, including a blood count, to all employees as part of our regular annual and biannual physical examination program.

These blood tests are designed to identify a range of blood disorders including those associated with exposure to benzene.

Q9. WHEN HEALTH PROBLEMS ARE FOUND BY MEDICAL, ARE EMPLOYEES INFORMED? HAVE ALL EMPLOYEES WHO HAD A DISEASE BEEN INFORMED?

A9. Yes, employees are informed of any health problems which have been found by Medical. This is in accordance with Company policy and good medical practice. The employees who were included in the study and have been diagnosed as having a disease have been informed. We are working with them to ensure they receive the proper medical treatment, depending on the type of disease diagnosed.

Q10. IS THERE ANY SCIENTIFIC EVIDENCE OF BENZENE CAUSING CANCER OTHER THAN LEUKEMIA?

A10. The recently completed CMA study showed a slightly higher, though not statistically significant mortality rate from lymphatic and hematopoietic (hem"ah-to-poi-et'ik) cancer among persons exposed to benzene. (Note: hematopoietic cancer is a condition of cancer of the body's blood-forming system.) We have just recently

heard reports that several animal studies have shown solid tumors. This is the first time we have seen that benzene produces solid tumors in experimental animals. We have not seen the final studies, since they are still in draft form.

Q11. DID THE REPAUNO AND THE CMA STUDIES INCLUDE THE SAME INDIVIDUALS? WHY WAS THERE A DIFFERENCE IN THE FINDINGS?

A11. No, the CMA study included only those Rapauno employees whose exposure to benzene was after 1957. It also included another 6,800 workers at six plants in six companies, including Du Pont's Sabine River Works, Texas.

Q12. DID THE CMA STUDY INDICATE AN EXCESS OF BLADDER TUMORS?

A12. No, the CMA study did not indicate such an excess.

Q13. DO THE REPAUNO AND CMA STUDIES CONFLICT IN ANY WAY?

A13. These studies differ in results in that the Repauno studies showed excess bladder cancer cases, whereas neither the Repauno nor CMA studies show excess bladder cancer deaths.

Q14. YOU'VE INDICATED THAT THE CMA STUDY RESULTS WERE DIFFERENT WHEN COMPANY WORKERS ON THE SAME PLANT WERE USED FOR COMPARISON. IS THERE A REASON FOR THIS?

A14. The non-exposed workers in the control group had an unusually good health record. For example, there were far fewer deaths from leukemia and other cancers than we would have expected in this group based on general U.S. population statistics.

Q15. I UNDERSTAND THAT ACUTE MYELOGENOUS LEUKEMIA IS THE DISEASE MOST COMMONLY ASSOCIATED WITH HIGH LEVELS OF BENZENE EXPOSURE. HOW MANY DEATHS IN THE CMA STUDY WERE ATTRIBUTABLE TO THAT DISEASE?

A15. You're correct. Acute myelogenous leukemia is most commonly associated with high levels of exposure to benzene. However, no deaths were found in the study from this type of leukemia.

Q16. ARE THE EXPOSURE LEVELS IN THE CMA STUDY THE SAME TODAY AS THEY WERE IN THE YEARS OF EXPOSURE COVERED BY THE STUDY?

A16. Probably not. The cases of leukemia and bladder tumors occurred in employees potentially exposed to benzene during plant operations in the 1950's, when possible carcinogenic effects were not well recognized and operating procedures and personal protection were less stringent.

Since the 1950's, the plant has taken a number of steps that have reduced potential exposure. Facilities have been modified by converting from batch to continuous operation, relocating controls from the operating area to a central control room, and installing a powered exhaust system. Procedures have been improved by adding elastomeric glove and respirator requirements.

Q17. YOU SAY THAT THE CMA STUDY COMPARED DEATHS TO THE GENERAL POPULATION. DID THE STUDY ALSO LOOK AT THE INCIDENCE OF DISEASE AS THE REPAUNO STUDY DID?

A17. No, the CMA study only looked at deaths. This is because, unlike Du Pont, many companies do not keep useful records for studies of incidence of disease.

PHWjr/kjg  
12/16/83

# CMA PRESS RELEASE ON BENZENE STUDY

WASHINGTON (December 16) -- The Chemical Manufacturers Association has submitted the results of a large-scale study on the health effects of occupational exposure to benzene to several government agencies.

Dr. Geraldine V. Cox, CMA's Vice President and Technical Director, said the study "showed a slightly higher, though not statistically significant, mortality rate from lymphopoietic cancer, including leukemia, among the exposed workers when compared to the U.S. population." There were no deaths from acute myclogenous leukemia, the disease most commonly associated with high levels of benzene exposure, she said. Dr. Cox added that the over-all death rate of workers exposed to benzene was significantly less than expected from all causes in the general U.S. population.

She also said the study found that the death rates from lymphopoietic cancer, including leukemia, in exposed workers were "significantly higher than the rates in the study's in-plant worker control group," which enjoyed an unusually good health record.

The study also suggests there is a positive relationship between the cumulative level of exposure to benzene and deaths from lymphopoietic cancer, including leukemia. "But this observation is based on a very small number of deaths," she said, "and therefore it's impossible to draw firm conclusions on its meaning."

"All in all," Dr. Cox said, "the study provides mixed results. It is not at all clear whether comparison to the general U.S. population or to the internal control group is more meaningful. Taken by itself, the study does not provide the answer to the question of the appropriate level of workplace exposure to benzene. It now must be examined along with other information on the subject."

The study was conducted by Environmental Health Associates, an independent health research organization, and is the largest formal benzene epidemiology study ever to be conducted. It examined the mortality rate of workers in seven chemical plants operated by six CMA member companies. Workers included in the study were employed on their jobs for at least six months between 1946 and 1975.

It compared the death rate and causes of death among 4,602 workers -- all of whom worked either continuously or intermittently in areas where benzene was present -- to that of the general U.S. population. It also compared the death rate of these workers to that of a control group of 3,074 workers in the same plants whose jobs did not expose them to benzene.

Nineteen of the 4,602 workers whose jobs exposed them to benzene died of lymphopoietic cancer (seven of these were leukemia), while 16 would have been expected. Three of the 3,074 workers in the control group died from these types of cancer (none from leukemia), while 9 would have been expected.

Benzene is a widely used industrial chemical manufactured primarily from petroleum. High levels of benzene exposure have been linked with leukemia and it is classified as a suspect carcinogen by the International Agency for Research on Cancer.

The study was reviewed by recognized epidemiologists within the academic community. "The reviewers expressed reservations about overinterpreting the significance of the study because of the low number of leukemia deaths, and the unexplained and exceptionally low mortality rates among the control workers," Dr. Cox said. Copies of the study have been provided to the Occupational Safety and Health Administration, the National Institute for Occupational Safety and Health, the Environmental Protection Agency, the Food and Drug Administration, the Consumer Product Safety Commission, the National Institute of Environmental Health Sciences and the National Cancer Institute.

# # # #

12/16/83

SAL 000019360