November 11, 1976

MEMORANDUM

TO: Matthew M. Swetonic

FROM: Leonard S. Zahn

SUBJECT: Session on Vinyl Chloride at APCA Specialty Conference on "Toxic Substances in the Air Environment," Boston, Nov. 7-9, 1976

The program for this session was different from that in the program mailed recently by the Air Pollution Control Association. There were two additional reports from scientists at Laval University in Quebec and a B.F. Goodrich Chemical Co. man replaced a scheduled speaker from Dow Chemical Co.

The participation of four scientists from Laval indicates increasing attention to vinyl chloride (VC) in Canada's Province of Quebec and perhaps throughout that country. The Laval people are concentrating on the birth defect angle but are not excluding the cancer angle.

Here are highlights from the comments made by the various speakers. The order is that of the actual program.

1. "Progress in a community vinyl chloride mortality analysis study" -- Gilles Theriault, Laval University. He did not actually present a paper but served instead as the coordinator for presentations by the Laval group. He introduced each of his colleagues and made various comments, among them the following:

There are three VC plants in Quebec (2 monomer, 1 polymerization). A survey begun in 1973 turned up 12 cases of primary liver cancer in Shawinigan (S), which has had a VC plant in operation since 1943. One angiosarcoma was found in a non-VC community (Chicoutomie?).

VC is now linked with bladder cancer (on the basis of Ittura's findings -- see below). Another important aspect of VC toxicity is its mutagenic effect, as is seen in the birth defects reported in three Ohio towns and in the chromosome breakages found in lymphocytes of VC workers.

Data from death certificates are not too reliable. Hospital records provide more and better data. He hopes his group will be getting occupational data in regard to research involving VC with birth defects and cancer.

(At one point, a man in the audience pointed out that a considerable industrial complex had been built up around S.)

Leonard Zahn and Associates, Inc. PUBLIC RELATIONS COUNSEL
(P. O. BOX 223) 13 LINCOLN ROAD • GREAT NECK, N.Y. 11021 • (212) 895-7445

2. "Comparative study of cancer mortality between the towns of Shawinigan (S) and Drummondville (D) in Quebec over a 10-year period" -- Hilda Ittura, Laval University. She reported a study of total mortality, cancer mortality, and mortality from certain sites of cancer (lung, liver, bladder, pancreas, and brain) in the general population, in males and in the 20-64-year age group in the period 1965-74 in S and D. The study was based on data from death certificates.

Ittura said her report was preliminary and that nothing could be concluded. However, the data provide enough clues to plan new research that would establish "the real effect over the workers and over the community exposed to PVC."

Her findings:

Total mortality. (Per 1000 population) Higher in D than in S. D was 9.59 in 1965, 9.2 in 1974, with average of 9.07. S's average was 6.68, increasing from 5.67 in 1965 to 8.80 in 1974.

In the 20-64-year group, S's rate was 4.94 in 1964 and rose to 6.26 in 1974. D's rate was 5.22 in 1964 and dropped to 3.81 in 1974.

In males of all ages, D had no great change (average of 11.03). In S the rate was 6.94 in 1965, 10.70 in 1974 (average 8.28).

In males aged 20-64, S's rate in 1965 was 7.0, in 1974 it was 8.81 (average 7.04). In D it was 7.49 in 1965, 5.38 in 1974 (average 6.79).

Cancer mortality. The average rate in D was 1.84, in S 1.55. The rates were similar in the 20-64 group, averaging 1.39 in D and 1.33 in S.

In males of all ages the rates were similar, averaging 2.16 for D, 1.89 for S. In males 20-64, D's rate was 1.13 in 1965, 1.93 in 1974 (average 1.47). S's rate was 1.37 in 1965, 2.39 in 1974 (average 1.79).

Mortality by cancer site. Rates were higher in S than in D for mortality from cancer of the lung, liver, bladder, pancreas, and brain, especially in males aged 20-64. The rate in S was 5.0 in 1965, 13.50 in 1974 (average 8.78). It was 2.82 in D in 1965, 6.49 in 1974 (average 5.22).

Lung cancer -- The total population rate was 2.53 for S and 2.50 for D. In males 20-64, S's rate was 5.59, D's 3.99.

Liver cancer -- The total population rate was 0.51 for S, 0.32 for D. In males 20-64, the rate in S was 0.66, in D there was not a single case.

Pancreas cancer -- The total population rates were 0.90 for S and 0.61 for D. For males 20-64, rates were 1.06 in S and 0.72 in D.

Bladder cancer -- The total population rate was 0.51 in S, 0.29 in D. For males, 0.66 in S, 0.24 in D.

Brain cancer -- There was a large difference in rates between the two communities but there were not sufficient cases to provide any statistical significance.

3. "An epidemiological description of 10 Canadian cases of angiosarcoma of the liver" -- Fernand Delome, Hopital Regional de la Mauricie and Laval University. In June 1974, after diagnosing an angiosarcoma in S, he undertook a survey that turned up 8 other cases, all in VC workers. He recently found another case (the only one still alive) for a total of 10 cases. These are the only known cases of angiosarcoma in Canada at this time.

His cases were described as follows: 41-61 years old (average 50 years), 11-29 years of VC polymerization work (average 21 years, 1 month), considerable exposure to VC "gas" ranging from 5 years, 3 months, to 26 years (average 16 years, 10 months), average of 20.5 years from first exposure to VC to diagnosis of angiosarcoma, all beer drinkers (only 2 drank more than a bottle daily), all cigarette smokers (more than a pack daily), negative medical history, all lived near the VC plant.

Delome also gave pathological descriptions of tissues from livers of the angiosarcoma patients. He said a liver angiosarcoma can develop after at least 4 years' exposure to VC and that it takes at least 10 years from the beginning of exposure to tumor development. (He must have meant for clinical indication of the tumor's presence.)

4. "Birth defects associated with VC exposure" -- Lise Goulet, Laval University. Her report was a description of a proposal for a study on birth defects associated with community exposure to VC. (It seems some preliminary work is already in progress.)

In her opening she referred to two studies (Selikoff and Infante) done on the effects in children of VC workers following the discovery of chromosome breakages in the workers. Regarding the Infante study, she said the methods used (interviewing males only and then extrapolating to the females) "make the results less convincing." However, both studies indicate something may be amiss.

Finding of higher incidence rates of birth defects in a community where a VC plant is does not implicate VC as

being the only agent responsible, Goulet said. The findings deserve attention and justify further research.

The specifics of her proposal:

Phase 1.

All cases of birth defects and stillbirths from women who lived in S (and South Shawinigan) from 1966-75 will be collected. The same will be done for D, a town matched in all respects but one -- there is no VC plant there. A VC plant has been in S since 1943 and the wind blows from the plant over the populated area of the town 89% of the time. Each case of birth defect and stillbirth will be pinpointed on maps of the two communities. The rates for both towns will be compared; the proportion of birth defects and stillbirths over live births also will be computed. The observed rates will be compared with expected rates on the basis of provincial and national statistics.

The geographic distribution of cases around the VC plant in S will be plotted. Records will be otained of the annual census of the total population and newborns in the 1966-75 period.

Hospital records will be studied because the data are not yet available from the provincial record of birth defects and stillbirths begun in 1970. There are five hospitals in the S area and she expects to be able to trace 95% of all birth defects. There is one hospital in D where, it's believed, most of the women of the area deliver their children.

Three different hospital records will be checked: the mother's history at time of delivery; the baby's history (this usually covers the first five days of life); and special records kept for stillbirths.

It is expected there will be about 400 births annually available for study from each community. There probably will be less than 10 birth defects and perhaps one or two cases a year of CNS malformation.

Phase 2.

More detailed data will be needed in regard to residence, occupation and related information about the families of the births under study.

The study is expected to take about eight months.

5. "Occupational hazards: do they extend beyond plant boundaries?" -- Peter F. Infante, NIOSH, Cincinnati. At the

outset of his talk, Infante spoke in impromptu fashion in regard to questions about VC and birth defects that had been raised by Goulet. He said it was virtually impossible to assess an excess risk of birth defects from a cohort study of occupational exposures. There just aren't enough pregnancies, no women in the VC industry, he said.

The CDC did a study of children born with CNS abnormalities in 17 cities that VC plants and birth defect monitor systems. Four cities had a significant excess and in two the excess was able to be determined by monitoring less than half the births. One would expect 5 out of 100 due to chance alone, he said.

While we cannot say these findings are related to VC, Infante continued, it seems from the data that continue to come in that with women living in large industrial complexes there are excesses of children being born with birth defects.

The thrust of Infante's formal presentation was that a number of toxic agents have spread from the work setting to the general environment and that many of them may have adverse health effects now and in the future. He urged testing of new chemicals before they enter the marketplace.

He briefly reviewed the toxic effects of a number of substance (lead, cadmium, asbestos, mercury, etc.) which are harmful to workers and to their offspring and also to the general public.

Infante then discussed the genetic effects of VC, summarizing the paper he and his colleagues published in The Lancet of last April 3. He said there were now at least four studies showing chromosome aberrrations in VC workers and an excess of miscarriages in wives of such workers.

He stressed that there are structural analogs of VC that could be harmful to man both as carcinogens and as mutagens. Vinylidene chloride is mutagenic, he said. Chloroprene seems to be both mutagenic and carcinogenic, he added, as do other substances chemicallyrelated to VC.

He said vinylidene chloride had been cited as a mutagen in an article but that he had been unable to get data on it. Someone in the audience said the reference apparently was to work done by Viola who had claimed induction of intestinal tumors in animals with massive doses of the substance. There is no real indication that vinylidene chloride is carcinogenic, the speaker said.

Infante singled out chloroprene as a harmful agent with a structure similar to that of VC. An angiosarcoma had recently been identified in a polychloroprene worker, he said.

During his talk, Infante gave what he said were new VC experimental data from Maltoni. Following are the figures, which pertain to exposure in rats:

PPM	Mammary Cancers	Angiosarcomas
25	9	3
10	11	0
5	13	0
1	7	0

Four mammary cancers were found in the controls. Infante did not say how many animals there were in each exposed group.

6. "Ultrasound as a diagnostic tool for VC damage assessment" -- K.J. Taylor, Yale University. Ultrasound is useful in examining changes in the liver and spleen, he said, and in tests he did in a Wales (UK) VC plant the technique showed changes indicative of changes related to VC exposure.

Much of his presentation consisted of slides of ultrasound scans (imaging). The technique is noninvasive, does not involve radiation and requires no injection of a contrast medium.

VC exposure can lead to portal hypertension which often results in massive fatal hemorrhage, Taylor said. The portal vein in the VC workers he examined often showed up as a "tortuous" vessel, he said. Exposure to VC can cause liver and spleen abnormalities and cancer of many sites, he said.

Ultrasound is suitable for mass screening, Taylor said in recommending a study with this technique be done of VC workers and their families.

7. "New applied technology for VC control in PVC manufacture" -- W.C. Holbrook, B.F. Goodrich Co. He said at the outset that while VC is carcinogenic at certain levels, a number of questions still remain to be answered. Exposure levels today for both workers and communities are far below those of previous years. Industry is working effectively to control and contain exposure to VC by employees and the general public. He described various control procedures being used in VC plants. He also made available copies of Goodrich's 1976 booklet, "Vinyl chloride and cancer -- A study in prevention."

8. "Personal monitoring for VC exposure" -- Philip W. West, Louisiana State University. His technical presentation dealt with a small, simple personal minotor for VC exposure as well as exposure of other hazardous gaseous materials, such as CO, NO_x, chloroform, etc. He said the device, a bit larger than a silver dollar, was effective, reliable, had

no moving parts, needed no power supply, etc. It gives a linear response from 5 ppb to 50 ppm, he said. Material collected by the monitor is analyzed by conventional gas chromatographic techniques. He said the device has been field tested here and in England.

(The "MiniMonitor" is manufactured and sold by the Reiszner Environmental & Analytical Labs, Inc., Baton Rouge, La. West said a Dr. Reiszner had worked on development of the monitor while studying for his doctorate.)

--