MANUFACTURING CHEMISTS ASSOCIATION

1825 CONNECTICUT AVENUE, N W. WASHINGTON, D.C. 20009 (202) 483-6126

January 6, 1978

TO: Vinyl Chloride Research Coordinators
Technical Panel on Vinyl Chloride Research

SUBJECT: Final Report from Equitable Environmental Health, Inc. (EEH) on Epidemiological Study of Vinyl Chloride Workers

Gentlemen:

On November 1, 1977 the final report from EEH was mailed to all Research Coordinators and Panel members. Subsequent to this mailing, Dr. Torkelson, et. al., found errors requiring correction before further consideration could be given to the acceptance of the subject report.

On January 4, 1978 the required corrections were received in the form of the attached pages 19, 20, and 28. The corrected pages are to be inserted in your copy of the report mailed to you on November 1, 1977.

Consideration of the subject document will be taken up under agenda item 7.1 during the January 11 and 12 meetings of the Research Coordinators and the Technical Panel respectively.

Sincerely,

J. T. Seawell
Project Manager
Vinyl Chloride Research

JTS:ec
Enclosures

Malignant Neoplasms of Urinary Organs. Although urinary tract tumors were not in excess, detailed data on the 8 deaths from this cause are shown in Table 22.

Tumors of Brain and Other Parts of Nervous System. Table 23 summarizes information on the 28 deaths from tumors of other and unspecified sites, including 12 deaths from tumors of the brain, as opposed to 5.9 expected, giving an SMR of 203, significant at the 0.05 level. Of these, 4 are classified as glioblastoma multiforme, but only one of these 4 was definitely confirmed by autopsy, and in 2 cases, autopsy was certified as not performed. Five of the brain tumors were classified either as "malignant brain tumors" or "carcinoma of the brain", but none of these diagnoses was definitely confirmed by autopsy, and in 3 cases the absence of autopsy was certified. Of the remaining 3 brain tumors, 2 were classified as astrocytoma, both confirmed by autopsy, and one as "ependymoma of the 4th ventricle" confirmed by craniotomy.

Of the 12 brain tumors, 7 occurred in workers from plants producing only PVC, 2 were in plants producing both PVC and VC (one of which also produced copolymers), 2 were in plants producing only homopolymers or copolymers, and one was in a plant producing only VC. There was no apparent relationship with maximum exposure or total integrated exposure: 6 deaths were in individuals whose maximum level of exposure was classified as "low", while 3 each occurred in categories "medium" and "high". Five deaths were in men whose time-weighted dose was calculated as having been less than 100.

It is difficult to interpret the significance of this finding of an apparent excess of brain tumors. In the absence of definite confirmation by either autopsy or craniotomy in 8 of the 12 cases, it is quite possible that some might have been secondary brain tumors, with unrecognized primary sites, or other non-malignant space-occupying lesions in the cranial cavity. It is of interest to note that an excess of malignant brain tumors was also reported by Waxweiler,R.J. et al of NIOSH (Annals of the New York Academy of Science, 271:40-48, 1976) from a much smaller study (136 deaths and 12,720 person-years), confined to 4 plants with at least 15 years history of operation in the polymerization of VC. These authors reported an SMR of 329 based on only 3 deaths, all from glioblastoma multiforme, all histologically confirmed. In fact the NIOSH group claimed in this report to have identified altogether 9 histologically confirmed cases of glioblastoma multiforme in workers exposed to vinyl chloride in U.S. industry. It is difficult to say to what extent their study population overlaps that of the presently reported EEH study.

In view of all the above, further investigation of the question of malignant brain tumors in workers exposed to vinyl chloride should be pursued.

VII. DISCUSSION

Although the present study when compared with the first study reported in 1974 increased the study size from 7,128 to 9,677 workers who were traced, the person-years of observation from 77,846 to 120,203, and the certified deaths available for analysis from 328 to 669, it did not strengthen any of the associations suggested in the initial report.

The successive additions to the population and the improved follow-up have been accompanied by a rise in the overall-cause Standardized Mortality Ratio from 75 to 89. The major change has been in the SMR for major cardiovascular and renal disease, which was originally 80 and is now 95. There has been a concurrent downward shift in the SMR for "all malignancies", which is now 104 compared with 110 in the 1974 report.

In the current study, the SMR's for malignancies of various specific sites are also lower than in the 1974 report. For example, the SMR for digestive tract cancer has changed from 94 to 75, that for respiratory tract cancer from 112 to 107, that for cancer of other and unspecified sites from 155 to 147. The latter included 12 cancers of the brain as shown in Table 23 and discussed on the preceding page. No conclusion can be reached as to whether or not this apparent excess is related to occupational exposure to vinyl chloride, and further investigation is desirable.

All SMR's based on more than five deaths were tested for statistical significance, and three were found to be significantly lower than 100 (see Table 5). In general, since the health of an employed population is better than that of the general United States population, these significantly small SMR's are not surprising. With the single exception of the brain tumors, already discussed above, none of the SMR's (based on more than five deaths) that exceeded 100 was significantly different from 100. Inferenc

Table 5

Observed/Expected Deaths and Standardized Mortality Ratios for Selected Causes of Death in 9,677 Vinyl Chloride Workers

Cause of Death with ICD Number[a]	Obs./Exp.	SMR[b]
All causes	707/795.02	89**
All malignancies (140-205)	139/141.39	104
Malignant neoplasms, buccal and pharynx (140-148)	5/ 5.19	102
Malignant neoplasms, digestive organs and peritoneum (150-159)	29/ 40.82	75
Malignant neoplasms, respiratory system (160-164)	45/ 44.29	107
Malignant neoplasms, genital organs (170-179)	4/ 7.17	59
Malignant neoplasms, urinary organs (180-181)	8/ 6.85	123
Malignant neoplasms, other and unspecified sites (190-199)	28/ 20.18	147
Malignant neoplasms, brain and other parts of nervous system (193)	12/ 5.90	203*
Leukemia and aleukemia (204)	9/ 6.65	143
Lymphomas (200-203, 205)	11/ 10.36	112
Major cardiovascular and renal diseases (330-334, 400-468, 592-594)	347/385.24	95
Cirrhosis of liver (581)	14/ 26.45	56**
All other certified causes	169/241.95	74**
Number of workers	9,677	
Number of person-years	120,203	

a. Cause-specific numbers indicate categories in the 1955 (7th) revision of the International Classification of Diseases.
b. SMR's (other than for All Causes) adjusted for 38 deaths with no death certificates by factor of +5.68%
* Significant at the 0.05 level.
** Significant at the 0.01 level.