

Manufacturing Chemists Association

Minutes of Meeting

TECHNICAL TASK GROUP ON VINYL CHLORIDE RESEARCH

Sheraton O'Hare Hotel

Rosemont, Illinois

February 20, 1974

MEMBERS PRESENT:

T. R. Torkelson, CHAIRMAN	The Dow Chemical Company
T. R. Aalto	Tenneco Chemicals, Inc.
Z. G. Bell, Jr.	PPG Industries, Inc.
R. S. Brookman	Firestone Plastics Company
E. M. Dixon, M.D. for	Allied Chemical Corporation
W. A. Knapp	
R. J. Dowling for	UNIROYAL Chemical Division/
W. D. Harris	UNIROYAL, Inc.
B. W. Duck	The British Petroleum Company
	Limited, England
M. R. Gasque, M.D.	Olin Corporation
N. V. Hendricks	Exxon Corporation
C. A. Johnson, M.D.	The Goodyear Tire & Rubber Company
Flynt Kennedy	Continental Oil Company
H. L. Kusnetz for	Shell Oil Company
R. L. Maycock	
A. B. Lindquist	Stauffer Chemical Company
R. W. McBurney, M.D.	Diamond Shamrock Corporation
W. E. Rinehart	Ethyl Corporation
George Roush, Jr., M.D.	Monsanto Company
H. L. Schmidt, Jr.	Borden Chemical/Division of
	Borden, Inc.
W. M. Smith	Air Products & Chemicals, Inc.
R. N. Wheeler, Jr.	Union Carbide Corporation
K. D. Johnson	MCA Staff

GUESTS PRESENT:

L. H. Ballou, M.D.	Firestone Plastics Company
A. W. Barnes	ICI, Ltd., Plastics Division, England
Emilio Bartalini, M.D.	MONTEDISON, Italy
K. H. C. Bessant	BP Chemicals Int., Ltd., England
R. L. Bourget	Monsanto Company
W. J. Boyne	Borden Chemical/Division of
	Borden, Inc.
W. C. Cooper, M.D.	Tabershaw-Cooper Associates, Inc.

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GUESTS (cont.)

C. U. Dernehl, M.D.	Union Carbide Corporation
D. P. Duffield, M.D.	ICI, Mond Division, England
B. W. Eley	Monsanto Company
J. D. Forbes, M.D.	UNIROYAL, Inc.
W. R. Gaffey	Tabershaw-Cooper Associates, Inc.
J. W. Goode	Industrial BIO-TEST Laboratories, Inc.
D. E. Gordon, D.V.M.	Industrial BIO-TEST Laboratories, Inc.
R. B. Howard	Shell Chemical Company
E. Q. Hull, M.D.	Union Carbide Corporation
M. L. Keplinger	Industrial BIO-TEST Laboratories, Inc.
C. H. Kim	UNIROYAL Chemical Division/ UNIROYAL, Inc.
J. R. Livingston, Jr.	Exxon Chemical Company
W. F. Madden	ICI, Plastics Division, England
Richard Maier	Stauffer Chemical Company
Cesare Maltoni, M.D.	Institute of Oncology of Bologna, Italy
I. S. Pasternak	Esso Chemical Canada
Oddi Pietro	Montecatini Edison, Italy
D. P. Reid, M.D.	London School of Hygiene and Tropical Medicine, England
D. E. Rhoads	Tenneco Chemicals, Inc.
Ken Schadeberg	Industrial BIO-TEST Laboratories, Inc.
I. R. Tabershaw, M.D.	Tabershaw-Cooper Associates, Inc.
C. H. Whetstone, M.D.	Continental Oil Company
B. M. G. Zwicker	B. F. Goodrich Chemical Company, A Division of The B. F. Goodrich Company

1. Minutes of the Meeting of January 25, 1974

The subject minutes were approved as distributed.

2. Industrial BIO-TEST Oral Progress Report

As copies of the detailed quarterly progress report had been earlier distributed to members of the Technical Task Group on Vinyl Chloride Research, the oral presentation was primarily a summary report, augmented by slides illustrating the physical

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facilities set up for this project. The tabular data presented by Mr. Schadeberg on his slides is reproduced in Appendix A to these minutes.

It was suggested that, in future progress reports, the summary tables, as exemplified by this appendix, be furnished in the copies provided for general distribution to the group, and that the detailed data be filed with MCA for the record, but not included in the general reports. Mr. Schadeberg agreed to follow this format in the future.

The mortality revealed in Table I was discussed at some length. Members were somewhat relieved to note the improving picture, particularly with respect to losses from hamster cannibalism. It was agreed not to try to replace any animals lost to date, on the grounds that the stresses introduced by such disturbances to established orders of social dominance in the populations in any given cage would tend to perpetuate the earlier situation.

The reduced weight gain of the TE-IV Group rats (those with bedding and food in the cages during exposures) was noted, but the significance of this observation, if any, could not be determined. This group will be observed carefully for evidence of systemic toxicity.

3. Report of European Research

Dr. Maltoni repeated his presentation of the results of the European research programs, and the description of on-going experiments, that he had earlier presented to the OSHA hearing on February 15 in Washington. An updated version of his report, with the inclusion of the tabular data that appeared on his slides, will, upon receipt, be distributed as a separate mailing.

The only experiment that is now essentially complete is the initial series of exposures of Sprague-Dawley rats to levels of 10,000 ppm VCM down to 50 ppm. With the exception of the highest exposure group for which early mortality limited the incidence of such cancers, the rats showed a dose-related incidence of angiosarcomas of the liver, as shown in the following table:

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Exposure levels ^a (p.p.m.)	Rats with liver angio- sarcomas	Number of rats exposed
10,000	6	69
6,000	11	72
2,500	9	74
500	7	67
250	2	67
50	0	64

^a Atmospheric exposure of Sprague-Dawley rats to vinyl chloride, four hours daily, five days a week, for 12 months.
Note: No liver angiosarcomas were observed in controls or rats exposed similarly to 2500 p.p.m. vinyl acetate.

4. Support of Dow Proposals

The TTGVCR voted to request their managements to provide \$80,000 for the support of the Dow research as described in their proposal distributed to the group in the MCA mailing of January 29, 1974.

5. Support for Other Research

The TTGVCR endorsed the position of the Research Coordinators with respect to current support of research in the areas of mutagenicity, three-generation feeding studies, and 90-day feeding studies, recommending that these be deferred for the present.

6. Revision of SD-56 - Vinyl Chloride

This matter will be attended to after completion of the sub-task groups of their tasks of the development of work practices standards, medical surveillance, and industrial hygiene monitoring and analysis.

7. Progress Report from Tabershaw-Cooper Association on the Epidemiology Study

The staff of TCA distributed copies of an updated progress report (copy attached to these minutes as Appendix B). They pointed out that, in its present format and state, their tabulation merely reflects a distribution of death and is not

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intended to indicate the existence or non-existence of any specific risk or excess mortality in any category.

8. Tabershaw-Cooper Associates Proposals for Expanded Epidemiological Research

Dr. Tabershaw summarized his pending proposals for new studies involving (1) intensifying their efforts to trace missing cases, (2) clinical study of suspect deaths in the mortality study, and (3) undertaking a prospective epidemiology study among high-risk segments of the worker population. He indicated that he would soon be submitting formal proposals for these projects. (Prior to the publication of the present minutes, these proposals were received and distributed to the Technical Task Group by MCA under date of March 12, 1974.)

9. Establishment of a Vinyl Chloride Pathology Register

The full task group endorsed the recommendations of the Research Coordinators that the University of Michigan be requested to reactivate and expand their acro-osteolysis registry program to include all categories of occupational illnesses specifically related to vinyl chloride exposure. They requested that MCA pursue this matter with the University, and if necessary, to seek other agencies willing to perform such a service.

10. Report of the Working Group on Analysis and Monitoring

The report of the group, in the absence of its chairman, was read, and is attached to these minutes as Appendix C. The tenor of the resulting discussion was that member companies should submit their candidate analytical and monitoring methods for consideration by the working group as soon as possible. The latter should attempt to draft its recommendations in format that provided the maximum flexibility of implementation, as long as the methods employed met appropriate standards of sensitivity, selectivity, and precision.

11. Report of the Working Group on Medical Surveillance

The recommendations of this group have been incorporated in the work practices draft submitted by that group (see the following item in these minutes). It was pointed out that the recommended surveillance is required to document the effectiveness

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of the environmental controls programs. It was the opinion of the working group that liver function tests are of borderline significance and value as a predictor of the development of angiosarcomata.

12. Report of the Work Practices Working Group

The interim draft of their report was presented, with requests for suggestions as to its improvement. It was recommended that this draft (distributed to the Task Group on March 11, 1974), after review and discussion and possible revision, be presented informally to NIOSH as the personal recommendations of members of the working group now on the NIOSH consultants panel.

13. Future Meeting Schedule

In view of the uncertainties surrounding the timing of future federal agency activities relating to the vinyl chloride problem, the Task Group left the time of the next meeting subject to the call of the chairman.

Respectfully submitted,



Kenneth D. Johnson, Ph.D.
Secretary
Technical Task Group on Vinyl
Chloride Research

KJD:mb
Minutes Subject to Approval
April 8, 1974

Distribution:

- Technical Task Group on Vinyl Chloride Research
- Attendees
- Dr. Tiziano Garlanda

Industrial BIO-TEST Laboratories, Inc.

TABLE I

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

Chronic Vapor Inhalation Toxicity Study - Albino Rats,
Albino Mice, and Golden Hamsters

Summary of Mortality Data

Total Number of Mortalities at End of Month										
<u>ALBINO RATS</u>										
Month No.	Control		T-I		T-II		T-III		T-IV	
	M	F	M	F	M	F	M	F	M	F
1	0	0	0	0	0	0	0	0	-	0
2	0	0	2	0	1	0	0	0	-	0
3	0	1	2	0	1	0	1	4	-	0
4	0	2	4	1	3	0	1	4	-	0
5	2	3	5	1	6	1	3	4	-	0

<u>ALBINO MICE</u>										
Month No.	Control		T-I		T-II		T-III			
	M	F	M	F	M	F	M	F		
1	0	0	0	0	0	0	0	0		
2	0	0	0	3	0	0	0	0		
3	2	0	6	4	3	0	1	0		
4	5	1	19	5	4	1	4	7		
5	8	2	26	6	4	2	8	7		

<u>GOLDEN HAMSTERS</u>										
Month No.	Control		T-I		T-II		T-III			
	M	F	M	F	M	F	M	F		
1	5	4	4	4	7	5	2	5		
2	8	11	10	12	9	16	10	11		
3	8	13	12	14	12	18	14	13		
4	9	15	16	16	15	19	15	13		
5	9	18	16	16	16	20	15	15		

TABLE II

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

Chronic Vapor Inhalation Toxicity Study - Albino Rats, Albino Mice, Golden Hamsters

Summary of Mean Body Weight Values - Rats

Group and Test Level	Sex	Mean Body Weights at Week Indicated (grams)							Total Weight Gain (grams/animal)
		0	1	2	3	4	8	12	
Control	M	205	258	294	335	363	456	498	293
	F	160	188	214	223	235	275	299	139
TE-I 50 ppm	M	209	246	286	331	346	448	491	282
	F	168	184	207	223	232	274	297	129
TE-II 200 ppm	M	201	261	301	335	360	457	490	289
	F	171	200	208	228	242	289	302	131
TE-III 2500 ppm	M	200	245	302	326	351	453	499	299
	F	165	185	216	228	240	287	303	138
TE-IV 2500 ppm	F	181	209	223	236	251	282	288	107

TABLE III

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

Chronic Vapor Inhalation Toxicity Study - Albino Rats, Albino Mice, Golden Hamsters

Summary of Mean Body Weight Values - Mice

Group and Test Level	Sex	Mean Body Weights at Week Indicated (grams)							Total Weight Gain (grams/animal)
		0	1	2	3	4	8	12	
Control	M	35	36	37	39	40	41	43	8
	F	29	29	29	30	32	33	35	6
TE-I 50 ppm	M	33	34	35	37	39	39	43	10
	F	30	29	31	31	34	34	37	7
TE-II 200 ppm	M	36	37	37	40	40	38	42	6
	F	28	29	29	31	31	34	35	7
TE-III 2500 ppm	M	36	35	35	38	38	40	43	7
	F	28	28	27	30	31	34	34	6

TABLE IV

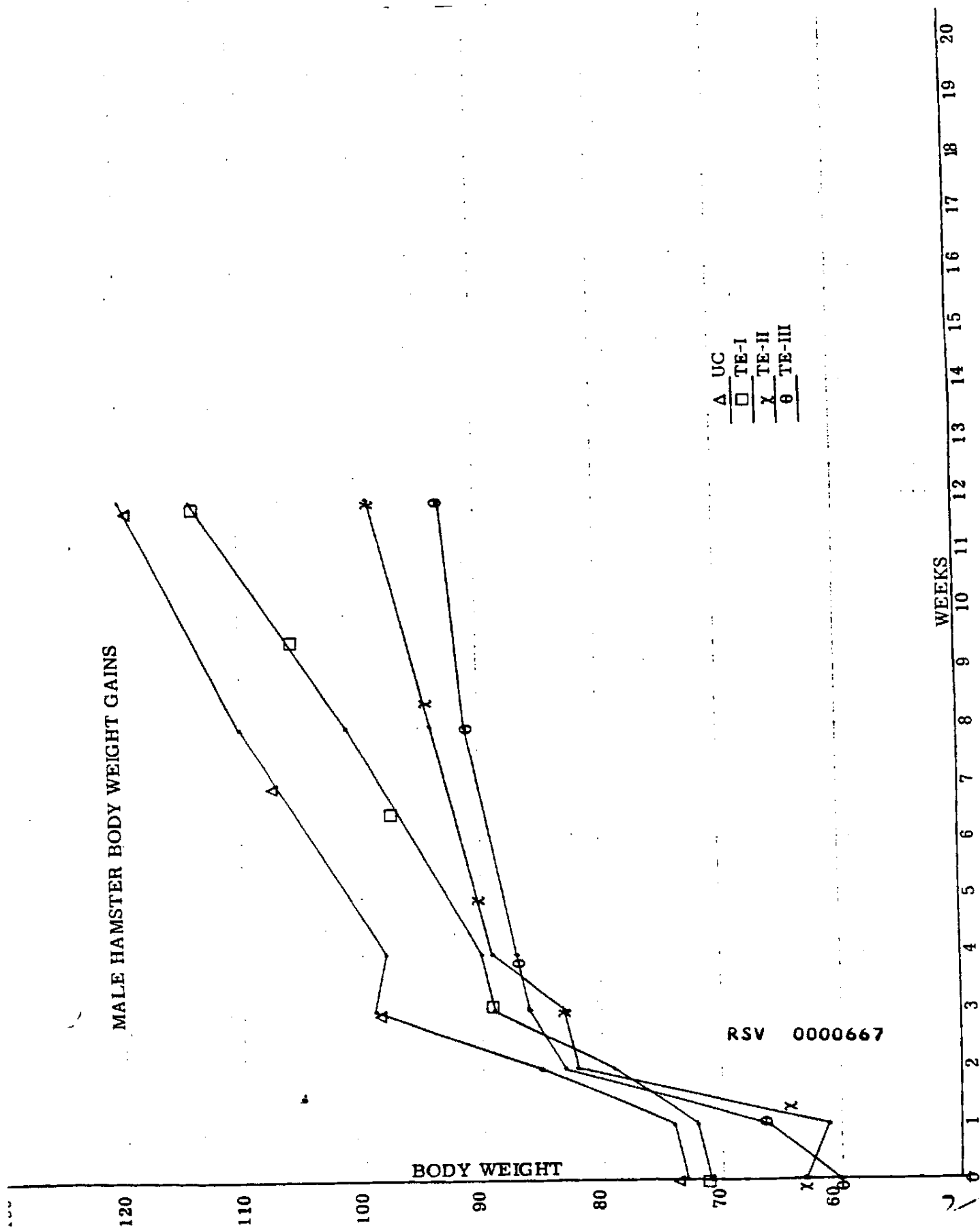
TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

Chronic Vapor Inhalation Toxicity Study - Albino Rats, Albino Mice, Golden Hamsters

Summary of Mean Body Weight Values - Hamsters

Group and Test Level	Sex	Mean Body Weights at Week Indicated (grams)							Total Weight Gain (grams/animal)
		0	1	2	3	4	8	12	
Control	M	73	74	86	99	98	110	120	47
	F	77	80	91	102	104	108	118	41
TE-I 50 ppm	M	71	72	79	89	90	101	114	43
	F	78	78	85	96	95	102	112	34
TE-II 200 ppm	M	63	61	82	83	89	94	99	36
	F	74	75	82	95	94	99	108	34
TE-III 2500 ppm	M	60	66	83	86	87	91	93	33
	F	69	70	87	95	92	100	106	37

MALE HAMSTER BODY WEIGHT GAINS



FEMALE HAMSTER BODY WEIGHT GAINS

BODY WEIGHT

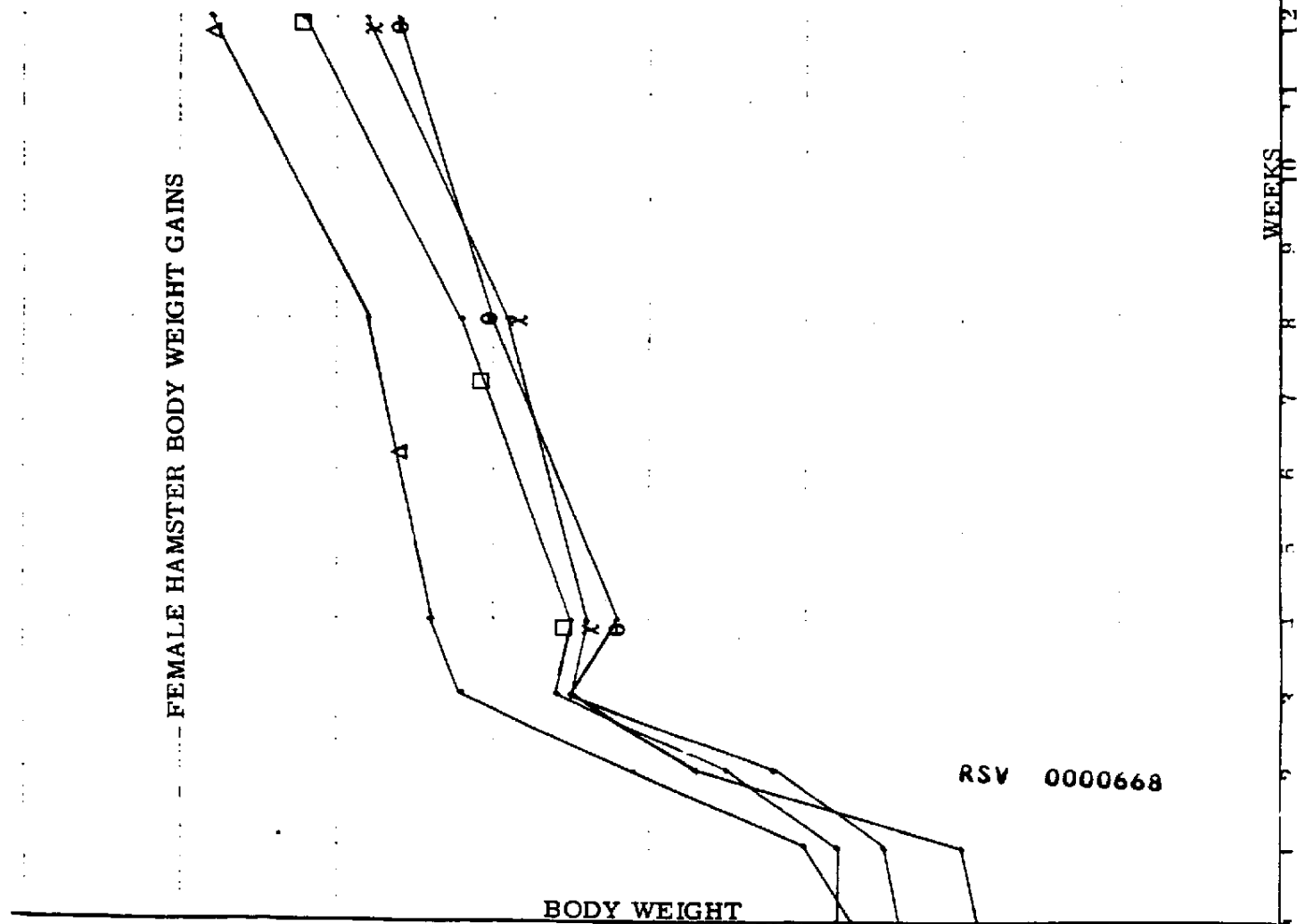
WEEKS

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Appendix B

VINYL CHLORIDE EPIDEMIOLOGY STUDY

PROGRESS REPORT: FEBRUARY 20, 1974

This is a report of a study in progress. Its purpose is to characterize the mortality experience of vinyl chloride workers up to the end of 1972. The study began in mid 1973 and consequently no attempt was made to obtain mortality data for 1973.

The study population consists of individuals who worked for at least one year in a job involving exposure to vinyl chloride before December 31, 1972, and was obtained in the following way.

We were supplied by the Manufacturing Chemists Association with the names of 43 North American plants involved in the manufacture of vinyl chloride or polyvinyl chloride. Four of these, which had begun operation after 1968, were ruled out of the study because of the brevity and recency of the exposures. Of the remaining 39, data reduction has been completed for 26, and data are in hand and being coded for six more. Of the remaining plants, four are now forwarding data to complete the required records on their workers. Study of one has been deferred because it stopped producing vinyl chloride 7 years ago, two others remain to be visited. Data are also in hand, but not yet processed, for a group of European plants.

In every plant, information on eligible workers as defined above was obtained for as far back as each plant's personnel records extended. Those who were not still employed, and who were not known from plant records to be either alive or dead, were traced by mail

or by a retail credit check to determine their vital status as of the end of 1972. The following tables, with the exception of the mortality data, deal with the 26 plants for which coding and key-punching are complete.

Table 1 shows the follow-up status of the study population of 4415 workers, 89 percent of whom have been traced. The 507 unknowns are still under active follow-up.

In any study in which follow-up is incomplete, it is important to examine the differences between those who have been found and those who have not. Tables 2 and 3 show the lengths of employment in exposed jobs by date of birth for the two groups. The median birth date is 1934 for those on whom follow-up is complete, and 1933 for those not yet found. The median duration of exposure is 69 months in the first group and 45 months in the second.

Similarly, Tables 4 and 5 show length of employment in exposed jobs versus the year in which exposure began for the found and not-found groups. The median date on which exposure began was 1963 for the first group and 1960 for the second.

In summary, those not yet found have about the same birth dates as those found, but have a much shorter exposure which began at an earlier age.

One interesting fact revealed by Table 2 is that there were 259 workers in the study with 20 years or more exposure and 658 with 15 years or more. These provide an excellent data base for prospective study.

Table 6 shows a distribution by selected causes for 131 deaths for whom death certificates were obtained. Certificates were included in this table even if the plants from which they came had not yet been processed. For comparison, the corresponding distribution of all U.S. male deaths in 1967 is shown. Because the age distribution of the study population is not the same as that of all U.S. males, and because the number at risk in the study population is not considered, this table is only descriptive. The main point of the table is to show that for rare conditions such as cancers of specific sites, the number of cases appearing in the study is too small to enable definite conclusions to be drawn. In order to investigate such rare conditions, the deaths must be studied in more detail than is possible from information contained in the death certificate itself.

When the remainder of the study plants have been processed, an estimated 150 - 200 more deaths will be found, since some of the oldest plants are in the group still being processed. At that time, calculations of the risk of death by broad cause groups will be made.

In summary, this study of the mortality of workers occupationally exposed to vinyl chloride is still incomplete. Of the 5000 to 5500 workers ultimately to be included, 4415 have so far been identified. So far the vital status of only 89% of these has been determined. Reports are still coming in on some of the oldest plants, so that the 128 deaths so far known will probably rise to 300 or more as data accumulate.

Because rare tumors of the kind suspected in recent weeks as being associated with VCM are not clearly identifiable in mortality statistics, a routine study of mortality ratios would not be expected to reveal them unless the incidence was quite high. For this reason this type of mortality study must be supplemented by case analyses. It should also be emphasized that the collection of identifying information on a population known to have been exposed for periods exceeding 10, 15 and 20 years provides a data base that will facilitate prospective studies.

RSV 0000672

Vinyl Chloride Epidemiology Study

Table 1

Study Population by Follow-up Status

Total	Alive	Dead	Unknown
4415	3780	128	507
Percent Follow-up - 89			

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RSV 0000673

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Vinyl Chloride Epidemiology Study

Table 2

Distribution by Birth Date and Years of Exposure,
for Members of Study Population for Whom
Follow-up is Complete*

Birth Date	Years of Exposure					
	Total	1-<5	5-<10	10-<15	15-<20	20+
Total	3877	1774	1052	393	399	259
1890-99	10	5	2	2	1	
1900-09	90	21	18	19	17	15
1910-19	434	103	80	65	95	91
1920-29	910	236	215	135	185	139
1930-39	1103	458	366	164	101	14
1940-49	1261	883	370	8		
1950+	68	68				
Unknown	1		1			

*Duration of exposure unknown for 31 workers.

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RSV 0000674

Vinyl Chloride Epidemiology Study

Table 3

Distribution by Birth Date and Years of Exposure,
for Members of Study Population Not Yet Found*

Birth Date	Years of Exposure					
	Total	1-<5	5-<10	10-<15	15-<20	20+
Total	497	366	73	36	14	8
1890-99	1	1				
1900-09	22	15	2	2		3
1910-19	60	34	12	7	4	3
1920-29	126	91	13	10	10	2
1930-39	143	92	34	17		
1940-49	142	130	12			
1950+	3	3				

*Duration of exposure unknown for 10 workers.

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RSV 0000675

Vinyl Chloride Epidemiology Study

Table 4

Distribution by Year Exposure Began
and Number of Years of Exposure,
for Members of Study Population
on Whom Follow-up is Complete*

Year Exposure Began	Years of Exposure					
	Total	1-5	5-10	10-15	15-20	20+
Total	3877	1774	1052	393	399	259
1940-49	290	49	34	26	43	138
1950-59	1020	163	131	249	356	121
1960-69	2126	1121	887	118		
1970-71	441	441				

*Duration of exposure unknown for 31 workers.

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RSV 0000676

Vinyl Chloride Epidemiology Study

Table 5

Distribution by Year Exposure Began
and Number of Years of Exposure,
for Members of Study Population Not Yet Found*

Year Exposure Began	Years of Exposure					
	Total	1-<5	5-<10	10-<15	15-<20	20+
Total	497	366	73	36	14	8
1940-49	73	50	8	8		7
1950-59	172	101	30	26	14	1
1960-69	239	202	35	2		
1970-71	13	13				

*Duration of exposure unknown for 10 workers.

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RSV 0000677

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Table 6

Percentage Distribution by Selected Causes for 131 Deaths
in Vinyl Chloride Workers, and Percentage Distribution
for the Same Causes in U.S. Males, 1967

Cause of Death	U.S. Males 1967	Vinyl Chloride Workers
All Causes	100.0%	100.0% (131)
Malignant neoplasms (140-205)	16.2	19.8 (26)
Buccal cavity and pharynx (140-148)	0.5	2.3 (3)
Digestive organs and peritoneum (150-159)	4.9	3.1 (4)
Liver (156)	0.2	0.8 (1)
Respiratory system (160-164)	4.6	6.9 (9)
Urinary organs (180,181)	0.9	0.8 (1)
Brain (193)	0.4	2.3 (3)
Leukemia and aleukemia (204)	0.8	0.8 (1)
Lymphosarcoma and other neoplasms of lymphatic and hematopoietic tissues (200-203, 205)	0.9	1.5 (2)
Major cardiovascular-renal diseases (330-334, 400-468, 592-594)	53.0	47.3 (62)
Vascular lesions affecting CNS (330-334)	8.9	3.8 (5)
Arteriosclerotic heart disease (420)	33.0	35.9 (47)
Hypertensive disease (440-447)	2.6	1.5 (2)
Cirrhosis of liver	1.7	1.5 (2)
Motor vehicle accidents (E810-E835)	3.6	6.9 (9)
Other accidents (E800-E802, E840-E962)	3.8	6.9 (9)
Suicide (E963, E970-E979)	1.5	3.8 (5)
Other	20.2	13.7 (18)

Appendix C

Subcommittee on Analytical and Monitoring Methods
Task Group on Vinyl Chloride
Manufacturing Chemists Association
Volunteered at meeting of January 25, 1974

B. Barnes, ICI
Z. G. Bell, PPG
R. Henderson, Olin
H. R. Hoyle, Dow (volunteered by T. R. Torkelson)
F. Kennedy, Continental Oil

Subsequent to the meeting, T. Aalto, Tenneco, has volunteered to serve on the subcommittee.

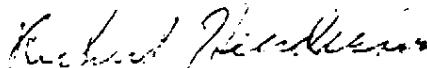
B. Barnes, Z. G. Bell, R. Henderson and F. Kennedy met on January 25, 1974. At that meeting and in subsequent conversations it was agreed that the role of the subcommittee should be to:

- I. Review literature on methods of analysis for VCM.
- II. Solicit information from contributors to the M.C.A. vinyl chloride projects on their experience with various procedures for sampling work environments and analyzing the samples.
- III. Evaluate procedures for sampling and analyses.
- IV. Recommend procedures for sampling and analyses.

It was agreed that there are analytical methods of sufficient sensitivity to detect VCM in air in the concentration range of one to 50 parts per million using reasonable air samples. Flame ionization, infrared, and pyrolysis followed by measurement of conductivity of water in which chloride is trapped are detection methods that can be used.

Members of the M.C.A. vinyl chloride project will be requested to submit to Dr. Henderson information on procedures for monitoring and analysis for VCM.

The members of the subcommittee will meet after information is received from member companies and circulated for evaluation.



Richard Henderson
Chairman, Subcommittee on
Analysis and Monitoring

