

Industrial **BIO-TEST** *Laboratories, Inc.*

1810 FRONTAGE ROAD
NORTHBROOK, ILLINOIS 60062

SEVEN-MONTH STATUS SUMMARY TO
MANUFACTURING CHEMISTS ASSOCIATION
CHRONIC VAPOR INHALATION TOXICITY STUDY WITH
VINYL CHLORIDE (ETHYLENE DERIVED)
IN ALBINO RATS, ALBINO MICE
AND GOLDEN HAMSTERS

JUNE 19, 1974

IBT NO. 663-03222

TABLE VI continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Tumors Observed Among Mice

Group Animal Number and Sex	Neoplastic Findings			Date of Death
	Lung	Liver	Skin	
T-III continued				
1505 Female	AA (s)	HS (s)		4-3-74
1565 Female	AA (s)	HS (s)		4-3-74
1409 Male	AA (s)	HS (s)		4-5-74
1543 Female	AA (s)	HS (s)		4-5-74
1544 Female	AA (s)	HS		4-5-74
1546 Female	AA (s)	HS (s)	MT (Axillary region)	4-5-74
1535 Female	AA (s)	HS (s)		4-7-74
1432 Male	AA (s)			4-8-74
1577 Female	AA (s)	HS (s)	MT (Para-aural)	4-9-74
	Metastatic		MT (Abdomen)	
	Mammary Tumor		MT (Pelvic region)	

Key to Symbols

AA = Multiple Alveologenic Adenomas of Lung

HS = Hemangiosarcoma of Liver

MT = Malignant Mammary Tumor

(s) = Multiple Lesions

CMA 001954

TABLE VI

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Tumors Observed Among Mice

Group Animal Number and Sex	Neoplastic Findings			Date of Death
	Lung	Liver	Skin	
T-I				
1123 Male	AA (s)	HS (s)		3-15-74
1110 Female	AA (s), Metastatic Mammary Tumor		MT (Para-aural)	3-20-74
1119 Female		HS (s)		3-24-74
1200 Female	Metastatic Mammary Tumor		MT (Femoral region)	3-30-74
T-II				
1347 Female	Metastatic Mammary Tumor		MT (Abdomen)	3-5-74
1309 Female		HS (s)		3-18-74
1289 Male	AA (s)	HS		3-25-74
1382 Female		HS (s)		4-2-74
1350 Female	AA (s)	HS (s)		4-5-74
1399 Female	AA (s)		MT (Inguinal region)	4-9-74
T-III				
1538 Female	AA (s)	HS (s)		3-6-74
1532 Female	AA (s)			3-7-74
1562 Female	AA (s)	HS (s)		3-8-74
1598 Female	AA (s)	HS (s)		3-18-74
1405 Male	AA (s)	HS (s)		2-25-74
1494 Male	AA (s)	HS (s)		3-22-74
1574 Female	AA (s)	HS (s)		3-22-74
1531 Female		HS (s)	MT (Femoral region)	3-23-74
1588 Female		HS (s)		3-25-74
1593 Female	AA (s)	HS (s)		3-30-74

TABLE V

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Tumor Data Among Mice

Group	No. Mortalities with Neoplasms	Location of Tumors			Metastasis to Lung
		Lung	Liver	Skin	
T-I	4 (1 Male, 3 Females)	2 (50%)	2 (50%)	2 (50%)	2
T-II	6 (1 Male, 5 Females)	3 (50%)	4 (66.7%)	2 (33%)	1
T-III	19 (4 Males, 15 Females)	17 (89.5%)	17 (89.5%)	3 (15.8%)	

CMA 001956

VII. Histopathology

Histopathologic examinations were conducted on all mice which showed grossly visible lesions through the end of the seventh month of inhalation exposures. All mice which showed neoplastic findings are presented in Tables V and VI.

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
T-III Mice	1535-F	Multiple small (1-2 mm) white foci in all lobes of the lung. Dark red focus (3 cm) involving most of one major lobe of liver and smaller (1-3 mm) lesions in other lobes. Adhesions between lobes of affected liver and between liver and mesentery.	-
	1432-M	Congestion of all lobes of lung Multiple small (1-3 mm) white foci in all lobes of lung	4 -
	1477-F	Left diaphragmatic lobe of lung congested, multiple white parenchymal foci in all lobes of lung ranging from 1 mm to 1 cm in size. Liver has small (1-5 mm) dark red foci in all lobes. Some liver lesions are raised and some depressed.	- -
		Subcutaneous multi-lobular fibrotic mass (5 x 5 x 3 cm) in inguinal region with retroperitoneal invasion. Several areas filled with brown fluid Two similar masses in left axillary region extending into para-aural region, each approximately 1.5 cm in diameter.	- -
		Two small subcutaneous masses (1 cm dia.) in right abdominal region filled with dark red fluid Large mass (2.5 cm) located in left axillary region	- -
	1494-M	Multiple small (1-2 mm) white foci in all lobes of lung. Small (1-5 mm) dark red foci in all lobes of liver. Abdominal cavity contains dark red fluid.	-

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
T-III Mice	1535-F	Multiple small (1-2 mm) white foci in all lobes of the lung. Dark red focus (3 cm) involving most of one major lobe of liver and smaller (1-3 mm) lesions in other lobes. Adhesions between lobes of affected liver and between liver and mesentery.	-
	1432-M	Congestion of all lobes of lung Multiple small (1-3 mm) white foci in all lobes of lung	4 -
	1477-F	Left diaphragmatic lobe of lung congested, multiple white parenchymal foci in all lobes of lung ranging from 1 mm to 1 cm in size. Liver has small (1-5 mm) dark red foci in all lobes. Some liver lesions are raised and some depressed.	- -
		Subcutaneous multi-lobular fibrotic mass (5 x 5 x 3 cm) in inguinal region with retroperitoneal invasion. Several areas filled with brown fluid Two similar masses in left axillary region extending into para-aural region, each approximately 1.5 cm in diameter.	- -
		Two small subcutaneous masses (1 cm dia.) in right abdominal region filled with dark red fluid Large mass (2.5 cm) located in left axillary region	- -
	1494-M	Multiple small (1-2 mm) white foci in all lobes of lung. Small (1-5 mm) dark red foci in all lobes of liver. Abdominal cavity contains dark red fluid.	-

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
T-III Mice	1565-F	Few small (1 mm) white foci in all lobes of lung. Diffuse dark red discoloration of one entire lobe of liver with adhesions to mesentery. Small (1-2 mm) dark red foci in other lobes of liver.	-
	1409-M	Multiple small (1-3 mm) white foci in all lobes of lung. Small (1-4 mm) dark red foci in all lobes of liver. Some liver lesions on surface had depressed centers.	-
	1543-F	Abdominal cavity filled with dark red fluid Multiple 1 mm - 2 cm white foci involving all lobes of lung. Hepatomegaly with multiple dark red foci (1-3 mm) in all lobes and adhesions between diaphragm and surface of liver. Also adhesions between liver lobes, liver to intestine, liver to mesentery.	-
	1544-F	Abdominal cavity filled with dark red fluid Multiple small (1-2 mm) white foci in all lobes of lung. Diffuse dark red discoloration of one lobe of liver with smaller (1-3 mm) dark red foci in other lobes. Adhesions between surface of liver lesions and mesentery.	-
	1546-F	Abdominal cavity filled with dark red fluid Several 1-5 mm white foci involving all lobes of lung. Large (3 x 3 x 3 cm) focus in one lobe of liver which involved almost the entire lobe with smaller (1-5 mm) similar lesions in all other lobes of liver. There are adhesions between the surface of the larger liver lesion and mesentery. Abdominal cavity filled with dark red fluid.	-

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
TE-III Mice	1531-F	Congestion of all lobes of lung Large (5 x 3 x 5 cm) subcutaneous mass in right femoral region extending into musculature of limb and abdomen.	1 -
	1588-F	Few small (1 mm) white foci in all lobes of lung. Large (2-3 cm) dark red raised foci in two lobes of liver with smaller (1-3 mm) lesions in other lobes. Adhesions between larger lesions and mesentery. Spleen enlarged 3 times normal.	- -
	1593-F	Abdominal cavity filled with dark red fluid Few small (1 mm) white foci in all lobes of lung. Small (1-3 mm) dark red foci in all lobes of the liver. Some of the lesions on the surface were raised while others had depressed centers. Spleen enlarged 1½ times normal	- -
	1505-F	Abdominal cavity filled with dark red fluid Several 1-5 mm white foci involving all lobes of lung. Large (3 x 3 x 3 cm) dark red focus in one lobe of liver which involved almost the entire lobe with smaller (1-5 mm) similar lesions in all other lobes of liver. There are adhesions between the surface of the larger liver lesion and mesentery. Abdominal cavity filled with dark red fluid.	-

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
TE-II Mice	1299-F	Multiple small (1-2 mm) white foci in all lobes of lung. Large (2 x 2 x 2 cm) subcutaneous tumor mass in inguinal region.	3
TE-III Mice	1405-M	Irregular surface on right kidney	-
	1538-F	Multiple small to large (1 mm - 1 cm) dark red foci in all lobes of the liver some of which are slightly raised and others have depressed centers. Multiple white foci (1-3 mm) in all lobes of lung.	-
	1532-F	Enlarged thymus Congestion of all lobes of lung	- 3
	1562-F	Multiple small (1-2 mm) white foci in all lobes of lung Multiple small (1 mm) dark red foci in all lobes of liver. Large (1 cm) raised lesion in one lobe of liver with adhesions between surface of lesion and adjacent mesentery and abdominal fat. Abdominal cavity filled with dark red fluid.	-
	1598-F	Multiple small (1-2 mm) white foci in all lobes of lung. Diffuse dark red discoloration of one lobe of liver which was enlarged and smaller (1-3 mm) lesions in all other lobes. Adhesions between surface of lesions and mesenteric fat. Abdominal cavity filled with dark red fluid.	- - -
	1574-F	Small (1-2 mm) white foci in all lobes of lung Large (2.5 cm) dark red nodular focus in one small lobe of liver. The lesion involved almost the entire lobe. The other lobes of liver were pale in color. Abdominal cavity filled with dark red fluid	- - -

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
TE-I Mice	1200-F	Dark red raised focus (1 cm) in major lobe of liver with adhesions to diaphragm. Multiple small (1-2 mm) white to dark foci in all lobes of lungs. Large subcutaneous tumor mass (4 x 4 x 2 cm) in right femoral region. Abdominal cavity contained moderate amount of dark red fluid.	-
	1071-M	All lobes of lung congested	2
TE-II Mice	1301-F	Gall bladder distended with bile	-
		Enlarged gall bladder	-
	1268-M	Congestion of all lobes of lung	4
	1309-F	Large (6 mm) nodular red focus in major lobe of liver with adhesions between capsular surface and mesenteric fat.	-
	1341-F	Congestion of all lobes of lung	3
		Enlarged spleen, 3 times normal	-
	1289-M	Multiple small (1-3 mm) white foci in all lobes of lung. Large (2 x 2 x 2 cm) dark red focus in one lobe of liver. Abdominal cavity contains moderate amount of dark red fluid.	-
	1382-F	Large (3 x 2 x 3 cm) dark red focus in one lobe of liver and smaller foci (0.5 cm) in other lobes. Abdominal cavity contains moderate amount of dark red fluid.	-
	1350-F	Small (1-2 mm) white foci in all lobes of the lungs. Large (3 cm) nodular focus in major lobe of liver with adhesions between capsular surface and mesentery. All lobes of liver have small depressed red foci. Abdominal cavity contains moderate amount of dark red fluid.	-

TABLE IV continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
TE-II Hamsters	2189-F	Congestion of all lobes of lung	3
	2004-M	Congestion of all lobes of lung	4
	2180-F	Congestion of all lobes of lung	4
	2166-F	Congestion of all lobes of lung	5
	2155-F	Congestion of all lobes of lung	2
TE-III Hamsters	2220-M	Congestion of all lobes of lung	4
	2312-F	Congestion of all lobes of lung	3
	2311-F	Right kidney has focus of white discoloration extending from capsule into cortex	-
Control Mice	835-M	Focal consolidation of all lobes of lung	1
	859-M	Enlarged kidney 1/2 times normal, w/granular surface	-
TE-I Mice	1033-M	Pale kidneys	-
	1048-M	Enlarged seminal vesicle, 5 times normal	-
	1023-F	Small (1-3 mm) dark red foci in all lobes of liver. One small lobe has large (2 cm) dark focus which is slightly raised. There are also discolored foci with depressed centers. A small (5 mm) yellow nodule is also attached to the larger mass. Multiple, small (2-4 mm) white foci in all lobes of lungs.	-
	1110-F	Several small (2 mm) dark red to white foci in right anterior lobe of lung. Large (5 x 5 x 7 cm) firm subcutaneous mass on right side of head in para-aural region which encircles neck and extends dorsally on other side of head toward left ear.	-
	119-F	Small (1-20 mm) dark red foci in all lobes of the liver and dark red fluid in abdominal cavity.	-

CMA 001964

TABLE IV

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Gross Pathologic Data

Group and Species	Animal Number and Sex	Gross Pathologic Findings	Grade
Control Rats	32-M	Focal consolidation of all lobes of lung	5
	173-F	Focal consolidation of all lobes of lung	3
	75-M	Focal consolidation of all lobes of lung	5
	51-M	6 x 4 x 5 cm subcutaneous multilobular fibrotic mass in abdominal region	-
TE-1 Rats	215-M	Dark red discoloration of all lobes of lung	1
	211-M	Congestion of lung	5
		Small consolidated foci in all lobes of lung	-
	283-M	Congestion of all lobes of lung Spleen enlarged, 2 times normal	4 -
TE-II Rats	499-M	Diffuse red discoloration of all lobes of lung	1
	521-F	Spleen enlarged, 3 times normal	-
		Draining abscess in inguinal region	-
	518-F	Congestion of all lobes of lung	4
TE-III Rats	657-M	Congestion of lung with small consolidated foci	3
	635-M	Consolidation of all lobes of lung	3
	721-F	Congestion of all lobes of lung	4
Control Hamsters	1750-F	Congestion of all lobes of lung	4
	1773-F	Congestion of all lobes of lung	4
	1784-F	Congestion of all lobes of lung	3
TE-I Hamsters	1861-M	Congestion of all lobes of lung	5
	1912-F	Congestion of all lobes of lung	4
	1910-F	Dilatation of both uterine horns with clear fluid (hydrometra)	-

CMA 001965

VI. Gross Pathology

Noteworthy gross pathologic findings are presented in Table IV.

Animals not listed showed only postmortem changes or were too badly cannibalized or decomposed for valid examination.

CMA 001966

TABLE III

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Mortality Data

Cumulative 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	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
6	3	4	6	2	6	1	5	4	0
7	4	4	8	6	6	2	6	5	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	
6	12	2	30	6	8	3	10	9	
7	18	5	31	11	9	12	13	23	

<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	
6	13	18	16	16	20	21	16	16	
7	13	28	24	19	22	33	18	26	

V. Mortality Data

The cumulative monthly mortality data are presented in Table III.

No definite dose-related trends have been observed.

CMA 001968

TABLE II continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Mean Body Weights - Golden Hamsters

Sex	Group	Mean Body Weights (grams)											Overall Weight Gain
		Week Number					Month Number						
		0	1	2	3	4	2	3	4	5	6	7	
Males	Control	73	74	86	99	98	110	120	129	130	133	130	57
	TE-I	71	72	79	89	90	101	114	120	121	122	128	57
	TE-II	63	61	82	83	89	94	99	119	108	120	118	55
	TE-III	60	66	83	86	87	91	93	91	88	112	110	50
Females	Control	77	80	91	102	104	108	118	120	121	124	125	48
	TE-I	78	78	85	96	95	102	112	118	118	122	130	52
	TE-II	74	75	82	95	94	99	108	107	106	114	112	38
	TE-III	69	70	87	95	92	100	106	106	104	110	118	49

CMA 001969

TABLE II continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Mean Body Weights - Albino Mice

		Mean Body Weights (grams)											Overall Weight Gain
		Week Number				Month Number							
Sex	Group	0	1	2	3	4	2	3	4	5	6	7	
Males	Control	35	36	37	39	40	41	43	46	43	46	52	17
	TE-I	33	34	35	37	39	39	43	44	42	47	45	12
	TE-II	36	37	37	40	40	38	42	44	42	45	43	7
	TE-III	36	35	35	38	38	40	43	44	38	45	41	5
Females	Control	29	29	29	30	32	33	35	36	35	38	37	8
	TE-I	30	29	31	31	34	34	37	39	38	40	41	11
	TE-II	28	29	29	31	31	34	35	37	36	38	36	8
	TE-III	28	28	27	30	31	34	35	36	37	37	34	6

CMA 001970

TABLE II

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Mean Body Weights - Albino Rats

Sex	Group	Mean Body Weights (grams)											Overall Weight Gain	
		Week Number					Month Number							
		0	1	2	3	4	2	3	4	5	6	7		
Males	Control	205	258	294	335	363		456	498	517	537	543	550	345
	TE-I	209	246	286	331	346		448	491	526	545	554	567	358
	TE-II	201	261	301	335	360		457	490	522	549	567	565	364
	TE-III	200	245	302	326	351		453	499	529	550	567	576	376
Females	Control	160	188	214	223	235		275	299	315	320	326	344	184
	TE-I	168	184	207	223	232		274	297	310	308	323	348	180
	TE-II	171	200	208	228	242		289	302	313	316	329	342	171
	TE-III	165	185	216	228	240		287	303	312	321	329	346	181
	TE-IV	181	209	223	236	251		282	288	291	314	324	338	157

CMA 001971

Hamsters: Mean body weights of hamsters through the sixth month of the inhalation period revealed dose related decreases in body weight for both sexes from control down to TE-III animals. However, evaluation of body weight gains for all groups between the fifth, sixth and seventh months of the investigation indicated that gains of all test groups were nearly as great or greater than the control group gains. Below is a table showing average gains of each group of hamsters during the third, fourth, fifth and sixth months of the study.

Sex	Group	Mean Gain During Month Indicated (grams)			
		Third	Fourth	Fifth	Sixth
Males	Control	9	1	3	-3
	TE-I	6	1	1	6
	TE-II	20	-11	12	-2
	TE-III	-2	-3	24	-2
Females	Control	2	1	3	1
	TE-I	6	0	4	8
	TE-II	-1	-1	8	-2
	TE-III	0	-2	6	8

IV. Body Weight Data

The mean body weight and weight gain data are presented in Table

II. Below is a discussion of the data from each species.

Rats: The average seven-month weight gain of the TE-IV rats was found to be less than the control or other test group animals. This difference was attributed to the greater initial weights of the TE-IV group at the start of inhalation exposures. There were no other abnormalities or dose related trends in the other test groups.

Mice: There are no adverse body weight effects among the mice which can definitely be attributed to inhalation of the test material. Although the seven-month body weights and weight gains of the highest test level are less than the lower dose groups and the control mice, the differences are only slight.

CMA 001973

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		<u>TE-I</u>			<u>TE-II</u>			<u>TE-III</u>			<u>TE-IV</u>		
		Range	Mean		Range	Mean		Range	Mean		Range	Mean	
197	141	40.0	55.0	45.1	178	216	196	2400	2700	2535	2320	2480	2391
198	142	29.0	64.5	57.4	170	220	177	2460	2800	2594	2400	2520	2440
199	143*	-	-	-	-	-	-	-	-	-	-	-	-
200	144	38.5	56.0	49.0	178	310	223	2340	3120	2561	2100	3200	2480
201	145	37.5	55.5	48.0	174	212	197	2340	2740	2500	1980	2740	2553
204	146	41.5	61.0	51.0	188	248	218	2320	2700	2552	1980	2800	2352
205	147	41.5	52.5	47.0	184	234	207	2280	2840	2541	2420	2600	2523
206	148	40.5	51.5	49.2	178	272	223	2500	2800	2613	2260	2420	2352
207	149	47.0	56.5	51.6	180	206	193	2300	2820	2444	2200	2720	2524
208	150	48.0	54.5	51.4	170	242	200	2260	3420	2627	2600	2700	2654
211	151	42.5	51.0	47.0	160	230	189	2320	2520	2413	2200	2660	2440
212	152	36.0	64.5	48.1	154	282	194	2160	3200	2583	2200	2600	2435

* Equipment failure, exposures not conducted.

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		TE-I		Mean	TE-II		Mean	TE-III		Mean	TE-IV		Mean
		Range			Range			Range			Range		
170	122	45.0	51.0	48.5	180	208	192	2260	2440	2461	2200	2440	2355
171	123	35.0	55.0	48.0	186	210	197	2320	3020	2708	2080	3140	2347
172	124	17.5	57.5	37.5	148	248	198	2000	2800	2488	2400	2920	2640
173	125	39.5	51.5	48.7	178	204	197	2360	2620	2505	2460	2620	2543
176	126	35.0	66.5	54.2	190	222	211	2360	3060	2787	3060	3100	3080
177	127	43.0	62.5	52.9	174	214	195	2360	2860	2739	2140	2880	2551
178	128	42.0	60.0	48.2	184	214	195	2400	2800	2512	2440	2900	2644
179	129	41.0	65.0	53.3	192	228	210	2520	2800	2671	2500	2740	2657
180	130	37.5	60.0	50.1	190	206	198	2340	2560	2467	2400	2600	2500
183	131*												
184	132	48.5	57.5	52.9	170	206	196	2280	2580	2452	2380	2540	2453
185	133	39.5	57.5	52.0	186	220	206	2320	2800	2551	2220	2800	2434
186	134	47.0	53.0	49.6	184	224	209	2040	2680	2419	2380	2580	2480
187	135	46.5	55.5	50.7	180	262	194	2180	3400	2515	2400	2540	2472
190	136	46.0	50.0	48.0	170	220	201	2480	2800	2575	2480	3280	2753
191	137	43.0	51.0	47.6	196	212	202	2460	2620	2512	2340	2540	2445
192	138	46.0	52.0	49.7	178	206	197	2300	2640	2462	2360	2540	2440
193	139	43.0	54.0	48.9	174	200	187	2340	2520	2424	2220	2460	2343
194	140	35.0	61.0	54.3	158	246	205	2160	2700	2537	2020	3900	2590

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		TE-I			TE-II			TE-III			TE-IV		
		Range		Mean	Range		Mean	Range		Mean	Range		Mean
137	99	41.0	63.0	50.0	176	252	222	1600	3840	2745	1920	3600	2875
138	100	31.9	37.4	35.2	158	200	187	2000	2643	2354	1200	3440	2352
141	101	19.0	100.0	46.3	152	266	189	1860	2620	2346	1740	2600	2046
142	102	32.5	52.0	48.8	104	306	202	2620	3540	3100	2400	3320	2676
143	103	42.0	49.0	47.8	180	296	222	2080	2900	2580	1820	2620	2306
144	104	31.5	55.5	51.0	190	224	205	2340	2920	2546	2200	2820	2494
145	105	38.5	70.0	49.0	154	240	196	2320	2980	2408	2220	3160	2542
148	106	22.0	32.5	29.6	180	212	193	2240	2640	2393	2120	2270	2245
149	107	29.5	70.0	49.9	156	314	220	2140	3460	2614	1880	2040	1946
150	108	35.0	58.0	49.3	90	288	200	1780	2920	2566	2080	2860	2534
151	109	32.0	62.0	44.0	150	234	193	1280	2800	2349	2060	3000	2529
152	110	41.5	110.0	58.9	170	252	198	2300	2800	2497	2140	2700	2357
155	111	45.0	66.0	52.3	178	260	216	2620	2800	2683	2300	2900	2700
156	112	43.0	61.0	49.7	164	246	198	2300	2900	2573	2400	3240	2706
157	113	35.0	58.0	54.1	160	258	222	2220	2700	2519	2420	2560	2467
158	114	38.0	60.5	57.7	176	212	200	2220	2820	2392	2340	2680	2502
159	115	47.0	60.0	54.3	160	210	195	2180	2700	2538	1960	2660	2408
162	116	42.5	67.0	57.1	104	252	203	1460	2840	2592	2340	3080	2642
163	117	28.0	60.5	46.1	178	260	202	2240	3020	2535	2100	2400	2360
164	118	40.0	58.0	49.4	164	214	197	2280	2920	2922	2370	2540	2455
165	119	37.0	55.5	50.3	178	214	184	2280	2640	2428	2120	2740	2361
166	120	25.0	66.5	53.0	172	194	187	2400	2740	2529	2380	2480	2428
169	121	39.5	51.0	48.0	158	264	213	2400	2740	2543	2100	3020	2504

CMA 001976

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		TE-I			TE-II			TE-III			TE-IV		
		Range	Mean		Range	Mean		Range	Mean		Range	Mean	
113	81	21	50	42	180	244	211	1620	2520	2306	Equip. failure	-	
114	82	Holiday		-	-	-	-	-	-	-	-	-	
115	83	37	54	47	164	260	201	2180	2500	2385	1780	2240	2006
116	84	26	55	47	178	214	200	1980	2780	2393	2100	2380	2176
117	85	Equip. failure		-	-	-	-	-	-	-	-	-	-
120	86	45	46	45	168	232	199	1960	2960	2565	2200	2840	2529
121	87	32	54	44	160	250	184	2200	2820	2513	2040	2800	2390
122	88	48	60	54	140	204	173	2500	2920	2664	1040	1120	1083
123	89	20	58	44	202	388	295	2410	3960	3090	2000	2780	2377
124	90	39	52	46	124	180	175	1980	2600	2396	2120	2280	2236
127	91	37	55	47	196	200	197	1600	2560	2414	Equip. failure	-	
128	92	39	58	51	186	226	200	1660	2500	2191	Equip. failure	-	
129	93	43	55	50	136	266	230	1600	2620	2145	Equip. failure	-	
130	94	42	63	53	180	228	201	2680	3100	2883	One sample only		2900
131	95	35	70	53	190	250	220	1740	2800	2259	1940	3000	2333
134	96	52	77	68	208	262	230	2180	2960	2624	1700	2180	2180
135	97	25	48	38	135	248	186	1560	3480	2983	2080	3660	3513
136	98	40	43	41	118	200	172	2080	2800	2410	1860	2700	2170

CMA 001977

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		<u>TE-I</u>		Mean	<u>TE-II</u>		Mean	<u>TE-III</u>		Mean	<u>TE-IV</u>		Mean
		Range			Range			Range			Range		
85	61	29	47	43	148	216	191	1620	2280	2077	1220	2500	2306
86	62	47	54	49	200	220	210	2160	2560	2380	2500	2940	2725
87	63	46	80	60	98	224	185	400	1960	1659	2320	2720	2457
88	64	35	50	48	174	220	211	2080	2380	2246	2520	2680	2506
89	65	50	61	53	208	232	214	2220	2540	2394	2320	2520	2428
92	66	28	53	42	136	192	172	1200	2980	1963	Equip. failure		-
93	67	37	56	48	110	302	209	1600	2900	2401	2000	2680	2503
94	68	40	45	42	206	238	216	2080	3500	2722	Equip. failure		-
95	69	32	46	39	170	216	190	2000	2840	2367	2220	2500	2328
96	70	37	47	43	170	230	199	1880	2810	2448	1880	2810	2448
99	71	29	31	29	258	310	277	2740	3940	3185	3280	3680	3516
100	72	27	52	36	168	310	256	1900	3340	2499	2440	3340	2578
101	73	*	-	-	-	-	-	-	-	-	-	-	-
102	74	*	-	-	-	-	-	-	-	-	-	-	-
103	75	38	55	51	180	230	203	1680	2620	2585	2210	2640	2470
106	76	Holiday		-	-	-	-	-	-	-	-	-	-
107	77	Holiday		-	-	-	-	-	-	-	-	-	-
108	78	37	55	46	228	260	247	1800	2580	2397	2360	2900	2633
109	79	36	47	43	158	248	235	2120	2600	2409	2240	2560	2464
110	80	36	50	44	166	242	201	1960	3020	1448	2200	2680	2400

* Unable to run exposures due to weather.

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		TE-I			TE-II			TE-III			TE-IV		
		Range	Mean		Range	Mean		Range	Mean		Range	Mean	
57	41	47	59	53	96	188	128	1950	2900	2686	2210	2630	2310
58	42	48	56	54	148	248	219	2240	2660	2579	2610	3220	2616
59	43	51	59	56	196	262	238	2400	3100	2835	2900	3310	3203
60	44	46	80	63	200	240	211	2110	2680	2344	1560	1990	1752
61	45	43	61	52	178	220	195	2040	2780	2640	1920	2340	2149
64	46	42	58	53	188	210	199	1690	2690	1968	2040	2660	2281
65	47	114	136	119	172	452	298	1140	1750	1659	2550	2670	2569
66	48	48	114	84	146	416	255	2240	4000	2910	1160	1940	1754
67	49	43	60	52	178	240	206	2280	2590	2498	2500	2610	2573
68	50	24	39	32	96	124	105	2180	2460	2348	1520	1700	1612
71	51	Equip. failed		-	-	-	-	-	-	-	-	-	-
72	52	42	51	48	194	226	210	2380	2700	2565	2410	2560	2528
73	53	45	58	49	178	211	202	2310	2650	2516	2340	2590	2460
74	54	Holiday		-	-	-	-	-	-	-	-	-	-
75	55	Holiday		-	-	-	-	-	-	-	-	-	-
78	56	44	60	48	180	229	196	2190	2700	2445	2320	2620	2525
79	57	48	74	56	304	390	347	1740	2400	2141	1375	1870	1576
80	58	45	60	54	220	364	243	2020	2760	2404	1940	2580	2231
81	59	28	49	46	198	248	218	2060	2500	2333	1940	2560	2306
82	60	42	47	45	214	262	240	2080	2580	2229	2100	2800	2388

CMA 001979

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		TE-I			TE-II			TE-III			TE-IV		
		Range	Mean		Range	Mean		Range	Mean		Range	Mean	
29	21	48	66	58	192	248	219	1090	2490	1561	2400	1560	2488
30	22	47	63	56	216	340	265	2000	2870	2567	2030	2710	2105
31	23	31	51	46	200	256	220	1900	2770	2659	1960	2600	2295
32	24	42	47	45	196	232	106	2120	3960	2855	2020	2900	2441
33	25	29	58	51	172	232	212	2200	2840	2496	1360	1920	1655
36		45	60	47	92	280	203	1680	2640	1899	1530	2000	1799
37	27	46	58	55	210	242	225	1600	2600	2337	2670	3350	2998
38	28	48	58	52	168	190	184	2210	2830	2587	2070	3510	3356
39	29	42	55	43	188	216	209	1970	2770	2474	2590	2890	2686
40	30	45	52	50	204	212	209	1740	2800	2141	2600	2930	2750
43	31	45	60	52	106	238	180	2070	2900	2659	2610	3040	2891
44	32	41	58	48	98	190	177	1810	2570	1920	2250	2610	2564
45	33	39	56	44	178	240	215	1900	3010	2190	1890	2190	1920
46	34	47	53	50	168	206	200	1850	2790	2002	1980	2560	2379
47	35	46	55	54	210	224	217	2180	2600	2377	2050	2350	2213
50	36	40	62	60	166	198	171	1670	2510	2083	2310	2920	2692
51	37	43	51	50	172	214	190	2220	2610	2451	3160	3670	3307
52	38	28	55	38	190	220	198	2010	2750	2225	3090	4090	3688
53	39	38	49	45	182	212	193	1980	2460	2208	2530	2740	2638
54	40	45	57	49	134	238	278	1610	2590	2018	2070	2540	2525

CMA 001980

TABLE I

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Day Number	Exposure Number	Chamber Concentration (ppm)											
		<u>TE-I</u>			<u>TE-II</u>			<u>TE-III</u>			<u>TE-IV</u>		
		Range		Mean	Range		Mean	Range		Mean	Range		Mean
1	1	39	55	43	130	180	173	1820	2610	2510	2030	2880	2355
2	2	42	51	48	164	190	181	1700	2600	2548	2240	2600	2467
3	3	45	53	50	170	214	207	1290	2550	2098	2140	2590	2261
4	4	45	54	51	24	162	87	1190	3600	2540	1980	2490	2293
5	5	50	56	52	182	237	218	1160	3100	2202	1900	2580	2330
8	6	40	62	57	128	332	194	1600	2850	2401	2000	2480	2329
9	7	51	63	53	186	260	199	1990	2610	2475	2300	2980	2675
10	8	41	61	56	115	280	164	2240	2840	2555	1850	2310	1915
11	9	49	65	58	188	274	242	2010	2650	2283	1970	2690	2192
12	10	38	77	62	174	198	186	1150	2900	1770	2390	2930	2481
15	11	45	69	60	160	224	202	2230	2690	2510	3010	3570	3236
16	12	42	63	60	54	266	156	2400	3100	2653	2430	2920	2733
17	13	52	61	58	170	228	207	2750	2480	1972	1160	1920	1664
18	14	56	64	59	84	200	162	1870	2666	2544	1150	2400	1794
19	15	41	66	47	96	178	160	2200	2630	2556	2320	2610	2545
22	16	43	62	49	196	222	211	1990	2510	2391	2540	2640	2612
23	17	47	78	60	202	224	219	2470	3000	2922	2370	2560	2531
24	18	44	55	51	178	208	201	2220	2530	2356	2570	2980	2777
25	19	43	54	50	194	220	214	1610	2830	2690	1810	2150	1969
26	20	55	69	62	200	264	242	1690	2740	2488	2390	2650	2510

CMA 001981

III. Chamber Concentration Data

The daily range and mean of the Vinyl Chloride concentrations in each test chamber are shown in Table I. The overall average daily vapor concentrations were calculated to be 49.5, 201, 2548 and 2487 ppm for the TE-I through TE-IV chambers, respectively.

II. Summary

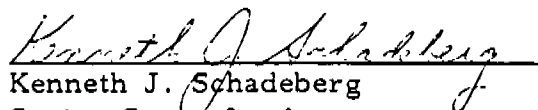
After seven months of inhalation exposures, dose related gross and histopathologic findings have been observed in all test levels of the mice. These findings have included test material related lesions consisting of alveogenic adenomas of the lung, hemangiosarcomas of the liver and malignant mammary tumors.

Studies of other parameters including behavioral reactions, body weights and mortality have not revealed definite dose related responses to inhalation of Vinyl Chloride.

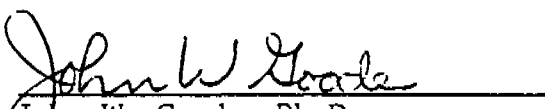
Respectfully submitted,

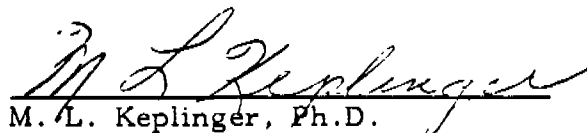
INDUSTRIAL BIO-TEST LABORATORIES, INC.

Report prepared by:


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Senior Group Leader
Inhalation and Pharmacology

Report approved by:


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Decatur Research Laboratories


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Manager, Toxicology

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CMA 001983

SEVEN-MONTH STATUS SUMMARY TO
MANUFACTURING CHEMISTS ASSOCIATION
CHRONIC VAPOR INHALATION TOXICITY STUDY WITH
VINYL CHLORIDE (ETHYLENE DERIVED)
IN ALBINO RATS, ALBINO MICE
AND GOLDEN HAMSTERS

JUNE 19, 1974

IBT NO. 663-03222

I. Introduction

A chronic vapor inhalation toxicity study with Vinyl Chloride (Ethylene Derived) was initiated on September 10, 1974. A summary of all data obtained through the seventh month of exposures is reported herein.

Industrial **BIO-TEST** *Laboratories, Inc.*

1810 FRONTAGE ROAD
NORTHBROOK, ILLINOIS 60062

TOXICOLOGY
ENVIRONMENTAL SCIENCES
CHEMISTRY
PLANT SCIENCES
MEDICAL SCIENCES

AREA CODE 312
TELEPHONE 272-3030

June 19, 1974

Dr. Kenneth D. Johnson
Manufacturing Chemists Association
1825 Connecticut Avenue, N. W.
Washington, D. C. 20009

Dear Dr. Johnson:

Re: IBT No. 663-03222 - Chronic Vapor Inhalation Toxicity
Study with Vinyl Chloride (Ethylene Derived) in Albino
Rats, Albino Mice and Golden Hamsters - Seven-Month Status

We are submitting herewith our laboratory report dated

June 19, 1974, prepared in connection with the above study.

Very truly yours,



J. C. Calandra
President

JCC:bp

CMA 001985