

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

DECATUR RESEARCH
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DECATUR, ILLINOIS 62526

TOXICOLOGY
ENVIRONMENTAL SCIENCES
CHEMISTRY
PLANT SCIENCES
MEDICAL SCIENCES

August 16, 1974

AREA CODE 217
TELEPHONE 877-9254

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

Dear Dr. Johnson:

Enclosed are tables summarizing mortality, body weight and gross pathologic findings through the eleventh month of inhalation exposures on the chronic inhalation toxicity study with Vinyl Chloride. I've also included a table giving daily concentration data from the seven-month point to the end of the eleventh month.

Preceding each table is a brief discussion of the data. A complete and formal eleven-month status summary with full evaluation of this data plus histopathologic data will be submitted shortly.

Sincerely,

Ken Schadeberg

Ken Schadeberg, B.S.
Senior Group Leader
Inhalation Toxicity

KS/dm
enc.

cc - Dr. T. R. Torkelson
J. W. Goode
M. L. Keplinger

RSV 0003204

I. Analytical Concentration Data

The daily range and mean of the Vinyl Chloride concentrations in each chamber from exposure 153 (data previous to this exposure given in seven-month status report) through the end of the eleventh testing month are reported in Table I. The overall average daily vapor concentrations were calculated to be 49.9, 198, 2501 and 2489 ppm for the T-I through T-IV chambers, respectively.

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)											
		T-I		T-II		T-III		T-IV					
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean		
RSV 0003206	153	45.5	48.5	47.5	176	214	197	1820	2680	2467	2340	2500	2409
	154	50.5	55.0	51.5	180	242	206	2300	2820	2459	2400	2640	2493
	155	Holiday, no exposures											
	156	43.5	53.5	46.5	180	242	202	2180	3000	2554	2140	2380	2231
	157	46.5	52.5	50.4	154	194	184	2320	2600	2457	2160	2400	2294
	158	36.5	52.5	45.0	138	250	192	1440	2600	2240	2500	3020	2760
	159	44.5	55.0	49.2	130	138	134	2460	2620	2540	2600		2600
	160	38.0	67.5	45.1	124	260	196	2000	3120	2687	1100	2510	2264
	161	47.0	61.0	53.1	130	200	179	2380	2920	2384	2500	3000	2664
	162	47.5	53.0	57.8	150	232	181	2380	2700	2484	2340	2700	2456
	163	50.0	53.5	51.5	180	210	195	2440	2800	2580	2740	3040	2815
	164	47.0	53.0	52.1	184	202	187	2200	2660	2488	2600	2900	2669
	165	46.5	56.0	49.4	190	216	200	2420	2800	2583	2660	2800	2755
	166	47.0	71.0	52.3	184	228	201	2100	2820	2520	2160	2500	2353
	167	42.5	53.0	47.9	180	204	199	2300	2740	2479	2480	2940	2667
	168	38.0	55.5	49.4	180	226	193	2160	2800	2472	2200*	2800	2545
	169	44.0	51.0	47.6	196	215	207	2440	3710	2932	2500	2900	2729
	170	48.0	56.5	53.6	184	216	205	2120	3100	2528	2460	2980	2668
171	46.0	51.5	49.3	186	198	191	2260	2620	2487	2400	2580	2488	
172	47.0	50.5	48.5	202	214	209	2180	2600	2478	2140	2460	2339	

RSV 0003206

TABLE I continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Chamber Concentration Data

Exposure Number	Chamber Concentration (ppm)											
	T-I			T-II			T-III			T-IV		
	Range	Mean		Range	Mean		Range	Mean		Range	Mean	
173	44.5	55.5	50.4	154	220	197	1500	3340	2468	2340	2760	2532
174	46.5	53.0	47.9	180	222	194	2100	2560	2367	2480	2600	2512
175	48.5	52.5	50.5	194	206	199	2380	2780	2487	2460	2520	2496
176	45.0	54.5	48.8	182	210	198	2320	2760	2534	2320	2660	2536
177*	47.5	55.0	51.0	-	-	-	2440	2780	2618	2560	2820	2673
178	47.5	52.5	51.2	186	222	203	2420	2700	2573**	2580	2700	2640
179	44.0	56.0	49.4	164	236	201	2560	2740	2645	-	-	-
180	Equipment malfunction, no exposures											
181***	45.5	57.0	51.4	188	218	204	1900	2760	2347	1900	2760	2347
182	44.0	51.5	50.0	184	212	193	2320	2500	2396	2420	2500	2464
183	43.0	75.0	57.4	88	222	171	2000	2640	2364	2100	2620	2280
184	47.0	55.0	50.9	172	230	203	2300	2720	2501	2040	2460	2355
185	39.0	57.5	48.0	180	214	199	2140	2400	2328	2280	2500	2380
186	35.0	66.0	48.6	182	250	209	2140	2888	2397	2200	2600	2392
187	38.0	75.5	49.9	170	266	202	2140	3240	2537	2500	2560	2545**
188	43.0	50.0	47.4	196	224	205	2160	2560	2400	2460	2560	2524
189	Holiday, no exposures											
190	41.0	50.5	47.5	192	210	198	2300	2620	2431	-	-	-
191	45.5	58.5	50.2	192	251	196	2160	2540	2350	2240	2320	2272
192	46.0	57.0	50.5	182	214	200	2320	2620	2452	2380	2440	2400
193	41.0	55.5	50.5	186	234	215	2380	2880	2633	2420	2760	2540

RSV 0003207

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)											
		T-I		T-II		T-III		T-IV					
		Range	Mean	Range	Mean	Range	Mean	Range	Mean				
270	194	48.0	54.5	50.1	172	214	204	2260	2660	2447	2140	2400	2270
271	195	43.5	50.5	47.3	190	208	200	2140	2560	2439	2380	2500	2408
274	196	44.5	51.0	47.9	188	216	202	2180	2580	2377	2400	2460	2440
275	197	38.0	56.0	49.5	174	242	198	2160	2640	2386	2440	2440	2440
276	198	45.5	52.5	48.9	188	214	199	2320	2720	2457	2340	2740	2564
277	199	47.0	56.0	50.3	170	220	201	2280	2860	2585	2300	2920	2656
278	200	37.0	52.5	48.3	176	226	200	2220	2700	2473	2580	2900	2672
281	201	40.0	56.0	47.5	168	232	204	2360	2740	2515	2520	2720	2600
282	202	43.5	54.0	48.2	176	236	202	2120	2940	2459	2280	2520	2413
283	203	43.0	54.0	49.7	188	216	206	2340	2920	2550	2540	2780	2640
284	204	47.0	57.0	52.5	144	220	194	1400	3420	2620	2210	2600	2478
285	205	43.0	58.5	50.3	154	224	199	2100	2980	2504	2140	2560	2397
288	206	Equipment malfunction, but animals were exposed											
289	207	42.5	59.0	48.5	194	206	200	2360	2820	2593	2480	2620	2528
290	208	40.0	53.5	45.9	204	218	209	2280	2820	2482	2280	2560	2424
291	209	45.5	51.5	49.3	166	220	203	2380	2680	2521	2440	2560	2516
292	210	Equipment malfunction, no exposure											
295	211	46.5	54.5	47.6	186	230	207	2280	3200	2577	2280	2520	2428
296	212	43.5	53.0	49.3	200	210	205	2480	2660	2613	2520	2680	2585
297	213	Vinyl Chloride gas regulator broken, no exposures											

RSV 0003208

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)											
		T-I		T-II		T-III		T-IV					
		Range	Mean	Range	Mean	Range	Mean	Range	Mean				
298	214	Holiday, no exposures											
299	215	Holiday, no exposures											
302	216	Vinyl Chloride gas regulator broken, no exposures											
303	217	Vinyl Chloride gas regulator broken, no exposures											
304	218	45.5	50.5	48.2	202	226	218	2140	2460	2288	2400	2500	2480
305	219	44.5	52.5	48.6	186	210	204	2280	2740	2565	2400	2520	2445
306	220	45.0	57.5	42.3	190	218	203	2360	2660	2481	2400	2500	2440
309	221	41.5	49.5	45.9	168	192	185	2080	2500	2258	2360	2500	2410
310	222	47.5	55.0	51.0	186	196	193	2280	2500	2380	2280	2500	2364
311	223	44.5	57.5	51.3	160	226	184	1 sample only		2280	1 sample only		2440
312	224	39.0	46.0	42.8	148	172	160	1800	2040	1920	2640	2960	2800
315	225	37.0	52.5	44.2	146	196	174	1800	2440	2073	2500	3100	2680
316	226	46.0	55.0	54.0	182	220	208	2080	2500	2473	2400	2620	2480
317	227*	46.5	55.5	50.6	152	242	205	2040	2800	2558	-	-	-
318	228	46.5	52.0	49.2	170	280	192	1960	2380	2022	2240	2580	2400
319	229	44.5	52.0	49.1	192	222	201	2440	2620	2542	2500	2720	2640
322	230	49.5	56.5	52.0	198	222	210	2500	2680	2699	2300	2620	2460
323	231	49.5	62.0	54.9	176	250	208	2160	2840	2475	2260	2380	2333
324	232	49.5	54.5	50.7	200	208	204	2220	2620	2405	2200	2460	2348
325	233	45.5	56.5	49.7	190	206	196	2400	2840	2597	2220	2500	2370

RSV 0003209

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)											
		T-I		T-II		T-III		T-IV					
		Range	Mean	Range	Mean	Range	Mean	Range	Mean				
326	234	48.0	62.0	54.0	170	238	202	2300	2760	2576	2520	2760	2576
329	235	Equipment malfunction, but animals exposed											
330	236*	-	-	58.0	200	204	202	2500	2580	2540	-	-	-
331	237*	53.5	58.5	55.5	186	198	191	2220	2500	2376	-	-	-
332	238	56.0	56.0	56.0	206	208	208	2260	2380	2300	1 sample only		2420
333	239	47.5	55.0	51.3	185	210	202	2160	2600	2556	1700	2300	2084

* No exposure in group indicated; animal cages repaired.

** Exposures cut to 5½ hours; animal cages repaired.

*** Exposures cut to 4½ hours; gas chromatograph repaired.

Note: In exposures noted above, the equipment malfunction is referring to a breakdown in the gas chromatograph or sequential sampler valve system-chamber concentrations were believed to be near targets.

II. Mortality Data

The cumulative monthly mortality data are presented in Table II.

Below is a brief discussion of the data for each species.

Rats: With the exception of the T-IV rats (composed of females only and permitted food ad libitum) there is a dose related mortality effect in both sexes at the eleven month point. Although the total number of rats which died in the T-IV group is not as great as in the T-III female group, there was a rapid increase in mortality during the eleventh month in the T-IV group.

Mice: Dose related mortality effects were observed in both male and female mice at the eleven month point.

Hamsters: A significant increase in mortality rate was observed among male and female T-III hamsters during the eleventh month of the investigation. There were no other significant mortality findings.

TABLE II

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)
 Chronic Vapor Inhalation Toxicity Study - Albino Rats,
 Albino Mice and Golden Hamsters

Summary of Mortality Data - Albino Rats

Month Number	Accumulative Number of Mortalities at End of Month								
	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
8	4	5	9	7	10	5	10	8	1
9	4	6	10	8	11	5	16	15	4
10	5	7	11	11	12	9	24	28	7
11	7	8	13	13	14	19	34	52	17

TABLE II continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Mortality Data - Albino Mice

Month Number	Accumulative Number of Mortalities at End of Month							
	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
8	18	5	32	14	16	30	30	46
9	23	8	38	24	37	58	56	75
10	28	10	42	31	78	82	76	98
11	30	15	54	46	96	94	100*	100*

* All surviving mice sacrificed

TABLE II continued

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

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

Summary of Mortality Data - Golden Hamsters

Month Number	Accumulative Number of Mortalities at End of Month							
	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
8	14	28	24	19	23	35	19	28
9	14	29	24	20	25	36	20	28
10	14	30	26	20	26	37	23	29
11	15	31	28	21	26	38	28	36

III. Body Weight Data

The mean body weight and weight gain data are presented in Tables III through V. Below is a brief discussion of the data for each species.

Rats: There are no dose related findings.

Mice: There appeared to be a drop in body weights of both the males and females of the T-III group during the tenth month of testing. These mice were sacrificed during the eleventh testing month. The other test levels do not indicate any definite adverse effects.

Hamsters: Except for the T-III female hamsters, which revealed a low mean body weight for the eleventh month, there are no significant findings.

TABLE III

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

		Mean Body Weights (grams)												
		Month Number:												
	Group	0	1	2	3	4	5	6	7	8	9*	10	11	Gain
e	Control	205	363	456	498	517	537	543	550	559	697	677	689	484
	T-I	209	346	448	491	526	545	554	567	593	651	640	670	461
	T-II	201	360	457	490	522	549	567	565	585	681	663	696	495
	T-III	200	351	453	499	529	550	567	576	581	627	629	680	480
male	Control	160	235	275	299	315	320	326	344	356	392	366	380	220
	T-I	168	232	274	297	310	308	323	348	367	357	363	374	206
	T-II	171	242	289	302	313	316	329	342	358	368	362	386	215
	T-III	165	240	287	303	312	321	329	346	359	359	356	374	209
	T-IV	181	251	282	288	291	314	324	338	348	363	363	384	203

apparent malfunction of animal weighing machine during month indicated.

RSV 0003216

TABLE IV

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)												
		Month Number:												
Group		0	1	2	3	4	5	6	7	8	9*	10	11	Gain
Female	Control	35	40	41	43	46	43	46	52	49	47	43	47	12
	T-I	33	39	39	43	44	42	47	45	47	47	38	48	15
	T-II	36	40	38	42	44	42	45	43	44	46	37	44	8
	T-III	36	38	40	43	44	38	45	41	41	43	31	**	**
Male	Control	29	32	33	35	36	35	38	37	41	40	37	40	11
	T-I	30	34	34	37	39	38	40	41	40	40	42	43	13
	T-II	28	31	34	35	37	36	38	36	40	39	30	40	12
	T-III	28	31	34	35	36	37	37	34	37	39	27	**	**

Exposures were terminated for all mice at the end of the ninth month of the investigation.
 All surviving T-III mice were sacrificed during the eleventh month of the investigation.

TABLE V

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

		Mean Body Weights (grams)												
		Month Number:												
Sex	Group	0	1	2	3	4	5	6	7	8	9	10	11	Gain
Male	Control	73	98	110	120	129	130	133	130	138	141	129	126	53
	T-I	71	90	101	114	120	121	122	128	126	118	115	110	39
	T-II	63	89	94	99	119	108	120	118	122	117	115	115	52
	T-III	60	87	91	93	91	88	112	110	115	115	115	114	54
Female	Control	77	104	108	118	120	121	124	125	128	133	119	116	39
	T-I	78	95	102	112	118	118	122	130	126	125	118	110	32
	T-II	74	94	99	108	107	106	114	112	116	118	112	112	38
	T-III	69	92	100	106	106	104	110	118	105	107	103	99	30

IV. Gross Pathology

A summary of tumor data based on gross pathologic findings among all species is presented in Table VI. This table does not take into account animals that died and postmortem autolysis or cannibalism precluded gross pathologic examination.

TABLE VI

TEST MATERIAL: Vinyl Chloride (Ethylene Derived)

Chronic Vapor Inhalation Toxicity Study - Albino Rats,
Albino Mice and Golden HamstersSummary of Tumor Data
Based on Gross Pathologic Findings
Among All Species Through 8/14/74

Species	Group	Number of Animals Examined			Tissue Involved (Male/Female)			
		Total	Male	Female	Liver	Lung	Skin*	Kidney
Mice	Control	4	3	1	0/0	1/1	0/0	0/0
	T-I	36	12	24	4/9	5/16	2/7	0/1
	T-II	133	67	66	45/57	52/39	7/26	5/9
	T-III	121	58	63	48/47	44/45	4/20	7/3
Rats	Control	0	0	0	0/0	0/0	0/0	0/0
	T-I	3	3	0	2/0	2/0	0/0	0/0
	T-II	11	4	7	0/5	0/4	0/1	0/0
	T-III	52	18	34	7/24	0/6	0/8	0/2
	T-IV	7	0	7	0/5	0/0	0/5	0/0
Hamsters	Control	0	0	0	0/0	0/0	0/0	0/0
	T-I	0	0	0	0/0	0/0	0/0	0/0
	T-II	0	0	0	0/0	0/0	0/0	0/0
	T-III	10	7	3	2/2	4/1	1/0	0/0

* Mammary Tumors