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Attention: Section 8(e) Coordinator
Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Ref.: Letter, March 27, 2001, describing the voluntary review of certain categories of health and environmental studies recently acquired by Rohm and Haas Company.

Dear Coordinator:

Rohm and Haas Company submits this notice in accordance with Section 8(e) of the Toxic Substances Control Act.

This letter transmits results of a subchronic feeding study with young albino rats. Groups of 5 males and 5 females each were exposed to monomethyltin tris(isooctyl mecaptoacetate), CAS No. = 54849-38-6, at dietary levels of 0, 100, 500 or 2500 ppm for 3 months. After the first week, the highest dosage level was lowered to 1500ppm.

General condition, behavior, and survival were not adversely affected at any of the dietary levels.

Growth of males in the highest dosage group was slightly lower than in controls. Food intake and food efficiency were comparable in all groups. Hematological indices, blood sugar, serum enzymes, serum proteins, and urine composition showed no treatment-related differences amongst the various groups. Blood urea nitrogen was significantly increased in the males in the two highest dosage groups. Specific gravity of the urine was decreased in all test groups for females only. This decrease was ascribed to the high values in the controls. The relative weights of the kidneys and thymus were increased in males of the highest dose group.

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Macroscopic examination at autopsy revealed greenish discoloration of the kidneys in rats given 1500 (2500) ppm. Histopathological examination revealed treatment-related abnormalities in the kidneys (cystic dilated tubules in the outer medulla, filled with eosinophilic proteinaceous material, tubular nephrosis, granular appearance of the cytoplasm of proximal convoluted tubules) of male animals at the highest dose levels.

It was concluded by the study authors that the no-toxic effect of test substance was 100 ppm when fed in the diet of rats for a three-month period.

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Rohm and Haas Company does not consider the exact identity of this chemical to be Confidential Business Information (CBI)

If you have any questions concerning this submittal, my telephone number is (215) 592-2986.

Sincerely,

George J. Rowell
TSCA Manager
EHS Corporate Center

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CENTRAL INSTITUTE FOR NUTRITION AND FOOD RESEARCH
INSTITUT CENTRAL DE LA NUTRITION ET DE L'ALIMENTATION
ZENTRALINSTITUT FÜR ERNÄHRUNGSFORSCHUNG

RAPPORT NR. R 4062

Title: Sub-chronic (90-day) toxicity study with monomethyltin tris-isooctyl-mercaptoacetate in rats

Authors: Dr. H.P. Til, Miss Drs. M.I. Willems and M.Th. Spanjers

At the request of: Cincinnati Milacron Chemicals Inc., New Brunswick, N.J.

Approved by: Dr. C. Engel

Date: April 1973

Number of copies: 9

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Total or partial publication of this report without written assent is not allowed.

23-14000-971

SUMMARY

1. The toxicity of monomethyltin tris-isooctylmercaptoacetate was examined in a sub-chronic (90-day) toxicity study with weanling albino rats as the experimental animals. The test substance was fed to groups of five males and five females each at levels of 0, 100, 500 and 2500 ppm in stock diet. After the first test week the highest dosage level was lowered to 1500 ppm.

2. General condition, behaviour and survival were not adversely affected at any dietary level of the test substance.

3. Growth of males in the highest dosage group was slightly lower than in controls. Food intake and food efficiency were comparable in all groups.

4. Haematological indices, blood sugar, serum enzymes, serum proteins and urine composition showed no treatment-related differences amongst the various groups.

5. Blood urea nitrogen was significantly increased in the males of the two highest dosage groups.

6. The specific gravity of the urine was decreased in all test groups in females only. This decrease was ascribed to the high values in the controls.

7. The relative weights of the kidneys and thymus were distinctly increased in males of the highest dosage group.

8. Gross examination at autopsy revealed a greenish discolouration of the kidneys in rats given 1500 (2500) ppm.

9. Treatment related histopathological changes were found in the kidneys of male animals at the highest dose level. They were mainly characterized by cystic dilated tubules in the outer medulla, filled with eosinophilic proteinaceous material, by an increased degree and frequency of normally occurring tubular nephrosis and by a slightly more granular appearance of the cytoplasm of proximal convoluted tubules.

10. No significant alterations were observed at a level of 100 ppm of the test substance in the diet of rats for three months.

Sub-chronic (90-day) toxicity study with monomethyltin tris (isooctyl mercaptoacetate) in rats

1. INTRODUCTION

At the request of Cincinnati Milacron Chemicals Inc., New Brunswick, N.J., the toxicity of monomethyltin tris (isooctyl mercaptoacetee) was examined by feeding the material at various dietary levels to albino rats.

The present study included clinical, haematological and pathological observations during a three-month feeding period.

2. EXPERIMENTAL

2.1 Material

A sample of monomethyltin tris (isooctyl mercaptoacetate) was received from Cincinnati Milacron Chemicals on April 28, 1972. An infrared spectrum is shown in figure 1 (page 10).

2.2 Diets

The test material was thoroughly mixed into stock diet by means of a modified meat cutter (Stephan) at levels of 0, 100, 500 and 2500 ppm. The highest level was decreased to 1500 ppm in the second week. The percentage composition of the stock diet was as follows:

yellow maize	29.05	brewer's yeast	3
whole wheat	36	grass meal	3
soyabean-oil meal	10	soyabean-oil	3
meat scraps	4	vitamin preparations	0.7
fish meal	8	trace mineralized salt	0.5
dried whey	2	steamed bone meal	0.75

The diets were freshly prepared once a fortnight and stored at room temperature.

2.3 Animals

Twenty male and 20 female weanling albino rats from the CIVO-colony (Wistar derived) were divided according to body weight into four groups of five males and five females each and fed the various diets (see 2.2).

The animals were housed in screen-bottomed cages (five to a cage) at 24 - 26° C in a room of constant temperature. Diets and tap water were given ad libitum.

2.4 Experimental design and conduct

Individual body weights were recorded weekly. The food intake of each group was measured at weekly intervals during the whole experimental period.

Haematological data, consisting of haemoglobin content, haematocrit value, red blood cell counts and total and differential white blood cell counts were collected from all rats in week 10.

Determinations of blood sugar, blood urea nitrogen, serum glutamic-pyruvic transaminase (SGPT), serum alkaline phosphatase (SAP), bilirubin, total serum protein (TSP), albumin and globulins were carried out on all male and female rats at week 10.

Urine examinations, including appearance, pH, glucose, protein, occult blood, ketones and microscopy of the sediment, were conducted upon pooled urine samples of each group in the 10th week. Additional determinations of specific gravity and urobilinogene were conducted upon all rats.

In week 14 all rats were killed by decapitation and examined grossly for pathological changes. The following organs were weighed: heart, kidneys, liver, spleen, testes (plus epididymus), thymus, thyroids and adrenals. Samples of these organs and of a wide range of other organs were fixed in a 4 % neutralized formaldehyde solution. Microscopic examination was carried out on the liver and kidneys of all rats.

3. RESULTS

3.1 General condition, growth and food consumption

During the course of the experiment no deaths occurred and no abnormalities of condition or behaviour were observed.

Mean body weights are shown in table 1.

Table 1. Mean body weights of rats fed the test compound at dietary levels of 0 - 1500 ppm for 13 weeks

group no.	ppm test substance in stock diet	body weight (in g) at end of week									
		0	1	2	3	4	6	8	10	12	13
		males									
5952	0	62	100	140	174	209	267	298	304	320	330
5953	100	61	101	142	179	217	275	302	316	335	347
5954	500	61	103	145	182	218	264	288	299	316	326
5955	2500/1500	61	93	136	175	210	257	271	281	288	306
		females									
5952	0	56	86	114	133	146	169	180	187	194	200
5953	100	55	86	113	132	147	169	181	191	200	206
5954	500	55	85	112	132	145	167	182	189	198	204
5955	2500/1500	56	81	112	134	150	173	181	189	200	203

Average body weights of males in the highest dosage group were generally slightly lower than in controls, but none of the differences was statistically significant. In females the mean body weights of all groups were very similar.

Food intake and food efficiency figures (table 2) did not show distinct differences between the various test groups and the controls.

Table 2. Average food consumption and food efficiency

ppm test substance in stock diet	food intake in g/rat/day in week							food efficiency during week 1-4		
	1+2	3+4	5+6	7+8	9+10	11+12	13	gain	food	gain/food
					males					
0	12.4	17.0	17.3	16.2	15.7	18.2	17.7	147	412	0.36
100	12.9	18.2	18.9	17.5	16.6	19.8	18.7	156	435	0.36
500	13.4	18.7	16.9	15.8	16.1	18.6	17.8	157	449	0.35
2500/1500	11.4	17.7	17.3	15.1	15.2	18.7	17.2	149	407	0.37
					females					
0	10.4	12.2	12.1	11.0	10.4	12.3	12.3	90	316	0.28
100	10.2	11.9	11.8	10.9	11.3	12.7	12.0	92	309	0.30
500	10.2	12.2	12.1	12.2	11.3	12.4	12.8	90	314	0.29
2500/1500	9.9	12.9	12.7	12.4	11.9	13.8	13.0	94	319	0.29

3.2 Haematology

The results of the haematological examinations (table 3) show that there were no effects at any dosage level in either sex.

Table 3. Haematological data recorded at week 10

ppm test substance in stock diet	Hb g/100 ml	packed cell volume %	erythrocytes $x10^6/mm^3$	leucocytes total $x10^3/mm^3$	differential count (%) L	N	M	E
				males				
0	15.6	46.4	7.5	16.6	84.3	14.8	0.0	1.0
100	15.8	46.9	7.5	18.0	83.0	16.2	0.0	0.8
500	15.2	45.6	7.6	17.4	85.0	13.8	0.0	1.2
2500/1500	15.1	45.0	7.6	15.2	84.6	15.0	0.0	0.4
				females				
0	15.7	47.5	7.2	12.9	86.8	12.6	0.0	0.6
100	15.1*	44.9	7.0	13.1	88.8	9.0	0.0	2.2
500	15.0	45.2	6.9	14.5	79.6	19.4	0.0	1.0
2500/1500	15.3	46.7	7.1	13.8	89.8	10.0	0.0	0.2

*P < 0.05

3.3 Biochemical blood parameters

There were no treatment-related differences between test and control groups with respect to levels of blood sugar, total protein, albumin, globulins or in transaminase and phosphatase activities (table 4). Blood urea nitrogen values were slightly increased in males given 500 and 2500/1500 ppm. The bilirubin value of the control males was relatively high, which was due to an extremely high value in one of the animals. By omitting this value the average is 1.01.

Table 4. Mean biochemical blood values recorded at week 10

ppm test substance in stock diet	sugar mg%	BUN mg%	SGPT R-F units	SAP B-L units	bili-rubin mg%	TSP g%	al-bu-min g%	serum globulins %		
								α	β	γ
				males						
0	48	19	19	2.6	1.64	5.8	2.3	55.8	33.8	10.6
100	54	17	18	3.1	1.18	6.0	2.2	46.8**	37.0	16.2
500	48	25*	21	2.9	1.07	5.8	2.4	49.6	32.2	18.2
2500/1500	45	26*	20	2.8	1.02	5.8	2.4	48.8	35.4	16.2
				females						
0	53	17	11	2.2	0.76	5.9	2.1	46.4	35.2	18.4
100	53	20	13	2.2	0.70	5.7	2.5	42.0	34.0	23.8
500	50	25*	10	2.1	0.78	5.4	2.5	43.3	32.5	23.8
2500/1500	56	18	11	2.1	0.77	5.7	2.2	41.2	36.8	22.4

*P < 0.05; **P < 0.01.

3.4 Urine analyses

The results of the urine analyses (table 5) showed no changes in the composition of the urine which could be attributed to the feeding of the test substance.

Specific gravity values of females of all test groups (table 6) were significantly lower than in controls. There was, however, no distinct dose-related response. Since, moreover the control values were abnormally high (normal values 1.0606 - 1.0674), these differences are considered incidental findings.

Table 5. Results of urine analyses recorded at week 10

ppm test substance in the diet	appearance	pH	sugar	protein	occult blood	ketones	microscopic findings								
							RBC	WBC	epith	amorph	cryst	casts	bact	WE	sperm
males															
0	yellow	5	-	++	-	-	-	-	+	±	++	-	+	-	+
100	yellow	5	-	++	-	-	-	-	+	±	++	-	+	-	+
500	yellow	5	-	++	-	-	-	-	+	±	±	-	+	-	+
2500/1500	yellow	5	-	++	-	-	-	-	+	±	++	-	+	-	+
females															
0	yellow	5	-	+	-	-	-	-	±	±	-	-	±	-	
100	yellow	5	-	+	-	-	-	-	+	±	-	-	++	-	
500	yellow	5	-	+	-	-	-	-	±	±	-	-	+	-	
2500/1500	yellow	5	-	+	-	-	-	-	±	±	+	+	±	-	

Grading system: - = negative; ± = minimal; + = slight; ++ = moderate.

RBC = red blood cells; WBC = white blood cells; WE = worm eggs.

Table 6. Mean specific gravity and urobilinogene values in the urine recorded at week 10

ppm test substance in the diet	males		females	
	specific gravity	urobilinogene	specific gravity	urobilinogene
0	1.0645	0.32	1.0780	0.26
100	1.0691	0.34	1.0650**	0.30
500	1.0663	0.32	1.0590**	0.28
2500/1500	1.0636	0.32	1.0613**	0.30

**P < 0.01.

3.5 Organ weights

Mean relative organ weights are shown in table 7.

The relative weight of the kidneys and thymus were distinctly increased in males given 1500 (2500) ppm.

The relative weight of the heart was slightly decreased in females at 100 ppm. This phenomenon was, however, not observed at the 500 and 1500 (2500) ppm dietary levels.

Table 7 . Body weights (in g), relative organ weights (in g/100 g body weight) and their standard deviations of groups of five male and five female rats after a feeding period of 13 weeks

group no.	ppm monomethyltin tris (isooctylmercaptoacetate) in the diet	body weight	heart	kidney	liver	spleen	testicle+ epididymis	thymus	thyroid	adrenal
					males					
5952	0	330. (10.)	0.334 (0.009)	0.66 (0.01)	3.00 (0.06)	0.175 (0.009)	1.19 (0.04)	0.080 (0.007)	0.0042 (0.0002)	0.0126 (0.0015)
5953	100	348. (9.)	0.342 (0.005)	0.65 (0.01)	3.17 (0.09)	0.177 (0.004)	1.09 (0.02)	0.084 (0.006)	0.0052 (0.0005)	0.0112 (0.0010)
5954	500	326. (21.)	0.324 (0.008)	0.65 (0.02)	2.98 (0.08)	0.171 (0.005)	1.21 (0.05)	0.102 (0.009)	0.0048 (0.0005)	0.0118 (0.0005)
5955	1500	307. (11.)	0.340 (0.005)	0.78** (0.03)	2.84 (0.14)	0.158 (0.006)	1.28 (0.04)	0.121** (0.005)	0.0050 (0.0004)	0.0125 (0.0006)
					females					
5952	0	197. (5.)	0.405 (0.017)	0.63 (0.01)	3.00 (0.10)	0.180 (0.004)		0.144 (0.013)	0.0082 (0.0010)	0.0272 (0.0016)
5953	100	204. (12.)	0.349* (0.012)	0.62 (0.01)	2.89 (0.15)	0.197 (0.008)		0.134 (0.014)	0.0078 (0.0007)	0.0241 (0.0013)
5954	500	203. (7.)	0.421 (0.027)	0.64 (0.01)	2.99 (0.12)	0.189 (0.007)		0.116 (0.006)	0.0084 (0.0007)	0.0274 (0.0023)
5955	1500	201. (4.)	0.402 (0.007)	0.68 (0.03)	2.96 (0.14)	0.197 (0.011)		0.125 (0.007)	0.0068 (0.0003)	0.0240 (0.0013)

* $0.01 \leq P < 0.05$
** $0.001 \leq P < 0.01$
*** $P < 0.001$

Under each mean its standard deviation (in brackets) is given.

3.6 Pathology

3.6.1 Macroscopic examination

At autopsy a greenish discolouration of the kidneys was noticed in males receiving 2500/1500 ppm. No other gross changes which could be attributed to the ingestion of the test substance were noticed at autopsy.

3.6.2 Microscopic examination

At microscopic examination (cf. table 8) treatment related abnormalities were noticed in the kidneys of males fed 2500/1500 ppm. These renal abnormalities were mainly characterized by cystic dilated tubules in the outer medullary zone filled with eosinophilic proteinaceous material, by an increased degree and frequency of normally occurring tubular nephrosis, and by a slightly more granular appearance of the cytoplasm of proximal convoluted tubules (cf. table 8, KIDNEY 1, 2, 3). Histopathology of the kidneys of males at the lower feeding levels and of females at all feeding levels did not reveal treatment related changes.

The histological appearance of the liver of the test rats was fully comparable to that of the controls (table 8, LIVER).

Table 8. Histopathology[1] of the liver and the kidneys and the number of animals showing the observed lesions in the various groups

abnormalities	males				females			
	ppm test substance in the diet							
	0	100	500	1500/2500	0	100	500	1500/2500
Number of animals examined	5	5	5	5	5	5	5	5
KIDNEY								
1. CYSTIC DILATED TUBULES IN THE OUTER MEDULLA FILLED WITH EOSINOPHILIC PROTEINACEOUS MATERIAL	0	0	0	4	0	0	0	0
2. TUBULAR NEPHROSIS:								
a. Very slight	2	0	1	0	0	0	0	1
b. Slight	1	0	0	0	0	1	0	0
b. Moderate	0	0	0	4	0	0	0	0
3. GRANULAR APPEARANCE OF THE CYTOPLASM OF PROXIMAL CONVOLUTED TUBULES:								
a. Slight	1	1	1	2	0	0	0	0
b. Moderate	1	0	1	3	0	0	0	0
4. Intracytoplasmic droplets:								
a. Slight	1	1	2	0	0	0	0	0
b. Moderate	1	1	0	1	0	0	0	0
c. Severe	2	0	0	3	0	0	0	0
5. Nephrocalcinosis:								
a. Slight	1	1	0	1	2	1	2	0
b. Severe	0	0	0	0	0	1	0	0
6. A slight degree of unilateral hydronephrosis	0	0	1	0	0	0	0	0
7. Parasite	0	0	0	0	0	1	0	0

Table 8. Continued

abnormalities	males				females			
	ppm test substance in the diet							
	0	100	500	1500/2500	0	100	500	1500/2500
LIVER								
1. Small foci of RES-cells and eosinophils, occasionally accompanied by a single necrotic hepatocyte	3	2	2	4	2	1	1	2
2. Slight periportal infiltrate of inflammatory cells	0	0	0	0	0	1	0	0

[1]Treatment related changes are written in capitals.

4. DISCUSSION AND CONCLUSION

The continuous feeding of the test substance to young rats at various dietary levels up to 2500/1500 ppm for three months resulted in deleterious effects only at the highest feeding level in males. These effects included relatively low body weights, increased blood urea nitrogen levels, greenish discolouration of the kidneys and kidney enlargement accompanied by pathological renal changes.

The toxicological significance of the increased weight of the thymus of males given 2500/1500 ppm is not clear. It may be mentioned, however, that the values are within the normal range for the strain of rats used (0.092 - 0.122).

At the 500 ppm level blood urea nitrogen levels were increased in males only.

Since no treatment-related abnormalities were observed at the lowest level it is concluded that the no-effect level of the test compound in the present study was 100 ppm.

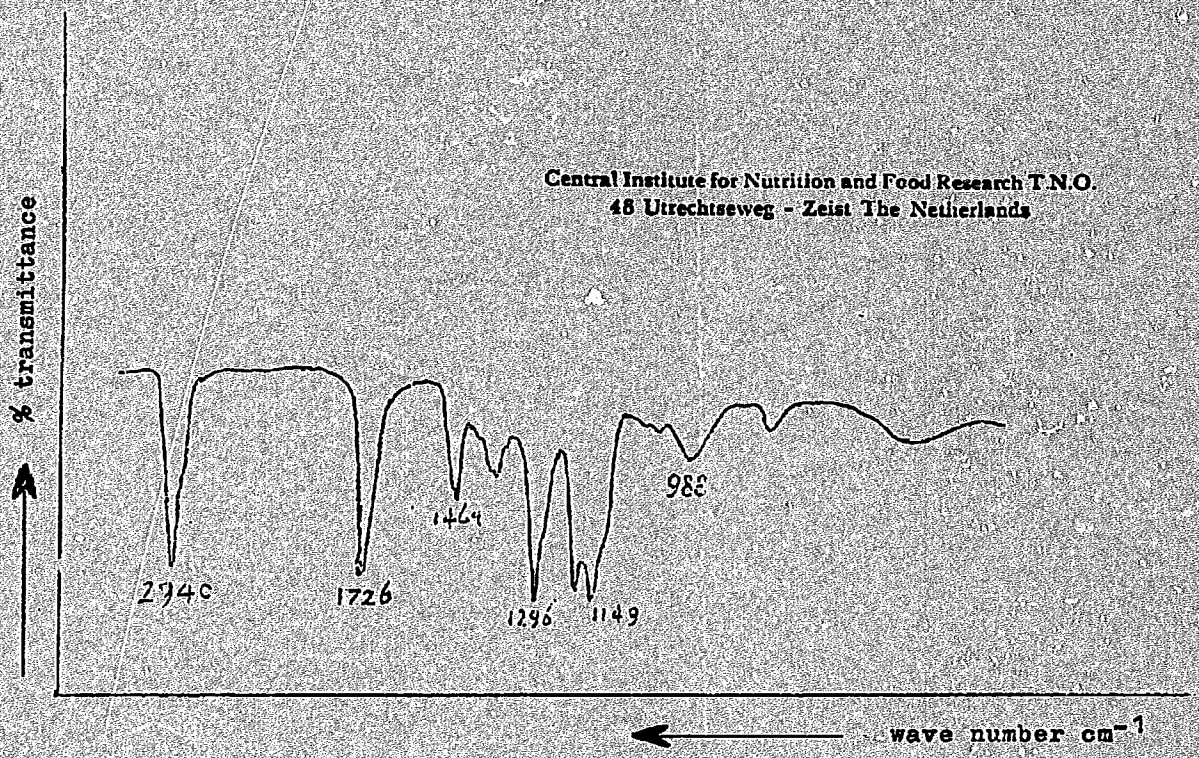

Fig. 1. Infrared spectrum of "monomethyltin tris (isooctyl mercaptoacetate)"

Phase: Sandwich

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ZENTRALINSTITUT FÜR ERNÄHRUNGSFORSCHUNG

CAS# 54849-38-6

Rapport No. R 4062 A

Title: Sub-chronic (90-day) toxicity study with monomethyltin tris (isooctyl mercaptoacetate) in rats (Individual data on haematology, biochemistry, pathology and histopathology)

Authors: Dr. H.P. Til, Miss Drs. M.I. Willems and M. Th. Spanjers

At the request of: Cincinnati Milacron Chemicals Inc., New Brunswick, N.J.

Approved by: Dr. C. Engel

Date: June 1973

Gehele of gedeeltelijke publikatie van dit rapport is zonder schriftelijke toestemming verboden.
Total or partial publication of this report without written assent is not allowed.

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Table 1.

Individual haematological values of rats fed monomethyltin

rat no.	Hb g/100 ml	packed cell volume %	RBC $x10^6/mm^3$	thrombo-cytes $x10^3/mm^3$	retics % of RBC	leucocytes				
						total $x10^3/mm^3$	differential count %			
							L	N	M	E
					Control: males					
z	15.2	46.0	7.5			15.0	82	17	0	1
r_1	15.5	45.0	7.4			14.8	86	13	0	1
r_2	—	—	—			—	—	—	—	—
l_1	15.6	46.5	7.1			19.1	90	10	0	0
l_2	15.9	48.0	8.1			12.5	79	19	0	2
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.6	46.4	7.5			16.6	84.3	14.8	0.0	1.0
					100 ppm: males					
z	15.8	47.5	7.5			16.4	78	19	0	3
r_1	16.0	50.5	7.9			19.5	85	15	0	0
r_2	15.2	44.0	6.9			13.7	79	20	0	1
l_1	15.9	47.0	7.6			19.5	84	16	0	0
l_2	15.9	45.5	7.7			10.9	89	11	0	0
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.8	46.9	7.5			18.0	83.0	16.2	0.0	0.8

Table 1. Continued (1)

Individual haematological values of rats fed monomethyltin

rat no.	Hb g/100 ml	packed cell volume %	RBC $x10^6/mm^3$	thrombocytes $x10^3/mm^3$	retics % of RBC	leucocytes				
						total $x10^3/mm^3$	differential count %			
							L	N	M	E
			500 ppm : Males							
z	14.8	44.5	7.1			15.8	78	20	0	2
r_1	14.5	45.0	6.8			15.6	83	16	0	1
r_2	15.8	-	8.5			16.5	85	14	0	1
l_1	15.4	47.0	7.6			16.1	89	10	0	1
l_2	15.5	46.0	8.2			22.8	90	9	0	1
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.2	45.6	7.6			17.4	85.0	13.8	0.0	1.2
			2500/1500 ppm : Males							
z	14.8	45.0	7.4			16.5	81	19	0	0
r_1	15.3	46.5	7.5			15.6	85	13	0	2
r_2	15.8	45.0	7.6			14.3	90	10	0	0
l_1	14.6	43.0	7.3			14.6	82	18	0	0
l_2	15.1	45.5	8.0			15.4	85	15	0	0
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.1	45.0	7.6			15.3	84.6	15.0	0.0	0.4

Table 1. Continued (2)

Individual haematological values of rats fed monomethyltin

rat no.	Hb g/100 ml	packed cell volume %	RBC $x10^6/mm^3$	thrombocytes $x10^3/mm^3$	retics % of RBC	leucocytes				
						total $x10^3/mm^3$	differential count %			
							L	N	M	E
				Control: females						
z	14.9	46.5	7.0			15.5	84	15	0	1
r_1	—	50.0	7.6			10.4	79	19	0	2
r_2	15.9	46.5	7.2			12.3	85	13	2	0
l_1	16.0	47.5	7.3			11.1	83	8	0	0
l_2	16.0	47.0	7.0			15.1	94	6	0	0
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.7	47.5	7.2			12.9	86.0	12.6	0.0	0.6
				100 ppm: females						
z	14.3	41.5	6.4			13.1	85	13	0	2
r_1	14.8	42.0	7.3			13.1	83	12	0	5
r_2	14.0	45.0	7.3			12.3	93	5	0	2
l_1	15.9	40.0	6.9			11.8	90	8	0	2
l_2	15.6	48.0	7.2			15.1	93	7	0	0
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.1	44.9	7.0			13.1	88.0	9.0	0.0	2.2

Table 1. Continued (3)

Individual haematological values of rats fed monomethyltin

rat no.	Hb g/100 ml	packed cell volume %	RBC $x10^6/mm^3$	thrombocytes $x10^3/mm^3$	retics % of RBC	leucocytes				
						total $x10^3/mm^3$	differential count %			
							L	N	M	E
				500 ppm : females						
z	14.2	43.0	7.0			15.7	62	36	0	2
r_1	14.6	46.0	6.8			13.3	80	12	0	0
r_2	15.1	46.0	7.0			11.1	85	13	0	2
l_1	15.8	47.5	6.4			14.3	85	15	0	0
l_2	15.3	44.5	7.0			16.3	78	21	0	1
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.0	45.2	6.9			14.5	78.6	19.4	0.0	1.0
				2500/1500 ppm : females						
z	16.4	49.0	6.9			15.0	83	17	0	0
r_1	15.2	46.0	7.3			12.0	92	8	0	0
r_2	15.3	49.0	7.5			12.5	95	4	0	1
l_1	14.2	45.0	6.5			13.2	84	16	0	0
l_2	15.1	45.5	7.2			14.3	95	5	0	0
r_1l_1										
r_1l_2										
r_2l_1										
r_2l_2										
r_3										
mean	15.3	46.7	7.1			13.8	89.8	10.0	0.0	0.2

Table 2.

Individual biochemical blood values of rats fed monomethyltin

rat no.	suger mg%	BUN mg%	SGOT R-F units	SGPT R-F units	SAP B-L units	bilirubin mg%	creatinin mg%	TSP g%	albumin g%
				control males					
z	45	19		25	33	4.15		5.8	2.3
r_1	45	24.5		23	23	0.96		5.6	2.5
r_2	59	17		18	28	1.22		6.1	2.4
l_1	50	18.5		15	23	0.93		5.8	2.2
l_2	55	16		15	2.4	0.88		5.8	2.2
$r_1 l_1$									
$r_1 l_2$									
$r_2 l_1$									
$r_2 l_2$									
r_3									
mean	48	19		19	2.6	1.64		5.8	2.3
				100 ppm males					
z	49	14.5		19	2.9	1.42		5.8	1.9
r_1	50	16		20	3.9	1.70		5.9	2.1
r_2	63	18		18	3.1	1.24		5.9	2.5
l_1	58	13		12	2.6	0.80		6.4	2.2
l_2	50	21		13	2.8	0.96		5.8	2.4
$r_1 l_1$									
$r_1 l_2$									
$r_2 l_1$									
$r_2 l_2$									
r_3									
mean	54	17		16	3.1	1.10		6.0	2.2

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Table 2. Continued (1)

Individual biochemical blood values of rats fed monomethyltin

rat no.	sugar mg%	BUN mg%	SGOT R-F units	SGPT R-F units	SAP B-L units	bilirubin mg%	creatinin mg%	TSP g%	albumin g%
				500 ppm : males					
z	35	27		23	23	124		50	13
r_1	43	29.5		22	31	108		59	14
r_2	40	19.5		12	31	0.96		6.2	2.5
l_1	67	22		24	29	0.96		6.0	2.6
l_2	51	29		14	30	110		5.8	2.4
$r_1 l_1$									
$r_1 l_2$									
$r_2 l_1$									
$r_2 l_2$									
r_3									
mean	48	25		21	29	1.07		5.8	2.4
				2500 / 1500	ppm : males				
z	40	22.5		25	23	110		5.8	2.6
r_1	49	23		21	25	120		5.8	2.4
r_2	40	22.5		17	34	1.00		5.9	2.4
l_1	50	22.5		24	18	0.88		6.0	2.3
l_2	46	30		13	31	1.13		5.7	2.5
$r_1 l_1$									
$r_1 l_2$									
$r_2 l_1$									
$r_2 l_2$									
r_3									
mean	45	26		20	28	1.02		5.8	2.4

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Table 2. Continued (2)

Individual biochemical blood values of rats fed monomethyltin

rat no.	sugar mg%	BUN mg%	SGOT R-F units	SGPT R-F units	SAP B-L units	bilirubin mg%	creatinin mg%	TSP g%	albumin g%
				Control females					
z	45	18		10	20	0.73		6.3	2.5
r_1	60	18		18	26	0.84		6.2	2.3
r_2	50	18		10	25	0.80		5.9	2.6
l_1	53	17		9	14	0.70		5.6	1.4
l_2	55	16		7	26	0.73		5.5	1.9
$r_1 l_1$									
$r_1 l_2$									
$r_2 l_1$									
$r_2 l_2$									
r_3									
mean	53	17		11	22	0.76		5.9	2.1
				100 ppm females					
z	45	22		9	20	0.72		5.8	2.5
r_1	50	20		9	22	0.70		5.5	2.4
r_2	50	16		19	24	0.72		6.0	2.5
l_1	65	26		15	23	0.72		5.9	2.5
l_2	56	22		12	23	0.63		5.4	2.4
$r_1 l_1$									
$r_1 l_2$									
$r_2 l_1$									
$r_2 l_2$									
r_3									
mean	53	20		13	22	0.70		5.7	2.5

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Table 3. Individual serum globulin values of rats fed monomethyltin

rat no.	serum globulins (%)			serum globulins (%)		
	α	β	γ	α	β	γ
	control: males			100 ppm. males		
z	57	33	10	46	38	1
r_1	64	32	4	43	40	1
r_2	50	35	15	48	34	1
l_1	53	35	12	48	32	2
l_2	55	34	12	49	41	1
mean	55.0	33.8	10.6	46.8	37.0	1
	500 ppm. males			2500/1500 ppm. male		
z	48	36	15	46	34	2
r_1	49	31	22	53	35	1
r_2	52	26	21	48	33	2
l_1	51	28	21	44	41	1
l_2	48	40	12	53	34	1
mean	49.6	32.2	18.2	48.8	35.4	16

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Table 4. Individual values of specific gravity and urobilinogene in the urine of rats fed monomethyltin

rat no.	specific gravity	urobilinogene (Ehrlich units/ 100 ml urine)	specific gravity	urobilinogene (Ehrlich units/ 100 ml urine
	Control: males		100 ppm: males	
z	1.0626	0.3	1.0701	0.3
r_1	1.0625	0.4	1.0671	0.4
r_2	1.0720	0.3	1.0737	0.4
l_1	1.0406	0.2	1.0673	0.3
l_2	1.0716	0.4	1.0675	0.3
mean	1.0645	0.32	1.0641	0.34
	500 ppm: males		1000/1500 ppm: males	
z	1.0633	0.4	1.0626	0.4
r_1	1.0647	0.3	1.0647	0.3
r_2	1.0749	0.3	1.0660	0.3
l_1	1.0735	0.3	1.0654	0.3
l_2	1.0552	0.3	1.0572	0.3
mean	1.0663	0.32	1.0636	0.32

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Table 4 Individual values of specific gravity and urobilinogene in the urine of rats fed monomethyltin

rat no.	specific gravity	urobilinogene (Ehrlich units/ 100 ml urine)	specific gravity	urobilinogene (Ehrlich units/ 100 ml urine
	control: females		100 p/mm: females	
z	1.0723	0.2	1.0660	0.3
r_1	1.0717	0.3	1.0660	0.3
r_2	1.0706	0.3	1.0666	0.3
l_1	1.0765	0.2	1.0657	0.3
l_2	1.0739	0.3	1.0593	0.3
mean	1.0730	0.26	1.0650	0.30
	500 p/mm: females		1500/2500 p/mm: females	
z	1.0716	0.3	1.0626	0.3
r_1	1.0653	0.3	1.0550	0.3
r_2	1.0674	0.2	1.0564	0.3
l_1	1.0510	0.2	1.0645	0.3
l_2	1.0606	0.4	1.0600	0.3
mean	1.0590	0.28	1.0613	0.30

Gross pathology

At termination the following organs were observed to be abnormal:

CONTROL

Liver - pale: male rat no. z.

accentuated lobular pattern: male rat no. l_1.

Kidneys - very slight, greenish discolouration: male rat no. l_1.

Lungs - small greyish areas: male rats nos. r_2 and l_2.

100 ppm level

Liver - accentuated lobular pattern: male rat no. l_1.

Kidneys - very slight, greenish discolouration: male rat no. l_2.

Lungs - small greyish areas: male rat no. r_2.

500 ppm level

Liver - accentuated lobular pattern: male rat no. l_2.

Kidneys - very slight, greenish discolouration: male rat no. l_2.

2500/1500 ppm level

Kidneys - marked green discolouration: male rats nos. z, r_1, r_2 and l_1.

No grossly visible abnormalities were observed in female rats fed the various diets.