Toxicology Information Collection (TIC) Report

The Dow Chemical Company

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Repeated Exposure of Rats and Dogs to Vapors of Eight Chlorinated Hydrocarbones			
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Abstract

Exposure of rats and dogs to vapors of eight chlorinated hydrocarbons on alternate days for 7 hours per day over a period of 6 months (75 exposure days) have been completed.

Endemic lung infection of the rat colony minimizes the value of the results produced by this study. All dogs survived the exposures but the single animal exposed to each vapor makes it unwise to base any definite conclusions on their response. This study therefore cannot be recommended for publication.

Briefly, it was found, subject to the above qualifications, that 1000 ppm. tetrachloroethylene produced more untoward effects than did 2000 ppm. Trichloroethylene or 1000 ppm, ethylidene dichloride, the latter being least harmful. Of the compounds studied at lower concentrations, comparison of 100 ppm, trichloroethane with 200 ppm. tetrachloroethane, leads us to believe that trichloroethane is fully as toxic or more so than tetrachloroethane. Ethylene dichloride at 200 ppm. is similar in severity to tetrachloroethane with 200 ppm. propylene dichhoride somewhat less toxic. The comparative toxicity of carbon tetrachloride has not been elucidated by the exposure to 400 ppm, which produced evident damage.

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Repeated Exposure of Rats and Dogs to Vapors of

Eight Chlorinated Hydrocarbons

Ethylidene Dichloride 10-22 ?
Carbon Tetrachloride
Trichloroethylene
Tetrachloroethylene
Ethylene Dichloride
Trichloroethane
Tetrachloroethane
Propylene Dichloride

Tables of Protocols Attached

Carbide and Carbon Chemicals Corporation Industrial Fellowship No. 274-10

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Summary

Exposure of rats and dogs to vapors of eight chlorinated hydrocarbons on alternate days for 7 hours per day over a period of 6 months (75 exposure days) have been completed.

Endemic lung infection of the rat colony minimizes the value of the results produced by this study. All dogs survived the exposures but the single animal exposed to each vapor makes it unwise to base any definite conclusions on their response. This study therefore cannot be recommended for publication.

Briefly, it was found, subject to the above qualifications, that 1000 ppm. tetrachloroethylene produced more untoward effects than did 2000 ppm. trichloroethylene or 1000 ppm. ethylidene dichloride, the latter being least harmful. Of the compounds studied at lower concentrations, comparison of 100 ppm. trichloroethane with 200 ppm. tetrachloroethane, leads us to believe that trichloroethane is fully as toxic or more so than tetrachloroethane. Ethylene dichloride at 200 ppm. is similar in severity to tetrachloroethane with 200 ppm. propylene dichloride somewhat less toxic. The comparative toxicity of carbon tetrachloride has not been elucidated by the exposure to 400 ppm. which produced evident damage.

Introduction

In March of 1939 exposures were started in an attempt to compare the chronic toxicity of ethylene dichloride and trichloroethylene. Groups of rats were exposed 8 hours a day to 200 ppm. of each chlorinated solvent and to a mixture containing 65% ethylene dichloride and 35% trichloroethylene. It was anticipated that the exposures would continue for several months, but 1/5 of the rats exposed to ethylene dichloride died after the first 8-hour exposure. No animals died as a result of the other two exposures in a 10-day period. The exposed rats died from an acute lung irritation such as might be expected from phosgene. Repeated careful quantitative chemical tests revealed no detectable phosgene, free chlorine or hydrochloric acid vapors in the vapor-air mixtures. The tests used were sensitive to small fractions of a part per million of the suspected materials and in view of their absence it seems impossible that the deaths could have been caused by anything save ethylene dichloride. It was concluded that rats are particularly susceptible to lung irritation from ethylene dichloride, which is a type of injury not produced by low concentrations of this material in humans.

Late in 1943 upon the request of the Sales Department the vapor hazard of trichloroethane was investigated. Contrary to the accepted fact that the more highly chlorinated compounds evince the greatest toxicity, it was found that trichloroethane at 170 ppm. killed 7/12 of the rats exposed 7 hrs. per day, 5 days a week for 30 exposure days whereas only 3/12 of the group exposed to 375 ppm. tetrachloroethane died.

The results of both the ethylene dichloride and trichloroethane exposures were not considered conclusive and a new approach was therefore decided upon. In passing, attention might be called to the fact that this work was undertaken before the interest of the National Institute of Health in chronic exposures of animals to ethylene dichloride came to our attention.

The high mortalities encountered in the daily exposure of small animals to ethylene dichloride at low concentrations led us to the use of alternate daily exposures. It was anticipated that the insult to the lung would be sufficiently alleviated so that rats would survive sufficiently long for liver and kidney damage to appear. To determine whether biochemical tests would be a useful tool in detecting early signs of liver damage and to gain some idea of the response of larger animals, one dog was assigned to exposure in each vapor. Facilities available limited to one the number used. It was hoped that by intensive and careful study of the dogs, pertinent information would be gained on blood effects as well as on liver and kidney metabolism.

It was also decided that, insofar as our physical facilities allowed, as many chlorinated hydrocarbons as possible would be compared by alternate exposure for a six month period. The concentration selected was to be the highest which, in our judgment, could be tolerated by a majority of the animals exposed. The chlorinated hydrocarbons selected for study included ethylidene chloride (1,1-dichloroethane), carbon tetrachloride (tetrachloromethane), trichloroethylene (ethylene trichloride), tetrachloroethylene (perchloroethylene or ethylene tetrachloride), ethylene dichloride (1,2-dichloroethane), trichloroethane (Beta or 1,1,2-trichloroethane), tetrachloroethane (1,1,2,2-tetrachloroethane or acetylene tetrachloride), and propylene dichloride (1,2-dichloropropane or propylene chloride).

Samples

The compounds used in this study represented the usual commercial grades. Ethylene dichloride, trichloroethane and propylene dichloride were Carbide and Carbon Chemicals Company products. Carbon tetrachloride and trichloroethylene were procured from Westvaco Chlorine Products Corporation. Ethylidene dichloride, tetrachlorethane, and tetrachloroethylene were supplied by the Dow Chemical Company.

Vapor Concentrations

Preliminary range finding exposures were made to determine the highest concentration which would be tolerated for an 8 hour exposure. When this was established alternate daily exposures were made for a two week period. If the rats survived it was assumed that this concentration would be satisfactory. Guided by the above procedure and several arbitrary decisions to arrive at more uniformity for comparison the following concentrations were selected:

Ethylidene dichloride	1000	ppm.
Carbon tetrachloride	400	"
Trichloroethylene	2000	"
Tetrachloroethylene	1000	"
Ethylene dichloride	200	"
Trichloroethane	100	"
Tetrachloroethane	200	"
Propylene dichloride	200	"

Rats

Two-hundred fifty albino rats of mixed sex were procured from Sprague-Dawley of Madison, Wisconsin. These rats were born between November first and tenth 1945 and were one month of age when received. After a preliminary observation period of two weeks 216 seemingly healthy animals were selected and distributed by randomization into 9 groups of 24 each. The 12 males and 12 females were kept in separate cages 6 rats per cage. Fertility was not studied because of the relatively short period of exposure. A group was assigned to each of the 8 compounds and the ninth held as an exposed control. The latter group was subjected to conditions approximating those found in the exposed groups without the addition of any vapor to the air furnished. The colony was maintained on Purina Laboratory Chow with supplements of orange and carrot. Exposure was made in the home cages to avoid repeated daily handling. Water bottles were removed from the cages while exposures were in progress. The water bottle delivery tips were sterilized daily and cages thoroughly scrubbed every two weeks. Infected animals were sacrificed as soon as the condition became apparent. Despite these precautions the incidence of lung infection was unduly high which predisposed to early death from vapor inhalation. It is possible that rats shipped long distances in cold weather may contract respiratory infections en route, that are of a chronic type, which may later fulminate when they are subjected to an additional respiratory insult.

Previous to the first exposure, blood cell counts and hemoglobin determinations were made, with repititions after the first, third, and sixth month of exposure. Weight was followed each week. Autopsies were made on all animals and portions of adrenal, kidney, liver, lung, spleen, and testis were taken for histopathological study. In addition nervous tissue was taken from all of the original rats that survived 75 exposures and the replacement group which survived 45 exposures. The nervous tissue was not studied, but if there is reason to investigate neuropathology the material will be available. Body weight, body length, and kidney and liver weight were determined immediately before sacrifice of survivors.

Dogs

Fourteen mongrel male dogs were procured from a dealer 3 months prior to exposure. In this interval they were dewormed, immunized against distemper and freed of external body parasites. They were maintained on Carnation Company Frisky meal and checkers with supplements of meat and bones. Previous to exposure urea nitrogen, brom sulfalein and serum phosphatase levels were established by duplicate determinations one month apart. After their exposures had started the publication by McCord *et al*. (1) on the thymol-barbital turbidity test was brought to our attention and was incorporated in the list of functional tests. The above tests were performed each month during the entire exposure period save in the last month when they were repeated 3 times at weekly intervals. Hematological studies were made monthly, weight was followed weekly, and organ and nervous tissue removed at sacrifice as described above for rats.

Vapor Exposure

The vapor concentrations were prepared by displacement of the fluids into heated evaporators through which dilution air entered the chambers. Total air flow was maintained at a rate which provided comfortable conditions for the animals. Rats and dogs were exposed together in the four chambers of 547 liter capacity. In the 196 liter capacity chambers the rats were exposed on one day and the dogs the next. The concentrations above 200 ppm. were prepared in the large chambers and the remainder in the small chambers, but airflow was controlled so that all chambers had an equivalent rate of air change.

Vapor concentrations were checked each day by means of the Zeiss interferometer with frequent verification by the thermal decomposition method. The interferometer calibration based on the analysis of vapor-air mixtures by thermal decomposition furnish the following sensitivity values for this instrument in ppm. per scale division: Ethylidene dichloride 24.5, carbon tetrachloride 20.4, trichloroethylene 18.8, tetrachloroethylene 16.3, ethylene dichloride 25.0, tetrachloroethane 16.5, trichloroethane 13.3, and propylene dichloride 19.1.

The mean daily interferometer readings for the entire period of exposure were as follows:

Ethylidene dichloride	1067	ppm.
Carbon tetrachloride	415	"
Trichloroethylene	2088	"
Tetrachloroethylene	1136	"
Ethylene dichloride	243	"
Trichloroethane	84	"
Tetrachloroethane	167	"
Propylene dichloride	160	"

Growth

Figures 10-1 to 10-5 portray the weight curves plotted as percent of original weight for the exposed dogs, and the rats separately by sex. Table 10-13 ranks the compounds in order of the increased retardation of weight gain. The "chi" square test was used for the rats because the data is amenable to calculation of frequency distribution. The use of only one dog on each compound made necessary the use of the "t" test for determining the statistical significance of their weight curves as they could not be considered in formulae dependant upon frequency distribution.

Figure 10-2

Weight Curves of Male Rats (A)

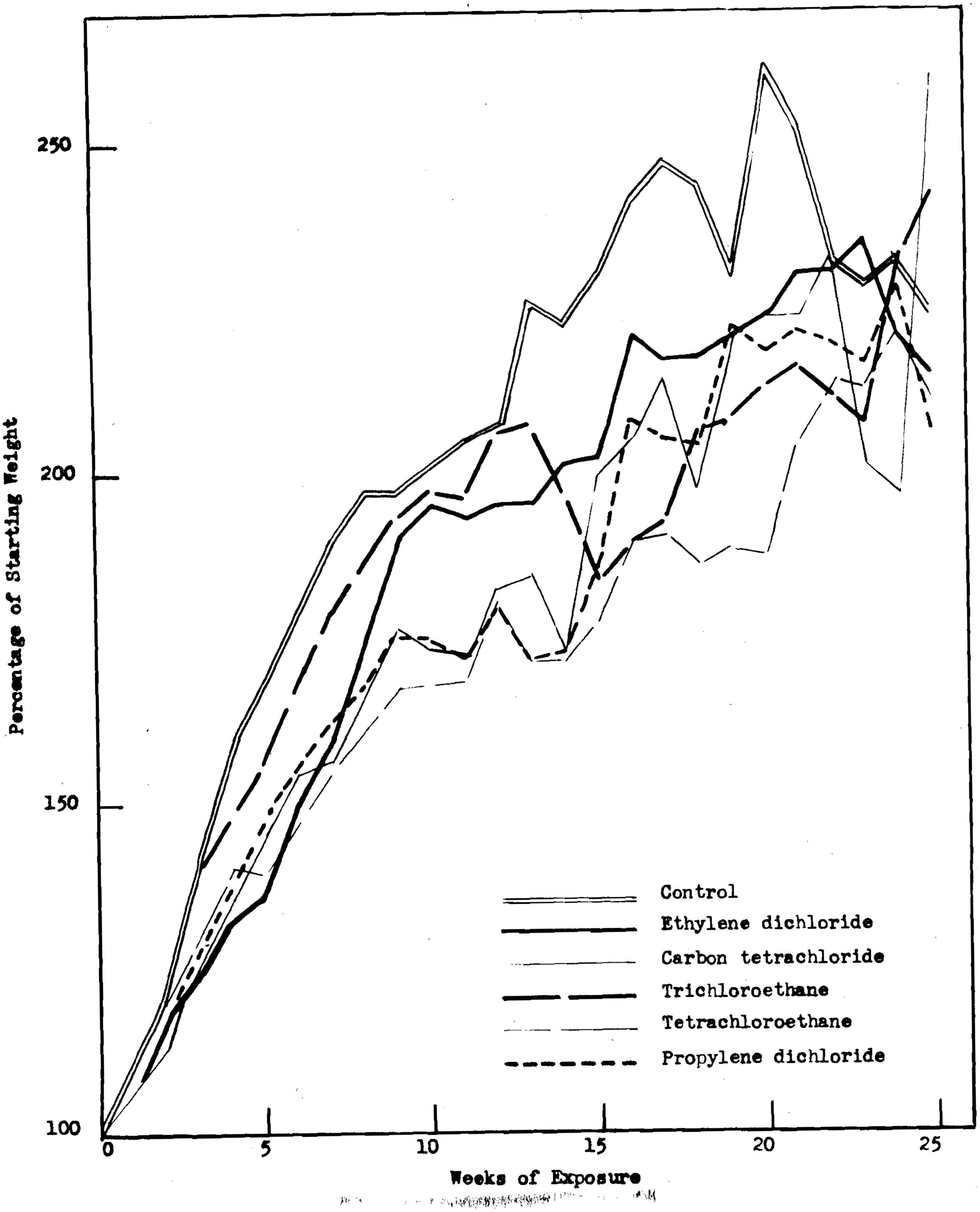

Figure 10-3

Weight Curves of Male Rats (B)

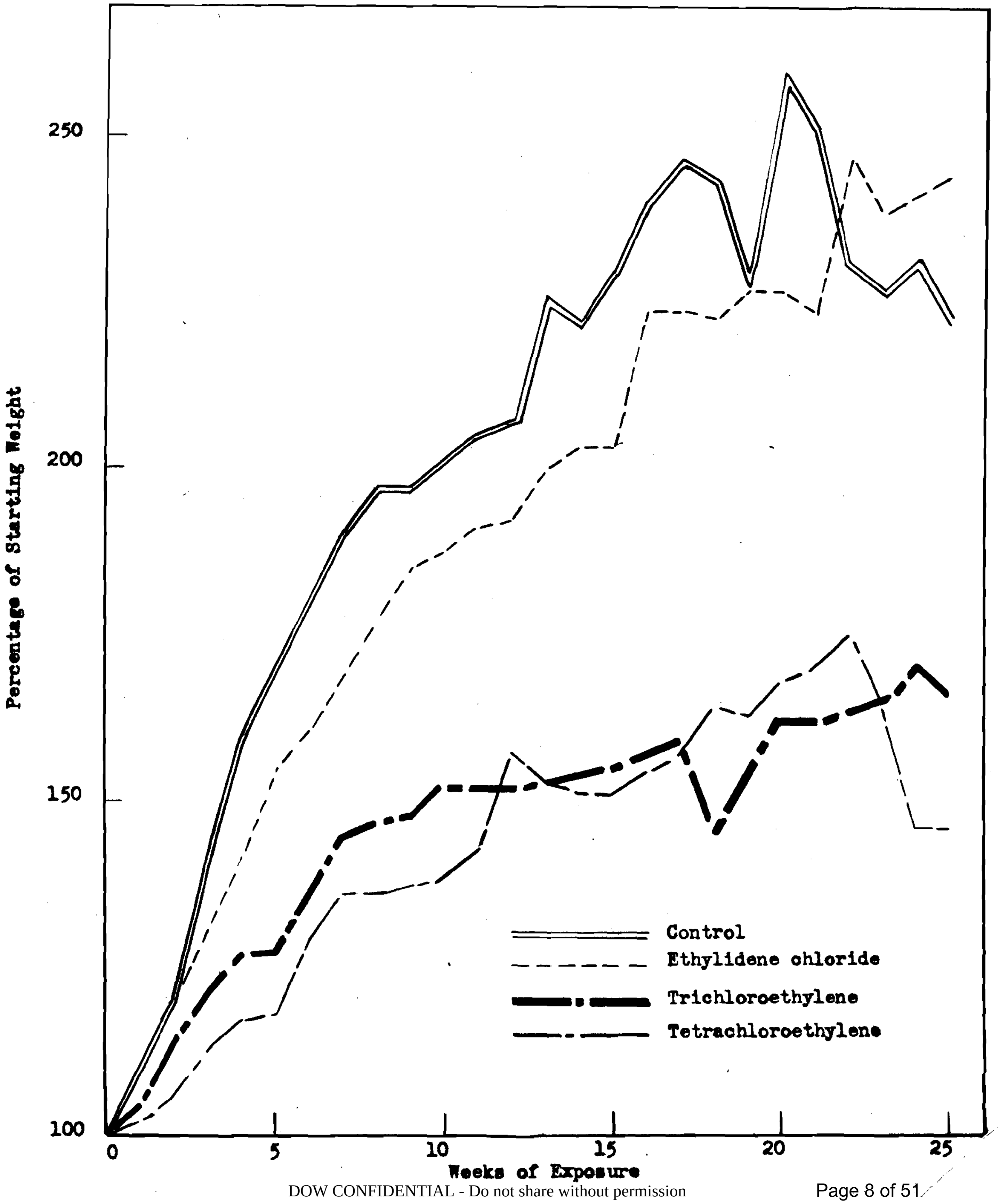

Figure 10-4

Weight Curves of Female Rats (A)

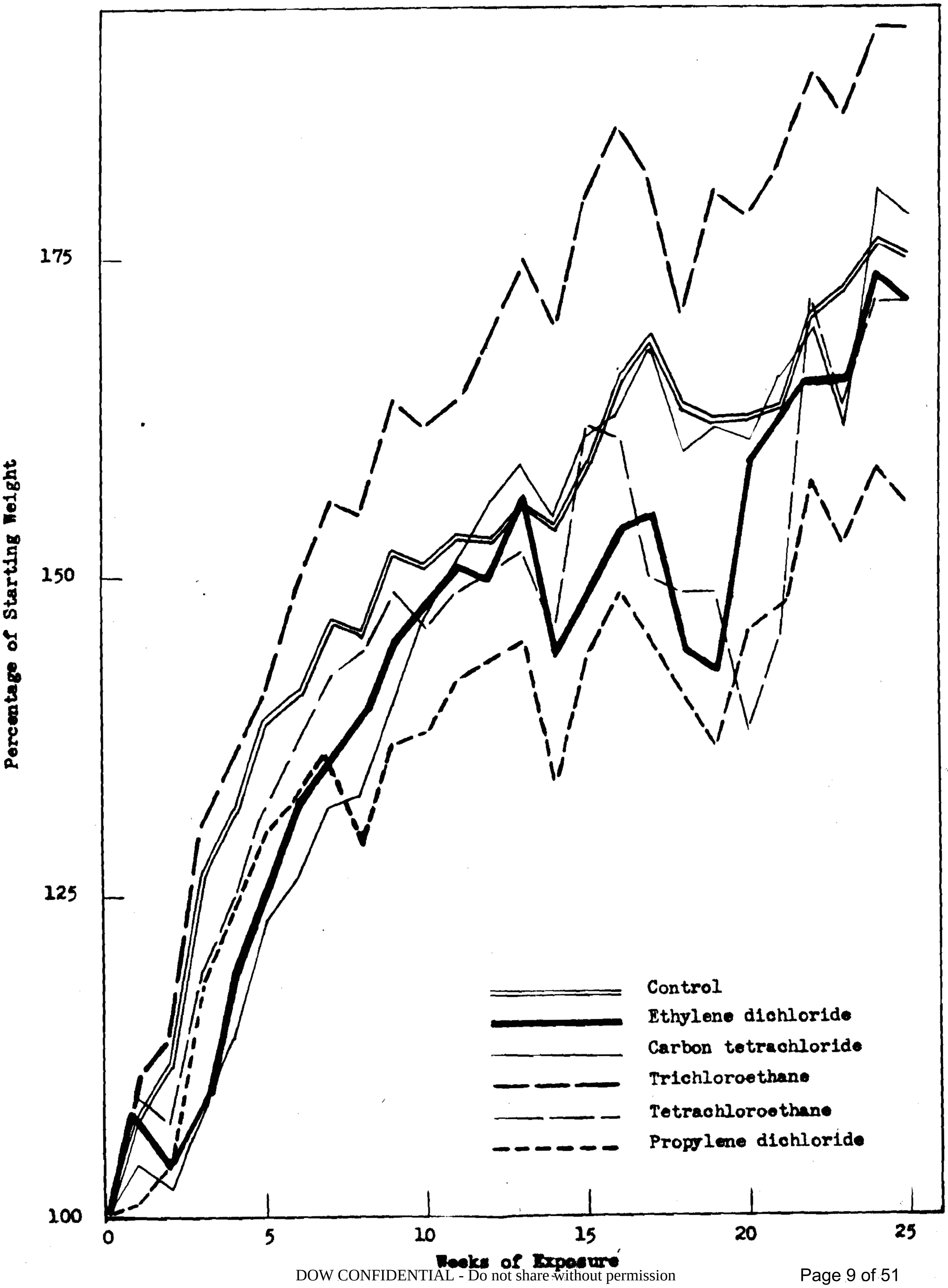

Figure 10-5

Weight Curves of Female Rats (B)

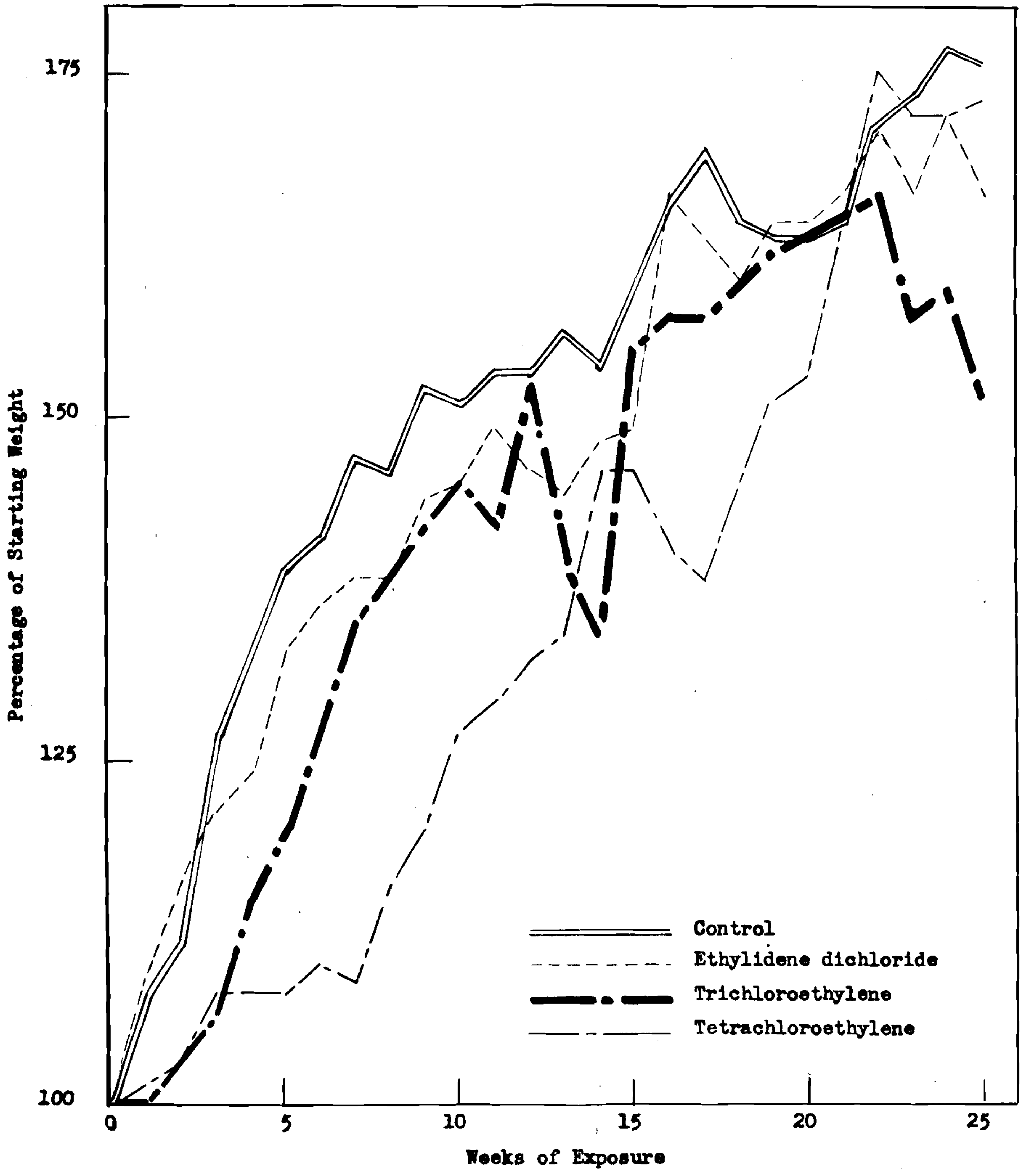

Table 10-13

Statistical Analyses of Weight Curves

and Order of Increasing Retardation of Weight

	Dogs		Male Rats			Female Rats		
	Rank	"t"	Rank	"Chi" Square	P	Rank	"Chi" Square	P
Propylene dichloride	1	2.0	3	15.40	0.31	7	28.27	0.0001*
Ethylidene dichloride	2	4.5*	2	9.74	0.70	5	17.56	0.004*
Trichloroethane	3	8.1*	1	7.59	0.66	1	21.44	(0.003*)
Ethylene dichloride	4	9.7*	4	17.33	0.24	4	14.83	0.01*
Carbon tetrachloride	5	11.4*	5	24.01	0.013*	2	9.79	0.2
Tetrachloroethylene	6	12.3*	8	72.54	<0.0001*	8	57.64	<0.0001*
Tetrachloroethane	7	13.2*	6	42.73	<0.0001*	3	10.19	0.07
Trichloroethylene	8	18.6*	7	52.23	<0.0001*	6	26.42	0.0002*

(*) = This group of female rats was stimulated and exceeded control group in weight gain.

* = Significant deviation from control group in weight loss.

It will be noted that all of the dogs showed significant deviation from the control in weight gain with the exception of the animal exposed to propylene dichloride. This dog had no functional testes and showed the typical eunuchoid tendency toward obesity. This abnormality may or may not have influenced his weight curve.

Furthermore, there is good agreement in the response of the dogs and male rats to the vapors of the last four compounds listed in Table 10-13. The "t" values for the dogs and "Chi" square values for the male rats are uniformly high for these four compounds and the probabilities are all significant. The female rats show a much more erratic response, with those exposed to trichloroethane stimulated so that they exceeded the controls in weight gains. Their response paralleled that of the males with trichloroethylene and tetrachloroethylene but in all other instances, with the exception of trichloroethane, they deviated from the pattern set by the males.

Mortality

The numerous early deaths in all groups made necessary the addition of replacement rats after the 30th exposure. They were largely of the same age and strain as the original rats and are included in the weight curves as if they had started with the original group. They attained a maximum of 45 exposure days and were sacrificed with the original survivors. Table 10-14 shows mortality and the number of uninfected rats that were sacrificed at the termination of the study. Those sacrificed after 45 days constituted the survivors from the replacement group.

There were no deaths among the dogs exposed.

Table 10-14

Mortality

	No. Exposed	% Mortality	Sacrificed after exposure for 45 days	75 days
Tetrachloroethane	29	41	4	7
Ethylidene dichloride	35	51	9	5
Propylene dichloride	27	55	2	7
Controls	30	57	5	6
Trichloroethane	29	62	1	10
Ethylene dichloride	38	66	2	9
Trichloroethylene	29	69	1	9
Tetrachloroethylene	38	69	7	3
Carbon tetrachloride	30	77	-	5

Body Length

The mean body length of the rats that survived exposure to tetrachloroethylene was significantly reduced as was also the fatness index which expresses grams per millimeter of body length. None of the other vapors produced significant effects in these respects.

Liver and Kidney Weight

Liver weight as percent of control corrected for body length is determined by dividing the liver weight of the rat under test or serving as a control, by the liver weight of rats of the same body length listed separately by sex in tables prepared by Donaldson (2), A proportion is then set up as follows to provide a value for x

$$\frac{\text{Mean Control Value}}{100} = \frac{\text{Mean Test Value}}{x}$$

where x = Liver Weight as % of control value corrected for body length.

Treatment of the data by the above method for liver and kidney weights showed that 400 ppm. carbon tetrachloride had caused a statistically significant increase in liver weight of survivors which was not evident in any other group. An increase was also noted in kidney weight after carbon tetrachloride exposure as well as in the 200 ppm. ethylene dichloride and 200 ppm. tetrachloroethane exposure groups.

Icterus Index

Icterus index determinations on individual blood samples, removed before sacrifice of survivors, revealed no difference from the controls. The acetone precipitation method and comparison with La Motte standards were both used.

Liver Fat

Liver fat analyses on pooled rat livers from each group indicated no excessive fatty infiltration but are not considered reliable except as they apply to rats that attained 45 exposures. This qualification is necessary because the livers of those rats receiving 45 and 75 exposures were inadvertently pooled, which fact would tend to reduce the values for those that had survived 75 exposures.

Functional Tests on Dogs

The generally accepted limits of normal liver function tests on dogs are as follows: Retention above 5% in brom sulfalein excretion, and 10 units per 100 ml. for serum phosphatase. Blood urea nitrogen values which reflect that the urea nitrogen values doubled. This occurred among controls as well as exposed animals and is therefore considered as unrelated to exposure.

Blood Cytology

The previous work with rats exposed to tetrachloroethane failed to demonstrate an increase in mononuclear cells such as has been reported by Minot and Smith (4). In the hope that dogs would show a response similar to that of humans, monthly blood counts and differential leucocyte counts were made on all of the dogs, with special attention to the two exposed to trichloroethane and tetrachloroethane. The results were negative in that no increase in monocyte count was demonstrated. The concentration of 200 ppm. tetrachloroethane was either too low to cause damage to the hematopoietic system or there exists a difference in response between dogs and humans as regards this criterion of damage.

Routine blood counts in general both on the rats and dogs were essentially normal. Throughout this study, the blood count values were subjected to statistical interpretation as recommended by Berg (5). The application of this method to routine counts makes possible the detection of errors in manipulation and technique simultaneously with completion of the count. Immediate recounts can then be made if necessary. The statistical evaluation is accomplished by comparison with tables of normal distribution based on conditions of careful routine. The troublesome task of predicting significance by judgement alone is therefore eliminated.

Pathology

A discussion of the pathology produced by the exposures is a very uncertain undertaking as there was a 57% mortality among the control rats. Twenty-five percent of the kidneys examined showed intense cloudy swelling or degeneration of the convoluted tubules, 46% of the livers showed intense congestion or cloudy swelling, and astonishingly enough fatty degeneration was also evident in 30% of the livers. Lung pathology was noted in 29% largely due to endemic lung infection of the consolidative type caused probably by a virus or pleuropneumonia-like organism according to Nelson (6). In other words, roughly 50% of the control animals had major pathology of the kidney, liver, or lung. Any effect judged to be related to exposure to the chlorinated hydrocarbons must therefore be very carefully weighed with these deficiencies in mind.

The pathology reported for ethylidene and ethylene dichloride, trichloroethylene, tetrachloroethane, and propylene dichloride must be discounted to a large extent when compared to that of the control group. However, the incidence of lung pathology was twice as great among the rats exposed to trichloroethylene and ethylene dichloride as in the control group.

Carbon tetrachloride produced major pathology, i.e., marked or generalized effects, in 78% of the livers as against 25% among the control rats. Kidney pathology was noted in 43% as against 25% among the controls. There was no demonstrable increase in kidney damage as a result of exposure to tetrachloroethylene but 61% of the livers compared to 46% for the controls had major liver pathology. Trichloroethane exposures produced major damage in 52% of the kidneys and 55% of the livers as against a 25 and 46% incidence among the controls. The incidence of lung damage was 78%, 58%, and 59% as against 29% in the control group for carbon tetrachloride, tetrachloroethylene, and trichloroethane respectively.

There was no major pathology produced by exposure to tetrachloroethylene or trichloroethane in the single dog used in each exposure. The animal that inhaled ethylidene dichloride had marked congestion of the lungs but no other pathology. Carbon tetrachloride produced marked cloudy swelling of the kidney and liver with fatty degeneration of the latter. The lungs were markedly congested with leakage of red blood cells into the bronchioles. Trichloroethylene produced fatty degeneration of the liver. Ethylene dichloride affected the kidney primarily in the dog, evident as marked cloudy swelling of the convoluted tubules with attendant desquamation and cast formation. Minor pathology produced by trichloroethane included light cloudy swelling of the liver and slight lung congestion. Tetrachloroethane produced light cloudy swelling of the convoluted tubules of the kidney, marked cloudy swelling of the liver and light congestion of the lungs. Propylene dichloride had no effect upon the kidney but produced marked cloudy swelling of the liver and severe lung congestion. No pathology was seen in cerebrum, cervical cord, optic or sciatic nerve of any dog.

Discussion

The only method whereby relative toxicity can be absolutely demonstrated is by exposure of animals to vapor concentrations which decrease progressively until a concentration which produces no effect on any criterion of injury is determined.

The most information that can reasonably be given as a result of these comparisons is to rate the compounds in groups exposed to like concentrations. Therefore, on the basis of the evidence presented 1000 ppm. tetrachloroethylene produces more damage than 2000 ppm. trichloroethylene or 1000 ppm. ethylidene dichloride. The latter produces even less effect than 2000 ppm. trichloroethylene. Of the compounds studied at lower concentration 100 ppm. trichloroethane seems to be worse than 200 ppm. tetrachloroethane or ethylene dichloride, which are indistinguishable, with 200 ppm. propylene dichloride producing somewhat less damage. We will not hazard a guess as to the concentration at which minor pathology produced by carbon tetrachloride will become extinct. This information will appear in the literature in the near future as a result of studies currently in progress at another laboratory.

Attention should be called to the fact that our original selection of concentration provides a relative rating system for the compounds in acute exposures, carbon tetrachloride excluded. However, deaths at high concentration are largely a result of anaesthetic effect and in no wise indicate the cumulative damage which may be caused by repeated exposure to low concentrations.

There is apparently very poor correlation between functional tests on dogs and organ pathology produced by carbon tetrachloride, as neither the brom sulfalein nor the phosphatase test indicated any disturbance of function during the course of the exposures. The liver degeneration reported for trichloroethylene, on the other hand, agrees with the disturbance noted in both brom sulfalein retention and increased production of serum phosphatase. Although no liver pathology was noted in the dog exposed to tetrachloroethylene, the serum phosphatase values were significantly raised. With tetrachloroethane marked cloudy swelling of the liver was associated with very high phosphatase values, but similar pathology resulting from propylene dichloride was not reflected in the functional tests. Similarly, high urea nitrogen values correlated with light cloudy swelling of the kidney tubules in the tetrachloroethane exposure but failed in the case of propylene dichloride.

Recent work published by Heppel et al. (7, 8, 9, 10) shows that 100 ppm. ethylene dichloride produced no deaths among rats exposed 7 hours per day 5 days a week for a total of 74 exposures. There was no effect upon growth rate and no influence upon fertility. At 200 ppm. 7/12 of the Wistar strain rats died in from 1 to 73 exposures and 8/12 of the Osborne-Mendel strain in from 1 to 6 exposures. No microscopic abnormalities were found in the 5 surviving rats of the Wistar strain which received a total of 86 exposures except fatty degeneration of renal tubules in one rat. A concentration of 400 ppm. for 173 days did not produce mortality but slight fatty metamorphosis was noted in the livers of 5 dogs and in the kidney of one. Functional tests were entirely negative. These results are not in disagreement with our findings on the rats and the dog which survived 75 alternate exposures to 200 ppm. ethylene dichloride.

Heppel et al. (11) have also reported on the exposure of rats and dogs to propylene dichloride. At a concentration of 1000 ppm. deaths occurred among dogs after 24 exposures and among rats after as few as 7 exposures. Some of the animals survived over 100 exposures. Marked visceral congestion, fatty degeneration of the liver, kidney, and less frequently the heart, and areas of coagulation necrosis in the liver were noted in animals dying after less than twelve 7-hour exposures to 1000 to 2200 ppm. He also sites evidence which suggests that the order of increasing lethal action against rats is as follows: Dichloromethane (methylene chloride), trichloroethylene, carbon tetrachloride, dichloropropane (propylene dichloride), and dichloroethane (ethylene dichloride).

Seifter (12) reports that toxic action to trichloroethylene was seen in dogs exposed to 500-750 ppm., 4 to 8 hours daily, 5 to 6 days a week for 3 to 8 weeks. The clinical picture of intoxication consisted of lethargy, anorexia, nausea, vomitting, weight loss, anemia, and liver dysfunction. The degree of toxicity was directly proportional to the intensity of exposure. The most significant change in the intoxicated dogs was the progressive impairment of liver function as shown by the brom sulfalein test. Microscopic sections of the liver taken from dogs that died or were sacrificed during the period of intoxication showed depletion of the glycogen and hydropic parenchymatous degeneration. No pathologic changes were noted in the intestines, adrenals, kidneys, and heart of intoxicated animals. Sections made from dogs that were allowed to recuperate until the brom sulfalein test was normal showed no signs of liver injury.

These findings parallel the results obtained on the single dog exposed to 2000 ppm. trichloroethylene in this study. Liver damage was greater than reported by Seifter but this is in line with the higher concentration used. There have been no other comparable animal studies reported in the recent literature.

Charles P. Carpenter

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Typed: January 14, 1947 - met

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Table 10-15

Composite Summary of Results on

Vapor Exposures to Chlorinated Hydrocarbons

	A	B	C	D	E	F	G	H	I
					Rats				
Wgt. Curve "Chi Square" Values for Males	17.33	24.01*	52.23*	72.54*	17.33	7.59	42.73*	15.40	
Wgt. Curve "Chi Square" Values for Females	17.56*	9.79	26.42*	57.64*	14.83*	21.44**	10.19	28.27*	
Mean Body Lgth in mm. at Sacrifice	228.8	226.7	230.0	218.5*	234.4	227.2	233.1	228.6	235.9
Fatness (gms./mm. Body Length)	1.260	1.165	1.202	1.024*	1.270	1.203	1.268	1.206	1.273
Liver Wgt. as % of Control Corrected for Body Lgth.	108.0	141.8*	106.3	98.6	108.3	94.0	113.3	105.0	100.0
Kidney Wgt. as % of Control Corrected for Body Lgth.	110.0	123.8*	102.5	106.3	117.8*	97.9	115.2*	102.8	100.0
Sets of tissues examined	29	28	26	36	36	27	23	23	24
Sets with major pathology	12	24	16	24	25	16	6	14	11
Sets with major kidney pathology	10	12	6	3	8	14	4	9	6
Sets with major liver pathology	5	22	5	22	21	15	5	11	11

(Continued)

Table 10-15
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	A	B	C	D	E	F	G	H	I
				Dogs					
Weight Curve "t" test values	4.5*	11.4*	18.6*	12.3*	9.7*	8.1*	13.2*	2.0	
Brom Sulfalein Mean % Retention	<5.0	<5.0	18.6*	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Urea Nitrogen (Mgm %) Mean Value	11.54	16.48	12.81	12.71	15.84	14.04	20.66*	20.18*	15.23
Phosphatase Units Mean Value	8.16	4.64	14.78*	19.44*	4.07	4.84	33.00*	8.10	5.82
Sets of Tissues Examined	1	1	1	1	1	1	1	1	1
Sets with Major Pathology	1	1	1	0	1	0	1	1	0

** Significant stimulation of weight gain

* Indicates results statistically significantly different from controls. Absence of asterisk on any given line indicates data not amenable to statistical interpretation.

(Continued)

CODE

A = 1000 ppm. Ethylidene Dichloride

B = 400 ppm. Carbon Tetrachloride

C = 2000 ppm. Trichloroethylene

D = 1000 ppm. Tetrachloroethylene

E = 200 ppm. Ethylene Dichloride

F = 100 ppm. Trichloroethane

G = 200 ppm. Tetrachloroethane

H = 200 ppm. Propylene Dichloride

I = 0 ppm. - Control

Table 10-16

South Charleston Works Laboratory Data

on Samples Used for Alternate Daily Vapor Exposures

Sample of	Ethylidene Dichloride	Trichlor-ethylene	Tetrachlor-ethane	Carbon tetra-Chloride	Propylene Dichloride	Ethylene Dichloride	Trichlor-ethane	Tetra-chlor-ethylene
Sample number	8-254	8-204	8-255	8-196	8-197	8-198	8-199	8-256
Specific gravity at 20/20°C.	1.1735	1.4578	1.5071	1.5998	1.1612	1.2554	1.4405	1.6252
Acidity as HCl, % by wt.	0.002	0.002	0.054	0.001	0.002	0.002	0.0076	0.002
Alkalinity as KOH, % by wt.	nil	nil	nil	nil	nil	nil	nil	0.010
Residue on evaporation, gm/100 ml.	0.0032	0.0018	0.0490	nil	0.0006	0.0034	0.0030	0.0004
Refractive index N_{20}^{D}	1.4165	1.4168	1.4895	1.4598	1.4395	1.4448	1.4705	1.5050
Color, Platinum-cobalt scale	20	10	400	30	3	8	20	30
Free halogens	nil	nil	nil	nil	nil	nil	trace	nil
Boiling range, °C at 760 mm								
i.b.p.	53.3	83.3	134.3	75.3	94.1	82.6	110.9	118.0
2 ml.	54.3	84.8	134.8	76.1	95.3	82.9	111.4	119.3
5	55.1	85.8	136.3	76.3	96.0	83.1	112.2	119.5
10	55.3	86.1	138.3	76.3	96.2	83.3	112.6	119.7
20	56.1	86.3	139.1	76.3	96.4	83.5	113.2	120.3
30	56.3	86.3	139.3	76.3	96.5	83.6	113.4	120.5
40	56.5	86.3	140.1	76.3	96.5	83.6	113.4	120.5
50	56.8	86.4	140.3	76.5	96.6	83.7	113.4	120.7
60	57.1	86.5	141.3	76.5	96.7	83.7	113.5	121.0
70	57.2	86.6	142.1	76.5	96.7	83.7	113.6	121.0
80	57.3	86.8	143.3	76.7	96.9	83.7	113.9	121.1
90	57.3	86.8	145.1	76.7	97.0	83.7	114.2	121.3
93	57.3	86.8	146.8	76.7	97.1	83.7	114.2	121.4
95	57.3	86.8	148.3	76.8	97.3	83.8	114.4	121.5
97	57.3	87.1	150.3	76.8	97.5	83.9	114.6	121.5
d.p.	57.5	87.1	151.3	76.8	98.9	84.0	115.4	122.0

Table 10-17

Range Finding Exposures for Selection

of Concentrations for Alternate Daily Exposures

Compound	Concentration ppm.	Number of Exposure x Hours	Fractional Mortality after 14 day Observation
Ethylidene Dichloride	16,000	1 x 8	6/6
	8,000	1 x 8	2/6
	4,000	1 x 8	0/6
	2,000	*6 x 8	0/12
Carbon Tetrachloride	8,000	1 x 6.5	12/12
	4,000	1 x 8	2/12
	3,000	1 x 8	0/12
	1,000	*5 x 8	0/12
Trichlorethylene	8,000	1 x 8	10/12
	8,000	1 x 4	4/7
	4,000	1 x 8	6/12
	4,000	1 x 4	0/12
	3,000	1 x 8	1/6
	3,000	*6 x 8	4/6
	2,000	*6 x 8	0/6
Tetrachlorethylene Eastman Kodak Co. Product	10,000	1 x .75	6/6
	8,000	1 x 2	6/6
	4,000	1 x 1	5/6
	2,000	1 x 8	0/6
	2,000	*6 x 8	3/6
Dow Chemical Co. Product	8,000	1 x 2	8/10
	8,000	1 x 1	3/7
	8,000	1 x 1/2	3/10
	4,000	1 x 8	11/17
	4,000	1 x 7	18/27
	4,000	1 x 4	0/8
Ethylene Dichloride	2,000	1 x 4	12/12
	2,000	1 x 2	2/6
	2,000	1 x 1	0/6
	1,000	1 x 8	6/6
	1,000	1 x 4	4/6
	500	*5 x 8	6/12
	200	*43 x 7	0/10
	200	43 x 7	10/10

(Continued)

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Page 2.

Compound	Concentration ppm.	Number of Exposure x Hours	Fractional Mortality after 14 day Observation
Trichlorethane	2,000	1 x 8	12/12
	1,000	1 x 8	6/12
	1,000	1 x 4	2/12
	500	1 x 8	4/6
	500	1 x 4	1/6
	250	*6 x 8	8/12
	170	30 x 7	7/12
Tetrachlorethane	1,000	1 x 8	1/12
	1,000	1 x 5	0/12
	1,000	1 x 4	3/6
	1,000	1 x 1	0/6
	500	1 x 8	4/6
	500	1 x 4.6	0/6
	375	30 x 7	3/12
Propylene Dichloride	4,000	1 x 4	12/12
	2,000	1 x 8	3/6
	2,000	1 x 4	0/6
	1,000	1 x 8	0/6
	1,000	*5 x 8	4/6
	500	*6 x 8	0/6

* Alternate daily exposures (Maximum 3 x a week)

Repeated daily exposures (Maximum 5 x a week)

Table 10-18

Body Weight and Organ Weight at Sacrifice

Sex	Rat No.	Body Length in mm.	Body Weight in gm.	Fat- ness gm. per mm.	Liver Weight in gm.	Kidney Weight in gm.
			Ethylidene Dichloride - 1000 ppm.			
M	38631	243	418	1.72	14.04	2.70
	39819	244	343	1.41	11.37	2.41
	39820	237	314	1.32	10.81	2.36
	38697	238	310	1.30	12.01	2.32
	38737	244	371	1.52	14.02	2.57
	39821	232	316	1.36	11.90	2.29
	39822	238	340	1.43	12.07	2.26
F	38492	218	238	1.09	7.01	1.65
	38524	219	217	0.99	7.86	1.44
	39744	218	232	1.06	8.79	1.60
	39748	221	238	1.08	9.32	1.72
	39750	214	245	1.14	7.73	1.49
	39751	222	252	1.14	8.50	1.67
	39778	215	232	1.08	8.09	1.81
			Carbon Tetrachloride - 400 ppm.			
M	39828	237	302	1.27	14.29	2.36
	38634	229	290	1.27	11.76	2.62
F	38506	224	247	1.10	14.24	1.92
	38510	226	261	1.15	13.21	2.11
	38522	227	273	1.20	13.32	2.32
	38534	217	216	1.00	11.44	1.87
			Trichloroethylene - 2000 ppm.			
M	38632	232	276	1.19	9.11	1.87
	38645	235	298	1.27	10.03	1.95
	38648	238	348	1.46	11.61	2.20
	38651	238	280	1.18	11.64	2.06
	38696	236	298	1.26	12.36	2.35
	38701	239	316	1.32	11.05	2.20
F	39758	210	218	1.04	7.78	1.31
	38547	220	232	1.05	8.52	1.47
	38573	222	234	1.05	8.41	1.60

(Continued)

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Page 2.

Sex	Rat No.	Body Length in mm.	Body Weight in gm.	Fatness gm. per mm.	Liver Weight in gm.	Kidney Weight in gm.
			Tetrachlorethylene - 1000 ppm.			
M	38702	214	226	1.06	8.61	1.67
	38705	225	260	1.16	9.67	1.95
	39838	226	218	0.97	8.62	1.76
	39834	227	260	1.15	8.90	2.05
	39014	227	250	1.10	8.95	2.04
F	39760	211	201	0.95	6.84	1.33
	39761	214	200	0.94	6.38	1.27
	39763	216	213	0.99	8.95	1.57
	39765	215	205	0.95	7.94	1.55
	38610	214	215	1.00	6.93	1.62
	39766	215	216	1.00	7.12	1.43
			Ethylene Dichloride - 200 ppm.			
M	39017	243	342	1.41	12.35	3.20
	39018	249	367	1.47	12.28	3.23
	39012	255	405	1.59	16.17	3.08
	39020	252	360	1.43	11.51	2.45
	39853	224	269	1.20	9.57	2.05
F	38499	215	222	1.03	8.78	1.59
	38565	225	246	1.09	9.19	1.81
	38591	212	200	0.94	8.17	1.55
			Trichloroethane - 100 ppm.			
M	38626	236	319	1.35	9.82	2.10
	38663	239	310	1.30	10.35	2.18
	38670	239	348	1.45	11.08	2.39
	39021	242	374	1.55	12.75	2.55
F	38493	218	224	1.03	6.60	1.50
	38505	215	236	1.10	6.58	1.25
	38525	227	249	1.10	7.45	1.65
	38556	221	238	1.08	9.05	1.71
	38568	234	285	1.22	8.40	1.65
	38593	218	238	1.09	8.01	1.35
	39773	210	202	0.96	6.75	1.26
			Tetrachloroethane - 200 ppm.			
M	38623	235	320	1.36	10.76	2.32
	38647	234	268	1.14	8.85	2.12
	38628	237	296	1.25	10.54	2.10
	38680	232	318	1.37	10.55	2.21

(Continued)

Table 10-18
Page 3.

Sex	Rat No.	Body Length in mm.	Body Weight in gm.	Fatness gm. per mm.	Liver Weight in gm.	Kidney Weight in gm.
			Tetrachloroethane - 200 ppm. (Cont'd.)			
M	39855	238	322	1.35	11.42	2.11
	40458	255	428	1.67	16.85	3.35
	38731	242	330	1.36	11.90	2.38
	40461	230	284	1.24	14.79	2.21
	40462	219	244	1.11	9.01	1.93
F	38615	224	236	1.05	8.45	1.60
	38502	218	229	1.05	8.90	1.71
			Propylene Dichloride - 200 ppm.			
M	38687	247	390	1.58	12.97	2.40
	39007	250	416	1.66	13.91	2.94
	38738	220	214	0.97	8.35	1.47
	40460	240	352	1.47	13.88	2.62
F	38497	220	240	1.09	9.38	1.82
	38501	216	218	1.01	8.20	1.45
	38514	223	230	1.03	7.57	1.51
	38571	220	228	1.04	7.87	1.53
	39775	221	220	1.00	8.12	1.50
			Controls - 0 ppm.			
M	40343	256	438	1.71	14.90	2.46
	40464	248	400	1.61	14.96	2.91
	38693	242	340	1.40	12.27	2.40
	38711	247	360	1.46	12.83	2.52
	40466	250	394	1.57	16.86	3.04
F	38581	217	226	1.04	7.10	1.55
	39776	224	228	1.02	7.13	1.60
	38585	223	244	1.09	7.32	1.48
	38587	232	224	0.96	7.31	1.55
	38599	235	270	1.15	8.21	1.84
	39777	221	218	0.99	7.93	1.48

Table 10-19

Results of Functional Tests on Dogs

Exposed to Chlorinated Hydrocarbons

Compound and Dog No.	Date	Brom Sulfalein % Retention	Urea N mgm. %	Phosphate Units	Thymol Units
Ethylidene Dichloride	11-20-45	<5.0	5.50	7.53	-
1000 ppm.	12-20-45	<5.0	7.81	10.21	<2.0
D36000	2-15-46	<5.0	8.13	7.50	<2.0
	3-12-46	<5.0	10.50	13.00	<2.0
	4-12-46	<5.0	9.63	11.40	<2.0
	5-14-46	<5.0	16.75	6.60	2.6
	6-14-46	<5.0	12.50	3.60	<2.0
	6-21-46	<5.0	13.00	4.20	<2.0
	6-28-46	<5.0	10.25	5.80	<2.0
Mean			11.54	8.16	
Carbon Tetrachloride	11-20-45	<5.0	4.75	1.66	-
400 ppm.	12-20-45	<5.0	9.56	14.26	<2.0
D36011	2-15-46	<5.0	13.88	1.50	<2.0
	3-12-46	<5.0	23.88	5.40	<2.0
	4-12-46	<5.0	15.63	5.60	<2.0
	5-14-46	<5.0	26.25	5.40	5.0
	6-14-46	<5.0	12.50	3.60	<2.0
	6-21-46	<5.0	13.00	4.20	<2.0
	6-28-46	<5.0	10.25	5.80	<2.0
Mean			16.48	4.64	
Trichlorethylene	11-20-45	<5.0	6.38	4.66	-
2000 ppm.	12-20-45	<5.0	9.56	4.39	<2.0
D36001	2-15-46	14.4	12.50	7.50	<2.0
	3-1-46	33.4	-	13.80	-
	3-12-46	20.9	14.25	17.70	<2.0
	4-12-46	15.6	13.88	33.60	<2.0
	5-14-46	17.5	30.25	11.40	<2.0
	6-14-46	15.1	12.25	9.60	<2.0
	6-21-46	16.5	15.38	9.00	<2.0
	6-28-46	15.5	11.13	15.60	<2.0
Mean			12.81	14.78*	
Tetrachlorethylene	11-20-45	<5.0	4.63	6.16	-
1000 ppm.	12-20-45	-	9.38	9.24	<2.0
D36003	2-15-46	<5.0	9.88	19.80	
	3-1-46	<5.0	-	14.20	-
	3-12-46	<5.0	16.63	12.90	<2.0
	4-12-46	<5.0	8.50	28.80	<2.0

(Continued)

Table 10-19
Page 2.

Compound and Dog No.	Date	Brom Sulfalein % Retention	Urea N mgm. %	Phosphate Units	Thymol Units
Tetrachlorethylene	5-14-46	<5.0	20.50	25.20	<2.0
1000 ppm.	6-14-46	<5.0	10.60	14.40	2.3
D36003	6-21-46	<5.0	15.38	19.80	<2.0
	6-28-46	<5.0	7.50	20.40	<2.0
Mean			12.71	19.44*	
Ethylene Dichloride	11-20-45	<5.0	9.25	1.66	-
200 ppm.	12-20-45	<5.0	9.69	3.18	<2.0
D36002	2-15-46	<5.0	13.00	1.80	<2.0
	3-12-46	<5.0	17.75	5.10	<2.0
	4-12-46	<5.0	12.88	11.40	<2.0
	5-14-46	<5.0	25.50	4.20	3.3
	6-14-46	<5.0	12.75	2.40	<2.0
	6-21-46	<5.0	17.13	1.80	<2.0
	6-28-46	<5.0	11.88	1.80	<2.0
Mean			15.84	4.07	
Trichlorethane	11-20-45	<5.0	5.50	3.03	-
100 ppm.	12-20-45	<5.0	9.38	4.56	<2.0
D37214	2-15-46	<5.0	9.88	4.50	<2.0
	3-12-46	<5.0	15.63	4.20	2.7
	4-12-46	<5.0	10.25	10.20	<2.0
	5-14-46	<5.0	27.00	4.20	-
	6-14-46	<5.0	12.88	3.60	<2.0
	6-21-46	<5.0	15.63	4.20	<2.0
	6-28-46	<5.0	7.00	3.00	<2.0
Mean			14.04	4.84	
Tetrachlorethane	11-20-45	<5.0	11.38	4.53	-
200 ppm.	12-20-45	<5.0	10.00	5.31	<2.0
D36007	2-15-46	<5.0	19.25	26.10	<2.0
	3-1-46	<5.0	-	31.50	-
	3-12-46	<5.0	23.00	27.60	<2.0
	4-12-46	<5.0	20.75	48.60	<2.0
	5-14-46	<5.0	20.00	33.60	3.3
	6-14-46	<5.0	20.13	47.40	<2.0
	6-21-46	<5.0	21.50	27.60	<2.0
	6-28-46	<5.0	20.00	21.60	<2.0
Mean			20.66*	33.00*	

(Continued)

Table 10-19
Page 3.

Compound and Dog No.	Date	Brom Sulfalein % Retention	Urea N mgm. %	Phosphate Units	Phymol Units
Propylene Dichloride	11-20-45	<5.0	5.00	6.16	-
200 ppm.	12-20-45	-	10.00	11.54	<2.0
D36004	2-15-46	<5.0	16.38	7.50	<2.0
	3-12-46	<5.0	22.50	8.40	2.7
	4-12-46	7.25	17.13	13.20	<2.0
	5-14-46	<5.0	27.00	7.80	<2.0
	6-14-46	<5.0	18.88	5.40	<2.0
	6-21-46	<5.0	20.75	6.60	<2.0
	6-28-46	<5.0	18.63	7.80	<2.0
Mean			20.18*	8.10	
Control	11-20-45	<5.0	9.00	6.03	-
	12-20-45	<5.0	8.88	11.82	<2.0
D36009	2-15-46	<5.0	13.88	7.80	<2.0
	3-12-46	<5.0	18.25	7.80	<2.0
	4-12-46	<5.0	13.88	10.20	<2.0
	5-14-46	<5.0	25.20	4.80	3.2
	6-14-46	<5.0	12.88	2.40	<2.0
	6-21-46	<5.0	12.25	4.50	<2.0
	6-28-46	<5.0	10.25	3.25	<2.0
Mean			15.23	5.82	
Control	11-20-45	<5.0	4.75	4.66	-
	12-20-45	<5.0	9.38	13.20	<2.0
D36010	2-15-46	<5.0	13.63	7.50	<2.0
	3-12-46	<5.0	20.13	7.20	<2.0
	4-12-46	<5.0	13.88	11.40	<2.0
	5-14-46	<5.0	15.25	4.80	3.3
	6-14-46	<5.0	12.75	3.60	<2.0
	6-21-46	<5.0	14.50	1.80	<2.0
	6-28-46	<5.0	12.50	3.00	<2.0
Mean			14.66	5.61	

Entries above line represent pre-exposure levels.

* Statistically different from control values as determined by the "t" test.

Table 10-20

Individual Blood Counts

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
Ethylidene Dichloride - 1000 ppm.									
D36000	11-21-45	6.78	13.9	10.7	84	14	2	-	-
	12-20-45	7.08	16.8	22.9*	86	11	3		
	2-14-46	7.03	17.0	7.8*	81	14	5		
	3-14-46	6.65	17.0	6.8	62	32	7		
	4-16-46	7.27	16.1	14.2*	79	18	3	-	-
	5-16-46	7.92	17.5	7.05*	83	15	4		
	6-3-46	7.31	18.0	12.0	80	18	2		
	6-26-46	6.97	15.2	13.3	79	16	5		
Carbon Tetrachloride - 400 ppm.									
D36011	11-29-45	7.29	16.3	9.0	66	29	5		
	12-21-45	9.81	15.0	9.25	66	33	1	-	-
	2-14-46	7.21	16.8	13.05	84*	12*	3	-	1
	3-14-46	6.78	16.1	11.1	84	14	2		
	4-16-46	7.45	16.0	7.5	76	19	5		
	5-16-46	7.8	16.0	9.15	68	28	5		
	6-3-46	7.77	17.2	9.6	65	30	5		
	6-26-46	6.81	16.1	10.65	76	20	4		
Trichloroethylene - 2000 ppm.									
D36001	11-21-45	6.20	14.2	19.1	79	18	3		
	12-20-45	6.74	13.7	19.1	89	11	-	-	-
	2-14-46	6.82	16.5	20.95	77	21	2		
	3-14-46	5.03	13.1	17.7	75	22	3		
	4-16-46	4.91	10.7	15.8	84	15	2	-	-
	5-16-46	5.11	12.5	11.45	72	19	9		
	6-3-46	5.85	12.8	11.75	81	12	7		
	6-26-46	5.13	12.3	11.1	78	17	5	-	-
Tetrachloroethylene - 1000 ppm.									
D36003	11-21-45	6.41	13.7	12.65	76	20	4		
	12-20-45	6.65	15.2	13.55	81	18	1	-	-
	2-13-46	6.90	15.0	9.15	84	16	1		
	3-13-46	7.22	15.9	12.9	76	21	4		
	4-15-46	7.52	15.9	16.95	81	16	3		
	5-16-46	7.25	15.0	15.05	70	28	2		
	6-3-46	7.39	16.7	11.95	73	25	2		
	6-26-46	6.66	15.5	8.0	71	25	4		

(Continued)

Table 10-20
Page 2.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Ethylene Dichloride - 200 ppm.					
D36002	11-21-45	6.04	13.5	9.0	78	18	3		
	12-20-45	5.36	13.2	6.75	78	20	2	-	-
	2-13-46	7.03	14.1	9.4	60*	35*	2	-	3
	3-13-46	6.15	13.6	6.4	66	29	5	-	-
	4-15-46	5.80	13.1	6.8	72	27	1	-	-
	5-15-46	5.50	13.3	7.9	69	28	3		
	6-3-46	5.95	15.5	8.55	72	23	5		
	6-26-46	6.08	14.6	10.45	75	23	2	-	-
				Trichloroethane - 100 ppm.					
D37214	11-29-45	5.9	13.7	13.7	74	25	2		
	12-21-45	7.59	15.8	9.15					
	2-13-46	8.69	17.2	9.00	83	15	2		
	3-13-46	7.45	15.2	16.2*	79	17	4		
	4-15-46	7.16	16.0	12.85	75	24	1		
	5-15-46	6.55	16.6	13.3	77	22	1		
	6-3-46	9.02	18.1	6.85*	87	12	1		
	6-26-46	7.85	13.7	8.0	81	16	3		
				Tetrachloroethane - 200 ppm.					
D36007	11-29-45	6.0	14.8	11.9	67	28	5		
	12-21-45	8.0	15.6	10.6					
	2-13-46	6.46	14.0	16.05	68	28	4		
	3-13-46	5.32	14.9	7.55*	74	22	4		
	4-15-46	6.84	13.6	10.55	67	26	7		
	5-15-46	5.40	13.7	9.65	67	28	5		
	6-3-46	6.27	13.5	7.9	63	28	9		
	6-26-46	6.52	13.2	6.3	66	30	4		
				Propylene Dichloride - 200 ppm.					
D36004	11-21-45	5.91	12.8	-	81	16	2		
	12-21-45	7.48	13.5	8.75	79	20	1	-	-
	2-13-46	5.88	16.0	5.6	74	26			
	3-13-46	6.28	15.1	10.55	74	24	2		
	4-15-46	4.95*	15.0	9.90	68	28	3		
	5-15-46	6.89*	15.8	10.45	68	27	5		
	6-3-46	7.92	16.5	6.15	61	37	2		
	6-26-46	6.33	15.0	8.25	60	36	4		

(Continued)

Table 10-20
Page 3.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Control					
D36009	11-29-45	5.61	13.7	15.75	78	18	2	2	-
	12-21-45	7.28	13.2	12.85	66	34*	-	-	-
	2-14-46	6.74	16.0	18.85	76	23	1		
	3-14-46	7.64	15.0	23.45	75	23	2		
	4-16-46	6.86	13.1	20.5	80	20	-		
	5-16-46	6.78	14.9	17.6	87	12	2		
	6-3-46	7.84	15.5	14.55	78	21	1		
	6-26-46	6.85	15.8	14.6	81	16	3		
				Control					
D36010	12-21-45	7.56	12.3	26.65	85	10	5	-	-
	1-24-46	6.13	14.0	11.15*	86	13	2		
	2-13-46	5.46	14.2	12.2	82	18	1		
	3-14-46	5.41	15.0	10.55	85	15	1		
	4-15-46	8.39	15.0	12.35	83	15	2		
	5-15-46	5.28	14.2	14.90	78	18	4		
	6-3-46	7.32	17.0	11.5	85	11	4		
	6-26-46	5.57	16.2	14.8	81	14	5		

Differential leucocyte counts of 6-26-46 are the mean values of from 2 to 6 counts of 100 white blood cells from different preparations all made at the same time. On 6-3-46 and 6-26-46 6 x 100 cells were counted from the dogs exposed to tetra-chloroethane and trichloroethane.

Ethylidene Dichloride - 1000 ppm.

Animal Number	Date	RBC	Hbg	WBC	N	L	M	E	B
R38633	12-31-45	5.93	14.9	8.75	12	88	-	-	-
	2-5-46	8.93	15.0	23.0*	11	87	2	-	-
	4-16-46	10.34	17.0	17.55	11	87	2	-	-
R38695	12-31-45	6.61	14.1	10.95	13	86	1	-	-
	2-5-46	8.56	16.1	14.8	15	84	1	-	-
	4-16-46	9.79	16.0	18.85	13	86	1	-	-
R38724	1-24-46	7.51	15.0	20.15	6	94	-	-	-
	2-5-46	8.79	16.5	21.3	10	89	1	-	-
R38716	12-31-45	7.92	16.0	14.35	11	89	-	-	-
	2-5-46	9.06	15.1	17.45	16	83	1	-	-
R38727	12-31-45	5.15	14.0	13.4	33	66	1	-	-
	2-5-46	7.77	16.8	16.65	15	82	3	-	-
	4-16-46	9.31	15.8	15.15	17	81	2	-	-

(Continued)

Table 10-20
Page 4.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Ethylidene Dichloride - 1000 ppm. (Cont'd.)					
R39821	3-11-46	7.34	13.8	11.05	10	88	2	-	-
	4-16-46	8.61	15.7	19.35*	10	90	-	-	-
	7-2-46	5.69	15.0	22.6	29	70	-	1	-
R38537	12-31-45	6.44	14.0	14.0	22	74	4	-	-
	2-5-46	5.98	15.1	14.75	14	81	4	1	-
R38492	12-31-45	7.15	14.9	19.15	16	82	2	-	-
	2-5-46	6.81	15.0	17.5	17	81	2	-	-
	4-16-46	7.45	15.0	27.5	19	81	-	-	-
	7-1-46	8.93	14.5	9.0*	39	60	1	-	-
R38589	12-31-45	7.96	14.0	16.3	12	86	-	-	2
	2-5-46	7.24	15.1	15.65	14	85	1	-	-
R38584	12-31-45	7.74	15.0	16.45	18	82	-	-	-
	2-5-46	8.42	16.5	22.2	31	68	1	-	-
R39751	3-11-46	7.25	15.4	11.9	11	86	3	-	-
	4-16-46	8.77	14.2	22.8*	14	86	-	-	-
	7-2-46	8.43	15.3	11.85*	24	76	-	-	-
R39778	3-11-46	7.96	16.2	16.45	8	88	4	-	-
	4-16-46	8.17	15.8	23.8	11	89	-	-	-
	7-2-46	8.36	14.0	12.65*	12	88	-	-	-
				Carbon Tetrachloride - 400 ppm.					
R38650	12-31-45	7.78	14.9	21.9	10	88	-	-	2
	2-7-46	9.12	15.2	20.6	17	81	2	-	-
R38619	12-31-45	6.25	15.8	10.45	10	90	-	-	-
	2-7-46	6.71	15.2	20.0*	7	93	-	-	-
R38736	12-31-45	5.79	14.5	10.8	16	82	2	-	-
	2-7-46	9.41*	14.0	24.4*	9	91	-	-	-
	4-18-46	7.90	14.0	30.0	20	75	5	-	-
R38690	12-31-45	7.50	16.0	22.15	18	82	-	-	-
	2-7-46	10.45	15.5	18.6	34	65	1	-	-
R38725	1-24-46	6.55	13.1	14.85	11	88	1	-	-
	2-7-46	7.65	13.1	22.0	12	88	-	-	-
	4-18-46	7.61	13.0	29.95	36	62	2	-	-

(Continued)

Table 10-20
Page 5.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Carbon Tetrachloride - 400 ppm. (Cont'd.)					
R38510	12-31-45	7.88	13.0	16.65	11	89	-	-	-
	2-7-46	8.27	15.0	20.95	17	82	-	-	-
	4-18-46	10.30	13.0	22.95	21	75	4	-	-
	7-1-46	7.27	12.9	11.25*	35	65	-	-	-
R38500	12-31-45	3.84	13.3	10.2	20	79	1	-	-
	2-7-46	7.66*	14.2	21.75*	23	75	2	-	-
R39753	3-11-46	6.3	15.2	28.6	11	85	4	-	-
	4-18-46	9.35	14.8	12.6*	10	84	6	-	-
R38555	1-22-46	7.24	15.0	18.6	33	64	3	-	-
	2-7-46	8.15	15.5	22.5	14	84	2	-	-
	4-18-46	6.75	14.0	26.15	20	79	1	-	-
R38588	12-31-45	9.06	13.6	13.35	19	80	-	1	-
	2-7-46	7.55	14.0	13.7	21	77	2	-	-
R38577	12-31-45	7.05	15.0	12.75	9	90	1	-	-
	2-7-46	9.35	16.7	22.75*	17	83	-	-	-
	4-18-46	9.47	14.2	22.3	9	91	-	-	-
				Trichloroethylene - 2000 ppm.					
R38641	1-2-46	6.17	14.9	15.8	16	84	-	-	-
	2-19-46	7.62	14.0	32.95*	9	89	2	-	-
	4-18-46	9.07	14.9	16.35*	12	85	3	-	-
R38648	1-22-46	8.85	15.1	16.95	24	76	-	-	-
	2-28-46	7.52	14.0	28.95*	9	86	5	-	-
	4-18-46	9.23	15.9	10.85*	12	86	2	-	-
	7-1-46	9.02	15.2	5.8	25	75	-	-	-
R38645	1-2-46	8.59	15.9	15.6	12	87	1	-	-
	2-19-46	6.53	14.1	10.6	21	74	5	-	-
	4-18-46	8.71	14.2	16.4	14	85	1	-	-
	7-1-46	7.34	16.8	7.20*	27	72	1	-	-
R38701	1-2-46	7.01	13.9	9.8	21	77	2	-	-
	2-19-46	8.17	15.2	21.7*	13	85	2	-	-
	4-18-46	9.84	14.2	16.0	16	84	-	-	-
	7-1-46	4.97*	15.9	8.35*	39	59	2	-	-
R38529	1-2-46	5.78	14.0	12.15	17	83	-	-	-
	2-19-46	8.13	14.0	17.8	11	89	-	-	-

(Continued)

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Page 6.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Trichloroethylene - 2000 ppm. (Cont'd.)					
R38503	1-2-46	7.90	14.8	20.6	11	87	2	-	-
	2-19-46	6.37	14.9	23.3	17	81	2	-	-
R39758	3-11-46	6.7	15.9	21.4	6	92	2	-	-
	4-18-46	6.55	13.0	15.5	13	85	2	-	-
	7-2-46	6.04	Not taken poor bleeder	12.15	25	73	1	1	-
R38547	1-2-46	8.11	18.5	15.55	12	86	2	-	-
	2-19-46	7.87	15.1	9.15	26	73	1	-	-
	4-18-46	9.38	14.8	22.25*	26	72	2	-	-
	7-1-46	8.34	16.7	5.45*	44	56	-	-	-
				Tetrachloroethylene - 1000 ppm.					
R38655	1-2-46	7.53	13.1	13.75	27	72	1	-	-
	2-20-46	13.80*	14.0	33.65*	9	90	1	-	-
	4-17-46	9.03	14.3	22.2	24	76	-	-	-
R38649	1-2-46	8.04	13.2	15.05	14	86	-	-	-
	2-20-46	7.65	14.1	21.35	19	79	2	-	-
R39836	3-11-46	5.8	14.0	13.7	14	84	2	-	-
	4-17-46	7.8	16.5	18.05	26	66	8	-	-
R38713	1-22-46	7.55	16.9	14.85	13	85	2	-	-
	2-28-46	6.68	13.0	24.4	9	90	1	-	-
	4-17-46	9.64		19.95					
R38702	1-2-46	6.07	13.1	9.00	11	85	4	-	-
	2-20-46	7.27	14.0	21.9*	16	84	-	-	-
	4-17-46	8.67	14.0	17.55	27	72	1	-	-
	7-1-46	6.50	16.8	10.0	41	59	-	-	-
R38705	1-2-46	8.74	14.8	11.1	14	85	1	-	-
	2-20-46	8.97	15.2	10.45	29	70	1	-	-
	4-17-46	7.71	15.3	21.95*	31	67	2	-	-
	7-1-46	8.46	14.9	11.35*	46	54	-	-	-
R38569	1-2-46	5.37	18.0	9.45	8	89	3	-	-
	2-20-46	6.83	15.1	17.65*	12	88	-	-	-
	4-17-46	8.51	13.0	15.7	24	76	-	-	-
R38496	1-2-46	7.53	14.0	13.8	16	83	1	-	-
	2-20-46	9.33	-	55.6	-	-	-	-	-

(Continued)

Table 10-20
Page 7.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Tetrachloroethylene - 1000 ppm. (Cont'd.)					
R39761	3-11-46	8.55	14.1	23.1	7	89	4	-	-
	4-23-46	7.63	12.0	24.7	9	76	15	-	-
	7-2-46	7.37	15.0	11.25*	24	74	2	-	-
R39765	3-11-46	6.6	15.9	16.2	8	86	6	-	-
	4-23-46	8.9	14.0	22.2	18	82	-	-	-
	7-2-46	9.17	14.2	12.7*					
R38610	1-22-46	7.87	15.2	11.05	32	68	-	-	-
	2-20-46	7.52	14.1	18.85	16	82	2	-	-
	4-23-46	8.75	13.1	22.05	13	85	2	-	-
	7-1-46	8.04	16.0	9.25*	37	62	1	-	-
R39767	3-11-46	5.78	15.6	8.8	9	90	1	-	-
	4-23-46	6.69	14.0	18.6	21	75	4	-	-
				Ethylene Dichloride - 200 ppm.					
R39016	1-22-46	6.62	11.7	17.7	17	78	5	-	-
	2-19-46	4.56	10.2	23.95	24	75	1	-	-
	4-19-46	4.25	10.9	11.85*	14	85	1	-	-
	7-1-46	5.50	10.0	9.95	22	77	1	-	-
R38703	1-2-46	6.56	13.4	13.25	17	82	1	-	-
	2-19-46	9.47	15.3	14.4	15	84	1	-	-
R39847	3-11-46	4.72	15.1	11.8	8	91	1	-	-
	4-19-46	6.31	13.0	16.0	18	82	-	-	-
R39018	1-22-46	5.11	12.8	10.5	11	84	5	-	-
	2-19-46	7.63	15.0	15.8	30	68	2	-	-
	4-19-46	8.27	14.4	24.0	34	62	4	-	-
	7-1-46	8.68	13.2	5.95*	44	56	-	-	-
R39853	3-11-46	3.66	-	10.8	19	80	1	-	-
	4-19-46	5.70	16.0	24.8*	19	78	3	-	-
	7-2-46	7.74	14.5	11.6*	30	70	-	-	-
R38557	1-2-46	6.81	14.6	10.35	11	88	-	-	1
	2-21-46	8.53	14.1	19.55*	30	70	-	-	-
R38533	1-2-46	6.53	16.0	9.15	22	76	1	1	-
	2-21-46	6.39	14.4	13.3	20	80	-	-	-

(Continued)

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Page 8.

Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Ethylene Dichloride - 200 ppm. (Cont'd.)					
R38495	1-2-46	8.2	13.2	12.6	12	87	1	-	-
	2-21-46	7.06	13.0	13.45	14	84	2	-	-
	4-19-46	7.48	13.4	12.8	29	71	-	-	-
R38562	1-2-46	7.60	14.9	18.1	28	71	1	-	-
	2-21-46	8.03	15.5	20.35	18	77	-	1	-
R38565	1-2-46	8.8	13.9	19.6	21	77	2	-	-
	2-21-46	7.7	15.0	22.9	13	85	2	-	-
	4-19-46	8.87	14.2	13.1*	21	78	1	-	-
	7-1-46	6.21	15.0	8.85	38	62	-	-	-
				Trichloroethane - 100 ppm.					
R38629	1-3-46	5.51	15.2	17.55	14	86	-	-	-
	2-21-46	9.50*	15.4	22.00	16	83	1	-	-
	4-22-46	9.29	16.0	19.85	16	81	3	-	-
R38622	1-3-46	6.68	13.6	14.85	11	88	1	-	-
	2-21-46	6.18	14.9	16.6	15	85	-	-	-
	4-22-46	7.41	15.0	11.6	33	63	3	1	-
R38653	1-3-46	7.23	15.0	16.55	16	84	-	-	-
	2-21-46	7.57	14.8	11.3	11	88	1	-	-
R38740	1-3-46	6.76	14.3	27.7	11	87	2	-	-
	2-25-46	6.61	14.0	24.75	75	22	3	-	-
R38682	1-3-46	6.20	13.5	10.55	12	87	1	-	-
	2-21-46	3.64*	8.5	27.6*	19	74	7	-	-
R39854	3-11-46	8.72	14.0	20.05	15	81	4	-	-
	4-22-46	7.76	13.9	25.75	19	80	1	-	-
R38525	1-3-46	5.94	14.0	12.3	12	85	3	-	-
	2-25-46	5.74	14.6	12.6	19	80	1	-	-
	4-22-46	7.93	13.9	10.3	11	86	3	-	-
	7-1-46	6.48	14.7	4.2*	25	75	-	-	-
R38505	1-3-36	7.49	14.1	19.2	15	85	-	-	-
	2-25-46	7.4	14.0	13.25	18	82	-	-	-
	4-22-46	8.24	14.0	17.05	20	78	2	-	-
	7-1-46	7.92	14.2	9.35*	21	78	1	-	-

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Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
			Trichloroethane - 100 ppm. (Cont'd.)						
R38576	1-3-46	7.45	13.9	14.65	13	85	2	-	-
	2-25-46	6.98	16.5	17.25	11	88	1	-	-
R38568	1-3-46	6.91	15.0	13.45	16	83	1	-	-
	2-25-46	6.39	15.1	19.6	13	86	1	-	-
	4-22-46	7.17	14.1	16.45	24	75	1	-	-
	7-2-46	9.11	15.8	11.95	18	80	1	1	-
			Tetrachloroethane - 200 ppm.						
R38647	1-3-46	6.99	14.8	18.3	6	94	-	-	-
	2-25-46	7.35	13.6	16.8	11	88	1	-	-
	4-22-46	7.95	13.0	15.5	13	84	3	-	-
	7-2-46	8.87	16.2	9.05	45	53	2	-	-
R38680	1-3-46	5.85	16.0	14.75	6	93	1	-	-
	2-25-46	7.17	13.0	33.7*	14	86	-	-	-
	4-22-46	9.87	15.9	13.3*	17	83	-	-	-
	7-2-46	8.13	17.0	13.1	40	60	-	-	-
R39855	3-11-46	6.87	14.0	13.6	10	85	5	-	-
	4-22-46	9.38	17.0	19.05	16	83	1	-	-
	7-2-46	9.59	18.0	16.85	29	70	1	-	-
R38704	1-3-46	8.00	14.1	10.00	15	84	1	-	-
	2-25-46	7.60	13.2	16.8	30	68	2	-	-
R38731	1-3-46	7.31	14.0	15.35	29	71	-	-	-
	2-25-46	6.1	13.9	16.45	21	78	1	-	-
	4-22-46	8.32	14.0	15.4	26	74	-	-	-
	7-2-46	5.98	16.0	5.50*	32	67	1	-	-
R38512	1-4-46	6.17	12.0	10.9	10	88	2	-	-
	2-25-46	6.9	14.5	19.3*	22	76	2	-	-
R38502	1-3-46	6.76	13.8	16.7	12	88	-	-	-
	2-25-46	7.88	13.1	12.35	19	78	3	-	-
	4-22-46	8.13	13.8	15.65	10	89	1	-	-
	7-2-46	7.98	14.7	13.2	22	78	-	-	-
R38515	1-3-46	6.00	13.4	12.65	29	71	-	-	-
	2-25-46	6.09	13.0	16.1	15	84	1	-	-
R38552	1-3-46	7.33	14.9	13.45	16	83	1	-	-
	2-25-46	6.83	14.0	19.25	19	81	-	-	-
	4-22-46	8.42	16.0	6.85*	22	78	-	-	-
R38594	1-3-46	4.83	14.0	9.7	14	86	-	-	-
	2-25-46	7.63*	14.2	13.1	10	90	-	-	-

(Continued)

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Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Propylene Dichloride - 200 ppm.					
R38617	1-4-46	7.90	15.1	18.3	18	81	1	-	-
	2-25-46	7.59	15.0	19.15	21	78	1	-	-
	4-23-46	8.51	14.9	16.2	10	86	4	-	-
R38630	1-4-46	7.34	13.0	17.9	10	88	2	-	-
	2-25-46	8.38	15.1	17.5	11	88	1	-	-
	4-23-46	9.37	14.9	23.8	12	86	2	-	-
R38675	1-4-46	7.41	14.2	20.75	11	85	4	-	-
	2-25-46	7.59	16.1	17.55	17	83	-	-	-
R38679	1-4-46	6.67	14.0	14.05	16	82	2	-	-
	2-25-46	8.68	14.5	26.85	20	80	-	-	-
R38732	1-4-46	6.45	14.8	20.2	23	77	-	-	-
	2-25-46	7.22	14.9	20.75	14	85	-	1	-
R38527	1-4-46	5.6	14.0	18.9	15	84	1	-	-
	2-25-46	6.66	13.8	22.4	13	82	5	-	-
	4-22-46	8.86	15.0	19.75	13	86	1	-	-
R38497	1-4-46	8.35	14.0	18.6	24	73	3	-	-
	2-25-46	7.10	14.0	16.45	20	78	2	-	-
	4-23-46	9.21	15.1	15.75	16	83	1	-	-
	7-2-46	11.31	16.6	7.45*	29	71	-	-	-
R38514	1-4-46	5.65	13.9	12.95	9	91	-	-	-
	2-25-46	6.99	13.5	35.55*	19	81	-	-	-
	4-22-46	9.38	16.0	17.35*	23	76	1	-	-
	7-2-46	7.82	14.1	10.6	27	69	2	2	-
R38550	1-4-46	4.40	16.0	19.4	12	88	-	-	-
	2-25-46	6.24	15.1	14.6	12	88	-	-	-
	4-23-46	6.57	14.2	13.4	17	83	-	-	-
R38578	1-4-46	5.26	16.6	10.45	13	85	2	-	-
	2-25-46	8.69*	14.9	19.45*	13	86	1	-	-
R39775	3-11-46	8.41	15.0	12.65	15	84	1	-	-
	4-23-46	9.16	15.5	21.85*	10	87	3	-	-
	7-2-46	8.57	15.0	9.45*	18	81	-	1	-

(Continued)

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Animal Number	Date	RBC	Hbg	WBC	Differentials N	L	M	E	B
				Controls					
R38658	1-22-46	7.94	13.9	25.5	24	71	5	-	-
	2-21-46	6.85	14.7	24.5	7	90	3	-	-
	4-17-46	2.08*	5.6	33.85	19	76	5	-	-
R38620	1-4-46	6.58	14.5	17.25	10	90	-	-	-
	2-20-46	5.25	15.0	18.2	16	82	2	-	-
R38625	1-4-46	5.15	13.1	9.85	23	77	-	-	-
	2-20-46	7.65	14.0	16.15	11	88	1	-	-
R38673	1-4-46	6.04	13.6	14.25	12	88	-	-	-
	2-21-46	7.67	15.5	23.25	22	76	2	-	-
R38711	1-4-46	5.69	12.9	10.00	18	80	2	-	-
	2-21-46	7.53	16.0	21.55*	46	53	1	-	-
	4-17-46	5.49	15.8	15.8	9	89	2	-	-
	7-2-46	9.26*	17.0	7.65*	16	84	-	-	-
R38554	1-4-46	7.78	14.0	13.95	9	91	-	-	-
	2-20-46	6.95	13.9	20.35	13	86	1	-	-
R38563	1-4-46	8.26	14.9	12.45	18	79	3	-	-
	2-20-46	7.85	14.3	24.9*	19	78	2	1	-
	4-17-46	8.62							
R38581	1-4-46	7.47	14.1	11.25	10	89	1	-	-
	2-20-46	6.55	15.0	22.75*	16	80	4	-	-
	4-17-46	6.93	15.0	15.9	22	77	1	-	-
	7-2-46	7-82	14.5	7.05*	23	77	-	-	-
R38585	1-4-46	6.66	14.1	15.00	7	91	2	-	-
	2-21-46	7.13	15.1	13.95	13	84	3	-	-
	4-17-46	7.99	14.8	19.05	20	80	-	-	-
	7-2-46	8.42	16.9	12.2	36	64	-	-	-
R38599	1-4-46	8.42	13.5	19.45	10	88	2	-	-
	2-21-46	7.82	16.1	18.4	23	76	1	-	-
	4-17-46	7.94	14.9	11.5	18	79	3	-	-
	7-3-46	7.91	16.5	8.05	18	81	-	1	-

Table 10-21

Growth, Fate, and Micropathology

(See abbreviations at end of table)

Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Path-ology	Micropathology
				Ethylidene Dichloride			
38660	M	128	+ 9	8	D	LUCH	K,LCW,LUC
38733	"	222	- 74	8	D	OM	K,Lcw,LU
38643	"	222	+ 16	12	D	LUCH	Kwz,LCW,LUC
38724	"	152	+ 22	18	D	LUCH	Kwz,LCW,LUC
38716	"	154	+134	28	D	LUt	KW,L,LU
38727	"	184	+146	48	D		K,L, LU
38695	"	210	+ 49	60	D	LUU	-
38640	"	80	+145	62	D	LUCH	H,KW,LUC
38633	"	212	+ 57	65	D		A,H,Kw,LCW,LUc
38631	"	166	+255	75	S		H,K,L,P,S,T
38697	"	122	+195	75	S		A,H,K,L,P,ST
38737	"	175	+206	75	S		A,H,K,L,LU,P,S,T
39819	"	191	+165	45	S		A,H,K,L,P,SFG,T
39820	"	183	+137	45	S		A,H,K,L,LU,P,SFG,T
39821	"	141	+177	45	S		A,H,K,L,LU,P,SFG,T
39822	"	187	+167	45	S	LUCh	A,HB,K,L,LUx,P,SFG,T
Dog							
36000	"	10.74kgm.	+1.31kgm.	75	S	LUL	A,H,K,L,LUC,P,PA,SC,T,TH
38597	F	145	- 7	7	D	LUC	KwZ,LCW,LUc
38561	"	153	+ 4	12	D	LUCP	K,LCW,LUc
39745	"	159	- 17	14	D	LUCHt	Kw,LcW,LUTX
38564	"	142	+ 26	21	S	OM	K,L,LU
39752	"	168	0	21	D	LUU	
38543	"	120	+ 48	23	S	OM	A,H,K,L.LU,P
38494	"	135	+ 1	24	D	LUU	
38553	"	142	+ 4	24	D	OM	
38584	"	128	+ 72	26	D	LUH	A,H,K,LCW,LUC,P,S
38586	"	120	+ 72	28	D	LUH	
38537	"	160	+128	33	S	OM	A,H,K,L,LU,P,S
38589	"	122	+ 34	34	D	LUCH	
38492	"	142	+194	75	S	LUch	A,H,K,L,LU,P,S,T
38524	"	131	+ 85	75	S	Lf	A,H,K,L,LU,P,S
39744	"	153	+ 77	45	S	OM,LUZ	A,H,K,L,LUcY,P,SFG
39748	"	169	+ 67	45	S	Lf	A,H,K,L,LUc,P,SFG
39750	"	168	+ 75	45	S		A,H,K,L,LUc,P,S
39751	"	186	+ 68	45	S		A,H,K,L,LUc,P,S
39778	"	164	+ 77	45	S		A,H,K,L,LUc,P,SFG

(Continued)

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		Weight in Gms.					
Rat Number	Sex	Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Path-ology	Micropathology
				Carbon Tetrachloride			
39824	M	196	- 26	4	D	LUCh	Kw,Lwy,LUC
38710	"	170	+ 5	7	D	LUC	Kw,LWY,LUC
39826	"	168	+ 34	18	D	Lj	A,H,K,LVWY,LU,S,T
38700	"	112	+ 83	20	D	LUH	Kz,LCW,LUC
39827	"	184	+ 6	23	D	LUU	Kw,LWY,LUCTW
38619	"	236	+ 10	24	D	LUCH	Kz,LCHW,LUC
38644	"	124	+ 22	26	D	LUCH,LA	KWZ,LWY,LUC
38672	"	104	+ 82	30	D	LUZ	
38690	"	168	+ 95	33	D	LUU	KWZ,LCW,LUC
38650	"	196	+ 50	41	D	LUC	KWZ,LCWy,LUC
38735	"	225	- 43	42	D	LUCH,LF	A,H,KWZ,LCW,LUC,P,Sg,TB
38666	"	118	+123	48	D	LUZ,LF	A,H,K, LCWy,LUC,P,S,T
38736	"	178	+ 90	55	D	LUU,LF	A,H,KWZ,LCHW,LUC,PZ,S,T
38725	"	112	+108	69	D		
38634	"	114	+182	75	S	LUCH,LF	A,H,K,Lcw,LUC,P,S,T
39828	"	200	+108	45	S	LF	A,H,Kw,LVW,LU,P,S,T
Dog							
36011	"	14.69kgm.	+.31kgm.	75	S	Lp	H,KW,LWY,LUCG,P,SC,T,TH
39754	F	140	- 20	1	D	LUCH	KW,LCW,LUCw
38601	"	140	- 28	6	D	LUC	K,LWY,LUC
38500	"	147	- 41	18	D	LUZ	KWZ,LCW,LUC
38516	"	128	+ 70	33	S	OM	KcWy,LWY,LUC
38588	"	150	+ 30	37	D	LUU	K,LcWy,LUC
39753	"	135	+ 42	42	D	LUCHt	Kw,LVWY,LUCTX
38544	"	108	+ 32	45	D	LUCH,HKC	Kw,LCWy,LUC
38609	"	129	+ 54	47	D	LUC,LF,KC	KWZ,LCWy,LUC
38577	"	140	+ 26	62	D	LUU,Lf,KC	A,H,K,LCWy,LUC,P,S
38555	"	132	+ 38	69	D	LUCH,KC	H,Kz,Lcw,LUC,Pz,S
38506	"	155	+ 95	75	S	LUCH,LF	A,H,K, Lcw,LUc,P,S
38510	"	148	+116	75	S	LF,KC	A,H,K, Lcw,LU,P,Sg
38522	"	140	+145	75	S	LF,KC	A,H,K, Lcw,Sg
38534	"	128	+ 94	75	S	LUt,Lf,KC	H,K,Lcw,LU,P,S
				Trichloroethylene			
38618	M	136	-	2	D		Kw,Lcw,LUc
39830	"	181	+ 17	11	D	LUC	Kw,LCW,LUC
39833	"	180	+ 16	12	D	LUU	KW,LCW,LUC
38734	"	218	+ 9	16	D	LUH	Kw,Lcw,LUC
38667	"	136	+ 76	25	D	LUU	KWz,Lcw,LUC
38717	"	129	+ 43	42	D	LUZ	KFW,Lcw,LUCT

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Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Pathology	Micropathology
38632	M	188	+ 84	75	S	LUT	A,H,K,L,LU,P,S,T
38645	"	196	+115	75	S		A,H,K,L,LU,P,S,T
38648	"	184	+168	75	S		A,H,K,L,LU,P,S,T
38651	"	163	+123	75	S		A,H,K,L,LUU,P,S,T
38696	"	158	+144	75	S		A,H,K,L,S,P,T
38701	"	232	+ 81	75	S	LUt	A,H,K,L,LUW,P,S,T
Dog							
36001	"	11.0kgm.	-3.4kgm.	75	S	LAjf	A,H,I,K,LY,LUc,P,S,T,TH
38523	F	150	- 26	6	D	LUC	K,Lcw,LUC
39759	"	164	- 34	6	D	LUC	Kw,LCW,LUC
38598	"	144	- 18	12	D	LUC	
38509	"	140	0	34	D	LUCHT	KWz,Lcw,LUc
38600	"	132	+ 70	37	D	LUC	K,Lcw,LUC
38535	"	131	+ 37	38	D	LUT	Kw,Lcw,LUc
38503	"	165	- 13	39	D	LUU	
38602	"	126	+ 2	44	D	LUCHt	K,Lcw,LUC
38529	"	148	+ 32	51	D		
38551	"	126	+ 79	68	D	LUU	A,H,K,Lcw,LUC,Pz
38545	"	144	+ 16	75	D	LUCH	A,H,KWz,LW,LUC,P,Scg,T
38547	"	141	+ 90	75	S		A,H,K,L,LU,P,S
38573	"	131	+103	75	S		A,H,K,L,LU,P,S
39758	"	160	+ 52	45	S		A,H,K,L,LU,P,Sf

Tetrachloroethylene

Rat Number	Sex	Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Pathology	Micropathology
39835	M	176	0	1	D	LUH	KW,Lc,LUC
39840	"	134	- 32	4	D	LUHT	Kw,LCW,LUTY
38646	"	182	- 12	5	D	LUH	K,LCW,LUC
38684	"	110	+ 24	5	D	LUCh	K,LCW,LUc
38662	"	130	+ 13	12	D		
38706	"	140	- 16	15	D	LUH	KwZ,LCW,LUC
38714	"	122	- 28	16	D	LUTZ	K,LCW,LUC
39836	"	142	- 14	16	D		K,Lcw,LUCY
38649	"	185	+ 29	21	D	LUCH	Kw,LCW,LUC
38718	"	114	- 4	37	D	LUZ	KWZ,LCW,LUc
38694	"	132	+ 78	41	D	LUCH	A,H,K,LCW,LUC,P,S,T
38655	"	162	+ 60	47	D	LUZT	A,K,LCW,LUC,PZ,S,T
39837	"	133	- 1	48	D	LUCHT	KW,LCW,LUC
38713	"	140	- 80	70	D	LUCHT	H,KwZ,LCW,LUC,S
38702	"	172	+ 38	75	S		H,K,L,LU,P,S
38705	"	150	+103	75	S		H,K,L,LU,P,S,T
39014	"	135	+108	69	S		A,H,K,L,LU,S,T
39834	"	174	+ 82	45	S	OM	A,H,K,L,LU,P,S,T
39838	"	152	+ 46	45	S		A,H,K,L,LU,P,S,T

(Continued)

Table 10-21
Page 4.

Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Pathology	Micropathology
				Tetrachloroethylene (Cont'd.)			
Dog							
36003	M	17.09kgm.	+.31kgm.	75	S		A,H,K,L,LU,P,S,T,TH
38596	F	140	- 14	3	D	LUc	KwZ,LCW,LUc
38508	"	147	+ 7	5	D	LUCH	K,LCW,LUC
38532	"	146	+ 8	5	D	LUCH	K,LCW,LUC
38570	"	149	+ 3	5	D	LUCH	K,LCW,LUC
38582	"	120	- 39	7	D	LUCH	K,LCW,LUC
39762	"	112	- 18	7	D	LUZ	
38513	"	142	- 30	8	D	LUT	K,LCW,LUC
38608	"	150	- 23	11	D	LUCh	K,LCW,LUC
39767	"	148	- 40	17	D	LUC	K,LC,LU
38496	"	172	- 60	19	D	LUT	K,LCW,LUt
38605	"	125	+ 39	39	S	OM	A,H,K,Lc,LUc,P,S
38603	"	114	- 24	39	D	LUT	A,H,K,LCW,LUC
38569	"	126	+ 35	63	D	LUU	H,KwZ,LCW,LUC,PZ
38610	"	126	+ 92	75	S		A,H,K,L,LU,P,S
39760	"	121	+ 74	45	S		A,H,K,L,LU,S
39761	"	138	+ 65	45	S	LUt	A,H,K,L,LUx,P,S
39763	"	136	+ 71	45	S		A,H,K,L,LU,P,S
39765	"	132	+ 72	45	S		A,H,K,L,LU,P,S
39766	"	165	+ 49	45	S		A,HB,K,L,LU,P,S
				Ethylene Dichloride			
38642	M	158	0	1	D		LW,LUC
38708	"	164	0	1	D		Kw,LCW,LUC
38719	"	133	0	1	D		Kw,LCW,LUC
38723	"	122	0	1	D		Kw,LCW,LUc
38726	"	138	0	1	D		Kw,LW,LUC
39019	"	120	- 12	2	D		KW,LW,LUC
39846	"	206	- 38	2	D		KW,LCW,LUc
38657	"	196	- 58	4	D	LUCH	KWZ,LCW,LUC
38739	"	161	- 46	10	D	LUZ	
38635	"	102	+ 2	15	D	LUU	KWZ,LCW,LUC
39847	"	170	- 11	15	D	LUU	KW,LCW,LUC
38703	"	142	- 50	18	D	LUZ	KWZ,LCW,LUC
38715	"	137	+ 47	19	D	LUU	Kw,LCW,LUC
38638	"	126	+ 30	21	S	OM	K,Lw,LUC
39849	"	156	- 30	22	D	LUCH,SZ	KW,LCW,LUCt
39816	"	156	- 15	26	D	LUU	K,LCW,LUC
38683	"	120	+ 4	26	D	LUC	K,Lw,LUC
39016	"	154	+164	72	S		A,H,K,L,LU,P,S,T
39010	"	142	+162	60	S		K,L,LU
39844	"	174	+130	45	S		A,H,K,L,LU,P,S,T

(Continued)

Table 10-21
Page 5.

Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Pathology	Micropathology
				Ethylene Dichloride (Cont'd.)			
39017	M	120	+116	72	S		A,H,K,L,LU,S,T
39018	"	150	+216	72	S		A,H,K,L,LU,P,S,T
39012	"	189	+229	69	S		K,L,LUc
39020	"	156	+178	72	S		A,H,K,L,LU,P, ,T
39853	"	180	+ 72	45	S		A,H,K,L,LU,P,S,T
Dog							
36002	"	17.74kgm.	+1.09kgm.	75	S		A,H,KWSM,Lw,LUc,P,SCG,T,TH
39768	F	178	- 11	10	D	LUH,LZ	KWZ,LW
38491	"	150	+ 16	21	S	OM	K,Lw,LUC
38562	"	156	+ 56	32	D	LUU	K,LCW,LUC
38606	"	136	- 30	39	D	LUZ	
38533	"	124	+ 36	41	D	LUC,LZ	KWZ,LCW,LUC
38557	"	129	+ 17	42	D		KTW,LW,LUc
38611	"	120	+ 64	44	D	LUchT	K,Lcw,LUT
38495	"	142	+ 37	53	D	LUCh	A,H,KWz,LW,LUC,PZ,S
38612	"	126	+ 46	54	D	LUCHt	A,H,K,LCW,PUC,P,S
38542	"	141	+ 3	58	D	LUCH	A,K,LCW,LUC,P,S
38499	"	138	+ 92	75	S		A,H,K,L,LU,P,S
38565	"	156	+108	75	S		A,H,K,L,LU,S
38591	"	114	+ 90	75	S		A,H,K,L,LU,P,S
				Trichloroethane			
38720	M	170	0	1	D		KWZ,LGW,LUC
39854	"	126	+ 24	18	D	LUCH	Kwz,LCW,LUCTI
38740	"	166	+ 58	22	D	LUCH	KWZ,LGW,LUC
38682	"	143	+112	37	D	LUU	KWZ,LCW,LUc
38653	"	132	+184	43	D	LUCH	KW,LGW,LUC
38654	"	140	+128	48	D	LUCHZ	KWZ,LUCTY
38677	"	134	+ 49	48	D	LUCHZ	KWz,LCGW,LUCTY
38629	"	194	- 14	69	D	LUCH	
39021	"	167	+211	72	S		K,L,LU
38621	"	138	+108	73	D	OM,LUACH	A,H,LCW,LUC,SG,T
38626	"	156	+164	75	S	LUT	A,H,K,L,LUc,P,S,T
38663	"	137	+179	75	S		A,H,K,L,LU,P,S,T
38670	"	120	+232	75	S		A,H,K,L,LU,P,S,T
Dog							
[illegible]7214	"	13.09kgm.	+1.21kgm.	75	S	LAM	A,H,K,Lw,LUc,P,S,T,TH
39772	F	134	+ 15	12	D	LUU	Kw,LCW,LUC
[illegible]	"	[illegible]	[illegible]	[illegible]	D	[illegible]	[illegible]

Table 10-21
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Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Path-ology	Micropathology
				Trichloroethane (Cont'd.)			
38576	F	139	+ 53	34	D	LUC	KCw,LCW,LUC
38590	"	132	+ 48	51	D	LUCh	KCW,LCW,LUC
38622	"	168	- 22	53	D	LUCHZ	KWZ,LCGW,LUCTY
38566	"	134	+ 94	60	D	LUZ	
39770	"	146	- 6	66	D	LUU	A,H,KW,LCW,LUC,S
38493	"	100	+132	75	S		A,H,K,L,LU,P,S
38505	"	110	+132	75	S		A,H,K,L,LU,P,S
38525	"	176	+ 82	75	S		A,H,K,L,LU,P,S
38556	"	140	+110	75	S	LUz	A,H,K,L,LU,P,S
38568	"	145	+149	75	S		A,H,K,L,LU,P,S
38593	"	133	+113	75	S		A,H,K,L,LU,P,S
39773	"	127	+ 77	45	S		A,H,K,L,LU,P,S
				Tetrachloroethane			
38668	M	144	+ 54	18	S	OM	Kw,L,LUl
38689	"	144	+ 64	18	D	LUZ	
38678	"	191	+ 34	21	S	OM	Kw,Lw,LU
38728	"	122	+ 81	21	S	OM	K,L,LU
38704	"	206	+ 4	33	S	OM	K,Lw,LUy
38691	"	119	+ 37	39	D	LUZ	
38692	"	150	+ 26	62	D	LUCt	
38623	"	112	+208	75	S		A,H,K,L,LU,P,S,T
38647	"	196	+ 72	75	S	LUZ	A,H,K,L,LU,P,S,T
38628	"	128	+168	75	S		A,H,K,L,LU,P,S,T
38680	"	126	+192	75	S		A,H,K,L,LU,P,S,T
38731	"	236	+104	75	S		A,H,K,L,LU,P,S,T
39855	"	164	+158	45	S		H,K,L,LUc,P,S,T
40458	"	218	+210	45	S		A,H,K,L,LU,P,S,T
40461	"	224	+ 60	45	S		A,H,K,L,LU,P,S,T
40462	"	166	+ 75	45	S		A,H,K,L,LU,P,S,T
Dog							
36007	"	17.84kgm.	-3.34kgm.	75	S		A,H,Kw,LW,LUc,P,TB,TH
38549	F	137	- 13	17	D	LUH	KWZ,Lw,LUC
38517	"	142	+ 63	33	S	OM	K,L,LU
38512	"	160	+ 68	33	S	OM	K,LCW,LU
38594	"	155	+ 1	40	D	LUCt	KZ,LCW,LUy
39774	"	156	+ 26	42	D	LUt	
38515	"	159	+ 12	44	D	LUCHt	KWZ,LCW,LUCY
38552	"	140	+ 82	48	D		A,H,K,L,LU,P,S
38604	"	143	- 7	51	D		
38526	"	114	+ 46	57	D	LUCHZ	A,H,Kz,LCW,LUCY,P,SCFG
38546	"	122	+ 6	60	D	LUZ	
38567	"	148	- 7	64	D	LUU	A,HB,Kw,LCW,LU,P,Sc

(Continued)

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Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Path-ology	Micropathology
				Tetrachloroethane (Cont'd.)			
38502	F	136	+104	75	S		A,H,K,L,LU,P,S
38615	"	136	+ 94	75	S		A,H,K,L,LU,P,S
				Propylene Dichloride			
38721	M	116	- 36	3	D	LUZ	-
38729	"	158	+ 41	26	S	OM	KW,LW,LU
38675	"	116	+ 86	29	D	LUCHt	LCW,LUC
38679	"	158	- 10	40	D	LUH	KWz,LCW
38732	"	116	+104	43	D	Lj	Kw,LCW,LUC
38669	"	146	+ 6	46	D	LUU	Kw,LCW,LUCY
38630	"	192	+ 96	51	D	LUZ	
38617	"	194	+ 19	54	D	LUU	A,HB,KWX,LCw,LUC,S,T
38652	"	100	+128	65	D	LUchTz	A,H,KZ,LCw,LUC,Pz,S,T
38624	"	176	+144	75	D	LUU	A,H,K,Lw,LUC,P,S,T
38687	"	156	+214	75	S		K,L,LU,P,Scg,T
39007	"	154	+254	72	S		H,K,L,LU,SFG,T
38738	"	112	+110	75	S		A,H,K,L,LU,P,S
40460	"	220	+120	45	S		A,H,K,L,LU,P,SFG,T
Dog							
36004	"	15.79kgm.	+5.46kgm.	75	S		A,H,K,LW,LUC,P,S,TH
38578	F	124	+ 86	24	D		
38595	"	125	+ 80	33	S	OM	KWz,Lw,LU
38580	"	136	+ 14	45	D	LUCH	KZ,LCW,LUCY
38511	"	124	- 24	47	D	LUCHZ	KW,LCW,LUCY
38490	"	124	+ 94	48	S	OM	K,L,LU
38616	"	135	+ 41	53	D	[illegible]	KWz,LCW
38527	"	148	- 3	58	D	LUCHt	
38550	"	174	+ 60	65	D	LUt	A,H,KWz,LCWY,LUCY,P,S
38497	"	168	+ 82	75	S	LUcp	A,H,K,L,LU,P,S
38501	"	148	+ 70	75	S		A,H,K,L,LU,P,S
38514	"	152	+ 88	75	S	LUp	A,H,K,L,LU,P,S
38571	"	132	+ 90	75	S	LUT	A,H,K,L,LUC,P,S
39775	"	160	+ 72	45	S		A,H,K,L,LU,P,SFG

(Continued)

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Rat Number	Sex	Weight in Gms. Original	Gain or Loss	Number of Alternate Exposures	Fate	Gross Pathology	Micropathology
					Control		
38627	M	164	- 10	6	D	LUC	
38636	"	116	- 44	6	D		
38730	"	136	- 34	10	D	LUZ	
41059	"	200	+ 81	18	S	OM	A,H,K,L,P,SFG,T
38722	"	142	+130	26	S	PH	KW,LCWy,LU
38625	"	176	+101	37	D	LUt	KZ,LCWy,LU
38620	"	212	+ 64	38	D	LUt	KZ,LCWy,LUT
38673	"	128	+ 57	38	D	LUCH	KW,LCWy,LUT
38658	"	108	+133	54	D	LUCH	A,H,L,LU,P,S,T
38688	"	144	+ 62	57	D	LUU	
38671	"	94	+126	67	D	LUCHt	A,H,KW,LW,LU,PZ,SCf
38693	"	140	+200	75	S		H,K,L,LU,P,SG,T
38711	"	166	+176	75	S	LUt	H,K,L,LU,P,SG,T
40343	"	192	+252	45	S		A,H,K,L,P,SFG,T
40464	"	205	+203	45	S		A,H,K,L,P,SFG,T
40466	"	185	+205	45	S		
Dog							
36010	"	11.59kgm.	+3.66kgm.	75	S		H,K,L,LU,P,PA,S,T,TH
38572	F	120	+ 20	22	D	LUZ	
38607	"	160	+ 12	22	D	LUU	KW,LCWy,LUC
38554	"	142	+ 12	33	D	LUZ	
38614	"	156	- 6	47	D	LUCHZ	KW,LCWy,LUC
38531	"	120	+ 32	48	D	LUCH	Kw,LCWy,LUT
38575	"	112	+ 56	54	D	LUU	A,H,K,LCw,LU,Pz,Sf
38592	"	120	+ 52	54	D	LUCH	Kw,LCW,LUt
38563	"	165	+ 15	65	D	LUCH	A,H,Kw,LCw,LUT,PZ,Sf
38581	"	132	+108	75	S		A,H,K,L,LU,P,Sf
38585	"	136	+122	75	S		H,K,L,LU,P,S
38587	"	160	+ 72	75	S	LUt	A,H,K,L,LU,O,P,Sf
38599	"	155	+135	75	S		A,H,K,L,LU,P,Sf
39776	"	166	+ 78	45	S		A,H,K,L,P,S
39777	"	162	+ 78	45	S		A,H,K,L,P,SFG

ABBREVIATIONS

Fate
D = Died
S = Sacrificed for examination

Gross Pathology
(Initial capitals denote organ, followed by small letters for slight or capitals for major effect)

K = Kidney
Kc = " , congestion

L = Liver
La = " , acini prominent
Lf = " , incipient cirrhosis
Lj = " , jaundiced
Lp = " , pale

LU = Lung
LUa = " , adhering to thorax
LUc = " , congestion
LUh = " , hemorrhage
LUp = " , petechial hemorrhage
LUt = " , consolidation
LUu = " , catarrhal pneumonia (mucois sheath on lungs)
LUz = " , abscess

S = Spleen
Sz = " , generalized infection

Micropathology

A = Adrenal, normal

H = Heart, normal
Hb = " , blood clots in chambers

K = Kidney, normal
Km = " , desquamation of cells in convoluted tubules
Ks = " , casts in convoluted tubules
Kw = " , cloudy swelling of convoluted tubules
Kx = " , cloudy swelling of loop tubules
Kz = " , nuclear degeneration of convoluted tubules

L = Liver, normal
Lc = " , congestion
Lg = " , free pigment
Lh = " , thickening of interlobular septa
Lv = " , Fat droplets or globules
Lw = " , cloudy swelling
Ly = " , fatty degeneration

(Continued)

ABBREVIATIONS (Cont'd.)

LU = Lung, normal
LUc = " , congestion
LUg = " , red blood cell leakage into bronchioles
LUi = " , fibrin in alveoli
LUl = " , enlarged lymph glands
LUt = " , pleural consolidation
LUu = " , catarrhal pneumonic involvement
LUv = " , thickening of alveolar walls
LUw = " , large lymphoid masses of tumors
LUx = " , increase of lymphoid tissue around bronchioles
LUy = " , sarcoma or tumor

P = Pancreas, normal

PA = Parathyroid, normal

S = Spleen, normal
Sc = " , congestion
Sf = " , pigment phagocytized or deposited
Sg = " , excessive pigment

T = Testis, normal
Tb = " , scant sperm

TH = Thyroid, normal