



"Contains NO CBI"

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UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC.
HEALTH, SAFETY AND ENVIRONMENTAL AFFAIRS

August 21, 1992

Ⓐ

**CERTIFIED MAIL
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Document Processing Center (TS-790)
Room L-100
Office of Toxic Substances
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Attn: Section 8(e) Coordinator (CAP Agreement)

Re: CAP Agreement Identification No. 8ECAP-0110

Dear Sir or Madam:

Union Carbide Corporation ("Union Carbide") herewith submits the following report pursuant to the terms of the TSCA §8(e) Compliance Audit Program and Union Carbide's CAP Agreement dated August 14, 1991 (8ECAP-0110). This report describes acute toxicity tests with 1-naphthyl chloroformate (CASRN 3759-61-3).

"Range Finding Tests on 1-Naphthyl Chloroformate as a 25% Solution in Toluene", Mellon Institute of Industrial Research, Report 23-92, December 19, 1960.

A complete summary of this report is attached.

Previous TSCA Section 8(e) or "FYI" Submission(s) related to this substance are:

(None)

Previous PMN submissions related to this substance are: (None)

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9/9/94

2.13

This information is submitted in light of EPA's current guidance. Union Carbide does not necessarily agree that this information reasonably supports the conclusion that the subject chemical presents a substantial risk of injury to health or the environment.

In the attached report the term "CONFIDENTIAL" may appear. This precautionary statement was for internal use at the time of issuance of the report. Confidentiality is hereby waived for purposes of the needs of the Agency in assessing health and safety information. The Agency is advised, however, that the publication rights to the contained information are the property of Union Carbide.

Yours truly,



William C. Kuryla, Ph.D.
Associate Director
Product Safety
(203/794-5230)

WCK/cr

Attachment (3 copies of cover letter, summary, and report)

SUMMARY

3

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Confidential

Report 23-92

R: 12-19-60

Gaw 12/21/60

MELLON INSTITUTE OF INDUSTRIAL RESEARCH

SPECIAL REPORT

Range Finding Tests on 1-Naphthyl Chloroformate

as a 25% Solution in Toluene

AFDR

Union Carbide Chemicals Co., U.C.C.

Industrial Fellowship 274-23

Summary

Stomach Intubation, rat - LD₅₀ = 5.7 ml./kg. of solution as received or 1.4 gm./kg. of naphthyl chloroformate.

Skin Penetration, rabbit - LD₅₀ = 7.1 ml./kg. of solution as received or 1.8 gm./kg. of naphthyl chloroformate.

Inhalation - rat

Concentrated vapor of solution

30 minutes killed 6 of 6.

15 minutes killed 2 of 6.

Metered concentrations of solution; 4 hours

9.5 mg./liter killed 6 of 6.

4.75 mg./liter killed 0 of 6.

Uncovered Skin Irritation, rabbit - moderately severe.

Eye Injury, rabbit - minor, Grade 4.

The toxicity of 1-naphthyl chloroformate as a 25% solution in toluene is slight by mouth and by skin penetration. However, a definite hazard to life exists by inhalation at room temperature. A 15-minute period in concentrated vapor proved fatal to two of six rats. Obviously, adequate ventilation and protective equipment must be provided for those working with this solution. Both uncovered rabbit skin and rabbit eyes are irritated by contact with it.

SUMMARY

BEST COPY AVAILABLE

Report 23-92

Inhalation

Concentrated vapor, generated at room temperature (approximately 20°C.) passing air at 2.5 liters/minute through a fritted glass disc immersed in a solution of naphthyl chloroformate as a 25% solution in toluene, killed six of six Dow-Wistar, female albino rats within a 30-minute inhalation period and killed two of six after a 15-minute period. Gross examination at autopsy revealed capillary breakdown in the lungs and congestion of the livers and kidneys.

Upon removal from the inhalation chamber, the survivors appeared to be lightly anesthetized as evidenced by prostration with muscular tremors. They gained weight normally during the subsequent two-week observation period but at sacrifice on the 14th day, some residual lung damage was observed:

Metered concentrations of 9.5 mg./liter killed six of six rats after a four-hour inhalation period while a concentration of 4.75 mg./liter killed zero of six after the same time interval. Two animals died before the end of the inhalation period, two died within three hours after its termination while the other two deaths were delayed for one and seven days. Gross pathology was similar to that found in the concentrated vapor test. The survivors (4.75 mg./liter) appeared to be normal upon removal from the inhalation chamber except for moderate eye irritation. No gross pathology was observed at autopsy 14 days later.

R: 12-19-60

Yau 12/21/60

MELLON INSTITUTE OF INDUSTRIAL RESEARCH

SPECIAL REPORT

Range Finding Tests on 1-Naphthyl Chloroformate
as a 25% Solution in Toluene*APDR*

Union Carbide Chemicals Co., U.C.C.

Industrial Fellowship 274-23

Summary

- Stomach Intubation, rat - LD₅₀ = 5.7 ml./kg. of solution as received or 1.4 gm./kg. of naphthyl chloroformate.
- Skin Penetration, rabbit - LD₅₀ = 7.1 ml./kg. of solution as received or 1.8 gm./kg. of naphthyl chloroformate.
- Inhalation - rat
- Concentrated vapor of solution
 - 30 minutes killed 6 of 6.
 - 15 minutes killed 2 of 6.
- Metered concentrations of solution; 4 hours
- 9.5 mg./liter killed 6 of 6.
 - 4.75 mg./liter killed 0 of 6.
- Uncovered Skin Irritation, rabbit - moderately severe.
- Eye Injury, rabbit - minor, Grade 4.

The toxicity of 1-naphthyl chloroformate as a 25% solution in toluene is slight by mouth and by skin penetration. However, a definite hazard to life exists by inhalation at room temperature. A 15-minute period in concentrated vapor proved fatal to two of six rats. Obviously, adequate ventilation and protective equipment must be provided for those working with this solution. Both uncovered rabbit skin and rabbit eyes are irritated by contact with it.

The following is a summary of data obtained with toluene itself:

- Peroral - LD₅₀ = 7.7 ml./kg.
- Skin Penetration - LD₅₀ = 14.1 ml./kg.
- Inhalation - concentrated vapor

 - 1 hour killed 2 of 6.

- Uncovered Skin - moderate injury.
- Eyes - severe injury.

Comparisons of data indicates that the mixture (naphthyl chloroformate, in toluene) is two to four times as toxic as toluene and that naphthyl chloroformate alone has six to twelve times the toxicity of toluene.

Sample

On August 29, 1960, one gallon of 1-naphthyl chloroformate as a 25% solution in toluene and bearing Passed Number PC-37259 was received from South Charleston, West Virginia. A toxicity assay was done at the request of R. J. Sexton, M.D., Medical Director, Institute Plant.

Single Peroral Doses

1-Naphthyl chloroformate as a 25% solution in toluene has a single dose LD₅₀ of 5.66 ml./kg. of solution as received or 1.42 gm./kg. on the basis of 1-naphthyl chloroformate itself.

Dow-Wistar nonfasted rats, five to six weeks of age and 90-120 grams in weight, were dosed at levels differing by a factor of 2.0 in a geometric series. The rats were reared in our own colony and maintained from time of weaning on Rockland rat diet (complete). The method of moving average for calculating the median-effective dose (LD₅₀) was applied to the 14-day mortality data.

The rats became depressed soon after dosing and developed rapid, shallow abdominal breathing. Deaths occurred within the ensuing 24-hour period. Gross examination at autopsy revealed a generalized congestion of the lungs and abdominal viscera with surface burns on the livers and kidneys from contact with the stomachs still partially filled with the chemical.

Skin Penetration

By rabbit skin penetration the LD₅₀ of the material as received is 1.07 (4.37 to 11.4) ml./kg. or 1.77 (1.09 to 2.85) gm./kg. on the basis of the contained 1-naphthyl chloroformate. Necrosis of the skin was found upon removal of the polyethylene covering after the 24-hour contact period.

Male albino New Zealand strain rabbits, three to five months of age and averaging 2.5 kg. in weight, were immobilized during the 24-hour skin contact period. Thereafter, the polyethylene sheeting used to retain the dose in contact with the clipped skin of the trunk was removed and the animals were caged for the remainder of the 14-day observation period. The rabbits were procured locally and maintained on Rockland rabbit ration. The moving average method of calculating the LD₅₀ was used.

Two deaths occurred within 24 hours after application of the chemical, and two others were delayed for six and eight days. Autopsy disclosed slightly hemorrhaged and congested lungs, mottled off-color livers with prominent acini, and off-color kidneys with internal congestion. The urine was of a dark amber color and contained occult blood. Most survivors lost weight during the two-week observation period and at sacrifice on the 14th day, autopsy revealed off-color livers, pale kidneys, and urine varying in color from bright yellow to brown.

Inhalation

Concentrated vapor, generated at room temperature (approximately 20°C.) passing air at 2.5 liters/minute through a fritted glass disc immersed in a solution of naphthyl chloroformate as a 25% solution in toluene, killed six of six

How-Wistar, female albino rats within a 30-minute inhalation period and killed two of six after a 15-minute period. Gross examination at autopsy revealed capillary breakdown in the lungs and congestion of the livers and kidneys.

Upon removal from the inhalation chamber, the survivors appeared to be lightly anesthetized as evidenced by prostration with muscular tremors. They gained weight normally during the subsequent two-week observation period but at sacrifice on the 14th day, some residual lung damage was observed:

Metered concentrations of 9.5 mg./liter killed six of six rats after a four-hour inhalation period while a concentration of 4.75 mg./liter killed zero of six after the same time interval. Two animals died before the end of the inhalation period, two died within three hours after its termination while the other two deaths were delayed for one and seven days. Gross pathology was similar to that found in the concentrated vapor test. The survivors (4.75 mg./liter) appeared to be normal upon removal from the inhalation chamber except for moderate eye irritation. No gross pathology was observed at autopsy 14 days later.

Irritation

Application of 0.01 ml. amounts of naphthyl chloroformate as received (25% in toluene) to the uncovered clipped skin of the rabbit belly caused erythema and edema on four animals and necrosis on a fifth. A 10% naphthyl chloroformate solution in toluene (2 ml. of sample as received plus 3 ml. of toluene) produced necrosis on three animals, moderate edema on one and marked erythema on another. Toluene was used as a control and caused necrosis on two rabbits' bellies and marked erythema on three others.

Moderately severe corneal injury and pain resulted from the instillation of 0.1 ml. amounts of naphthyl chloroformate as a 25% solution in toluene into the eyes of four rabbits. Five other eyes receiving 0.02 ml. amounts were moderately damaged. Grade 4.

Charles P. Carpenter

Charles P. Carpenter
ASSISTANT ADMINISTRATIVE FELLOW

A. Striegel

A. Striegel
JUNIOR FELLOW

December 19, 1960 - amd

Table 23-293

Naphthyl Chloroformate, 25% in Toluene (23-213)

Single Doses to Male Albino Rats Fed as Received by Stomach Tube

<u>Rat Number</u>	<u>1960 Date Dosed</u>	<u>Grams Weight</u>	<u>Weight Change in 14 Days</u>	<u>Dosage; Ml. per Kilo</u>	<u>Dose in Ml.</u>	<u>Days to Death</u>
10944	9-1	100	-	8.0	0.80	0
10943	9-1	102	-	8.0	0.82	1
9811	9-6	106	-	8.0	0.85	1
9804	9-6	100	-	8.0	0.80	1
11050	9-6	111	-	8.0	0.89	1
10945	9-1	112	+58	4.0	0.45	-
10946	9-1	91	+58	4.0	0.36	-
10948	9-1	108	+58	4.0	0.43	-
11041	9-6	101	+77	4.0	0.40	-
10725	9-6	103	+56	4.0	0.41	-
9124	8-30	110	+55	2.0	0.22	-
9148	8-30	101	+51	2.0	0.20	-
9144	8-30	105	+54	2.0	0.21	-
9124	8-30	112	+64	2.0	0.22	-
9729	8-30	102	+38	2.0	0.20	-

LD50 = 5.66 ml./kg. of solution as received or
1.42 gm./kg. on basis of contained naphthyl chloroformate

Table 23-294

Naphthyl Chloroformate, 25% in Toluene (23-213)

Single Doses to Male Albino Rabbits by Skin Penetration Administered as Received under Polyethylene Dam for 24 Hours

<u>Rabbit Number</u>	<u>1960 Date Clipped</u>	<u>1960 Date Applied</u>	<u>Grams Weight</u>	<u>Weight Change in 14 Days</u>	<u>Dosage; Ml. per Kilo</u>	<u>Dose in Ml.</u>	<u>Days to Death</u>
148	8-31	9-1	2744	-	10.0	27.4	1
151	8-31	9-1	3140	-	10.0	31.4	1
153	10-5	10-6	3328	-	10.0	33.3	8
156	10-5	10-6	3444	-237	10.0	34.4	-
122	8-31	9-1	2344	-	5.0	11.7	6
142	8-31	9-1	2532	-102	5.0	12.7	-
144	9-6	9-7	3058	-123	5.0	15.3	-
150	9-6	9-7	2720	+30	5.0	13.6	-

LD50 = 7.07 (4.37 to 11.4) ml./kg. of solution as received or
1.77 (1.09 to 2.85) gm./kg. on basis of contained naphthyl chloroformate

Table 23-295

Naphthyl Chloroformate, 25% in Toluene (23-213)

Single Inhalation by Groups of Female Albino Rats of Concentrated Vapor Generated at Approximately 20°C.

Rat Number	Date and Duration of Inhalation	Conc. Mg./L.	Initial Weight Grams	Weight Change in 14 Days	Time to Death in Chamber	Days to Death
9827			100	-		
9828	9-6-60		111	-	20 Min.	-
9839	30 Minutes in	135.08	100	-	20 Min.	-
9840	9-Liter		110	-	20 Min.	-
9847	Desiccator		106	-	20 Min.	-
9843			112	-	20 Min.	-
7835					30 Min.	-
7831	9-2-60		112	-		
7800	15 Minutes in	105.88	108	-	12 Min.	-
7880	9-Liter		128	-	-	0
7878	Desiccator		136	+35	-	-
7838			118	+25	-	-
			110	+34	-	-
				+41	-	-

Table 23-296

Naphthyl Chloroformate, 25% in Toluene (23-213)

Single Inhalation by Groups of Female Albino Rats of Metered Concentrations

Rat Number	Date and Duration of Inhalation	Conc. Mg./L.	Initial Weight Grams	Weight Change in 14 Days	Time to Death in Chamber	Days to Death
895			104	-		
896	10-21-60		105	-	3-1/2 Hr.	-
898	4 Hours in	9.5	103	-	4 Hours	-
899	9-Liter		123	-	4 Hours	0
894	Desiccator		100	-	4 Hours	0
898			105	-	4 Hours	1
899					4 Hours	7
895	10-18-60		110	-		
897	4 Hours in		108	+ 6	-	-
899	9-Liter	4.75	115	+20	-	-
894	Desiccator		106	+17	-	-
895			102	+22	-	-
897			106	+30	-	-
899				+18	-	-



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

William C. Kuryla, Ph.D.
Associate Director, Product Safety
Union Carbide Corporation
39 Old Ridgebury Road
Danbury, Connecticut 06817-0001

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

FEB 27 1995

EPA acknowledges the receipt of information submitted by your organization under Section 8(e) of the Toxic Substances Control Act (TSCA). For your reference, copies of the first page(s) of your submission(s) are enclosed and display the TSCA §8(e) Document Control Number (e.g., 8EHQ-00-0000) assigned by EPA to your submission(s). Please cite the assigned 8(e) number when submitting follow-up or supplemental information and refer to the reverse side of this page for "EPA Information Requests".

All TSCA 8(e) submissions are placed in the public files unless confidentiality is claimed according to the procedures outlined in Part X of EPA's TSCA §8(e) policy statement (43 FR 11110, March 16, 1978). Confidential submissions received pursuant to the TSCA §8(e) Compliance Audit Program (CAP) should already contain information supporting confidentiality claims. This information is required and should be submitted if not done so previously. To substantiate claims, submit responses to the questions in the enclosure "Support Information for Confidentiality Claims". This same enclosure is used to support confidentiality claims for non-CAP submissions.

Please address any further correspondence with the Agency related to this TSCA 8(e) submission to:

Document Processing Center (7407)
Attn: TSCA Section 8(e) Coordinator
Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency
Washington, D.C. 20460-0001

EPA looks forward to continued cooperation with your organization in its ongoing efforts to evaluate and manage potential risks posed by chemicals to health and the environment.

Sincerely,

Terry R. O'Bryan
Terry R. O'Bryan
Risk Analysis Branch

Enclosure

12831A



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Triage of 8(e) Submissions

Date sent to triage: FEB 24 1995

NON-CAP

CAP
Y N D

Submission number: 12831A

TSCA Inventory:

Study type (circle appropriate):

Group 1 - Dick Clements (1 copy total)

ECO AQUATO

Group 2 - Ernie Falke (1 copy total)

ATOX SBTOX SEN w/NEUR

Group 3 - Elizabeth Margosches (1 copy each)

STOX CTOX EPI RTOX GTOX
STOX/ONCO CTOX/ONCO IMMUNO CYTO NEUR

Other (FATE, EXPO, MET, etc.): _____

Notes:

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entire document: <u>0</u> 1 2 pages <u>1,2</u>	pages <u>1-4</u>
Notes:	
Contractor reviewer: <u>LPS</u>	Date: <u>1/5/95</u>

CECATS/TRIAGE TRACKING DBASE ENTRY FORM

CFCATS DATA: Submission # 8E:HQ-0892-12831 SEQ. A

TYPE: INT SUPP FLWP

SUBMITTER NAME: Union Carbide Chemicals and Plastics Company, Inc.

INFORMATION REQUESTED: FLWP DATE:
 0501 NO INFO REQUESTED
 0502 INFO REQUESTED (TECH)
 0503 INFO REQUESTED (VOL ACTIONS)
 0504 INFO REQUESTED (REPORTING RATIONALE)
 DISPOSITION:
0639 REFER TO CHEMICAL SCREENING
0678 CAP NOTICE

VOLUNTARY ACTIONS
 0401 NO ACTION REPORTED
 0402 STUDIES PLANNED/UNDERWAY
 0403 NOTIFICATION OF WORK ROTHERS
 0404 LABEL/MSDS CHANGES
 0405 PROCESS/HANDLING CHANGES
 0406 APP/USE DISCONTINUED
 0407 PRODUCTION DISCONTINUED
 0408 CONFIDENTIAL

SUB. DATE: 08/21/92 OTS DATE: 08/27/92 CSRAD DATE: 09/09/94

CHEMICAL NAME:

CAS#

3759-61-3

INFORMATION TYPE:	P F C	INFORMATION TYPE:	P F C	INFORMATION TYPE:	P F C
0201 ONCO (HUMAN)	01 02 04	0216 EPI/CLIN	01 02 04	0241 IMMUNO (ANIMAL)	01 02 04
0202 ONCO (ANIMAL)	01 02 04	0217 HUMAN EXPOS (PROD CONTAM)	01 02 04	0242 IMMUNO (HUMAN)	01 02 04
0203 CELL TRANS (IN VITRO)	01 02 04	0218 HUMAN EXPOS (ACCIDENTAL)	01 02 04	0243 CHEM/PHYS PROP	01 02 04
0204 MUTA (IN VITRO)	01 02 04	0219 HUMAN EXPOS (MONITORING)	01 02 04	0244 CLASTO (IN VITRO)	01 02 04
0205 MUTA (IN VIVO)	01 02 04	0220 ECO/AQUA TOX	01 02 04	0245 CLASTO (ANIMAL)	01 02 04
0206 REPRO/TERATO (HUMAN)	01 02 04	0221 ENV. OCC/REL/FATE	01 02 04	0246 CLASTO (HUMAN)	01 02 04
0207 REPRO/TERATO (ANIMAL)	01 02 04	0222 EMER INCI OF ENV CONTAM	01 02 04	0247 DNA DAM/REPAIR	01 02 04
0208 NEURO (HUMAN)	01 02 04	0223 RESPONSE REQUEST DELAY	01 02 04	0248 PROD/USE/PROC	01 02 04
<u>0209</u> NEURO (ANIMAL)	01 <u>02</u> 04	0224 PROD/COMP/CHEM ID	01 02 04	0251 MSDS	01 02 04
0210 ACUTE TOX. (HUMAN)	01 02 04	0225 REPORTING RATIONALE	01 02 04	0299 OTHER	01 02 04
0211 CHR. TOX. (HUMAN)	01 02 04	0226 CONFIDENTIAL	01 02 04		
<u>0212</u> ACUTE TOX. (ANIMAL)	01 <u>02</u> 04	0227 ALLERG (HUMAN)	01 02 04		
0213 SUB ACUTE TOX (ANIMAL)	01 02 04	0228 ALLERG (ANIMAL)	01 02 04		
0214 SUB CHRONIC TOX (ANIMAL)	01 02 04	0239 METAB/PHARMACO (ANIMAL)	01 02 04		
0215 CHRONIC TOX (ANIMAL)	01 02 04	0240 METAB/PHARMACO (HUMAN)	01 02 04		

TRIAGE DATA: NON-CBI INVENTORY

YES

CAS SR

NO

DETERMINE

ONGOING REVIEW

YES (DROP/REFER)

NO (CONTINUE)

REFER:

SPECIES

RAT
RBT

TOXICOLOGICAL CONCERN:

LOW

MED

HIGH

USE:

PRODUCTION:

COMMENTS:

> <ID NUMBER>
8(E)-12831A

> <TOX CONCERN>
L/H

> <COMMENT>

ACUTE ORAL TOXICITY IN MALE RATS IS LOW CONCERN BASED ON AN LD50 OF 5.7 ML/KG. DOSE (ML/KG) AND MORTALITY: 2.0 (0/5), 4.0 (0/5), AND 8.0 (5/5). CLINICAL SIGNS INCLUDED DEPRESSION, AND RAPID, SHALLOW ABDOMINAL BREATHING. AUTOPSY REVEALED GENERALIZED CONGESTION OF THE LUNGS AND ABDOMINAL VISCERA WITH SURFACE BURNS ON THE LIVER AND KIDNEYS FROM CONTACT WITH CHEMICAL-FILLED STOMACH.

ACUTE DERMAL TOXICITY IN MALE RABBITS IS LOW CONCERN BASED ON AN LD50 OF 7.1 ML/KG. DOSE (ML/KG) AND MORTALITY: 5.0 (1/4) AND 10 (3/4). NECROSIS OF SKIN WAS OBSERVED. AUTOPSY OF DECEDENTS REVEALED SLIGHTLY HAEMORRHAGED AND CONGESTED LUNGS, MOTTLED OFF-COLOR LIVER WITH PROMINENT ACINI, OFF-COLOR KIDNEY WITH INTERNAL CONGESTION, AND URINE COLOR WAS DARK AMBER AND CONTAINED OCCULT BLOOD. AUTOPSY OF SURVIVORS REVEALED OFF-COLOR LIVER, PALE KIDNEY, VARYING URINE COLOR.

EYE IRRITATION IN RABBITS IS HIGH CONCERN. TEST MATERIAL IS CLASSIFIED AS GRADE 4. 0.1 ML OF TEST MATERIAL CAUSED MODERATELY SEVERE CORNEAL INJURY AND PAIN IN 4-RABBITS. 0.02 ML OF TEST MATERIAL SEVERELY DAMAGED THE EYES OF 5 OTHER RABBITS.

SKIN IRRITATION IS HIGH CONCERN IN RABBITS. 0.01 ML OF TEST MATERIAL CAUSED ERYTHEMA AND EDEMA IN 4/5 ANIMALS. A 10% SOLUTION PRODUCED NECROSIS (3/5), MODERATE EDEMA (1/5), AND MARKED ERYTHEMA (1/5).

ACUTE INHALATION TOXICITY IN FEMALE RATS IS LOW CONCERN. TWO INHALATION STUDIES WERE PERFORMED.

IN THE FIRST, RATS WERE EXPOSED FOR 15 AND 30-MINUTES TO CONCENTRATED VAPORS OF 105.88 AND 135.08 MG/L, RESPECTIVELY. AT 105.88 MG/L THERE WERE 2 MORTALITIES AND AT 135.08 MG/L THERE WAS 100% MORTALITY (6/6).

IN THE SECOND STUDY, RATS WERE EXPOSED TO METERED CONCENTRATIONS OF 4.75 AND 9.5 MG/L FOR 4-HOURS. AT 4.75 MG/L THERE WAS NO MORTALITY AND AT 9.5 MG/L THERE WAS 100% MORTALITY (6/6). AUTOPSY OF DECEDENTS FOR BOTH STUDIES REVEALED CAPILLARY BREAKDOWN IN LUNGS AND CONGESTION OF LIVER AND KIDNEYS. SURVIVORS EXHIBITED PROSTRATION WITH MUSCULAR TREMORS. PATHOLOGIC EXAM REVEALED RESIDUAL LUNG DAMAGE FOR METERED CONCENTRATIONS. SURVIVORS EXPOSED TO CONCENTRATED VAPORS APPEARED NORMAL EXCEPT FOR MODERATE EYE IRRITATION.