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Attn: TSCA Section 8(e) Coordinator
Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency
401 "M" Street SW
Washington, DC 20460-0001

TSCA Section 8(e) Notification on:
Hydrogenated C-8 Dimer [Document Control # 88980000132R]

Dear Sir/Madame:

Pursuant to our TSCA 8(e) submission [Document Control # 8898000132R] on the results of acute inhalation exposures to 1-octene, dimer hydrogenated (CAS # 173994-67-7), we are providing a copy of the final study report for your records.

Confidentiality is being claimed for the company name and names of company employees. All pages containing this information have been stamped "Confidential". Two copies of the supplemental information are being submitted, the confidential information has been circled in one copy and excised from the other. The latter is intended for the EPA's Public File.

Sincerely,

COMPANY SANITIZED

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Attachments
FINAL REPORT C-8 DIMER.doc

This report is being made in compliance with Section 8(e) of the Toxic Substances Control Act (15 U.S.C. 2607), pursuant to our understanding of the Statement of Interpretation and Enforcement Policy (43 Fed. Reg. 11110 et. seq.). It has been compiled based on information available within the timer period given. While we believe the tests reported were properly performed, no representation can be made as to their accuracy of content. The corporation and individual signator also reserve the right to supplement any or all of the data contained herein and to revise or amend any conclusion drawn therefrom.

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**AN ACUTE NOSE-ONLY INHALATION TOXICITY
STUDY IN RATS WITH ALKANE 1**

FINAL REPORT

Author

Deborah A. Douds, M.S.

Study Completed on

April 23, 1998

Performing Laboratory

Springborn Laboratories, Inc. (SLI)
640 North Elizabeth Street
Spencerville, Ohio 45887

SLI Study No.

3428.4

Study No.

67206

Chemical Repository Unit No.

~~97308~~ 77364

Submitted to

SLI Study No. 3428.4

(2)

COMPLIANCE STATEMENT

This study was conducted in compliance with the Good Laboratory Practice Standards as described by the EPA (40 CFR Parts 160 and 792).



Deborah A. Douds, M.S.
Study Director/Author
Springborn Laboratories, Inc.

Date 4/23/98

QUALITY ASSURANCE STATEMENT

This study was inspected by the Quality Assurance Unit and reports were submitted to management and the Study Director in accordance with SLI's Standard Operating Procedures as follows:

<u>Phase</u>	<u>Date</u>
Dose Preparation	11/12/97
Data Audit	01/15/98
Draft Report Review	01/30/98
Final Report Review	04/23/98
Reports to Study Director and Management	01/30/98, 04/23/98

This study was conducted in compliance with the Good Laboratory Practice Standards as described by the EPA (40 CFR Parts 160 and 792).

Christopher W. Wilson
Christopher W. Wilson, B.S., RQAP-GLP
Supervisor of Acute Quality Assurance

Date 4/23/98

Anita M. Bosau
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Director of Compliance Assurance

Date 4/23/98

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SUMMARY

The four-hour nose-only inhalation toxicity of Alkane 1 was evaluated in Sprague-Dawley rats. Two exposures were performed in which two groups of five male and five female rats each received a four-hour nose-only inhalation exposure to a time-weighted average aerosol concentration (gravimetrically determined) of 1.05 or 2.09 mg/L. Following the exposures, the test rats were observed daily and weighed weekly. A gross necropsy examination was performed on all test animals at the time of death or scheduled euthanasia (day 14).

Mortality occurred during the study as follows:

Dose Level (mg/L)	No. Dead/No. Exposed		
	Males	Females	Combined
1.05	4/5	0/5	4/10
2.09	4/5	5/5	9/10

All mortality occurred by study day 2. The most notable clinical abnormalities observed during the study included decreased activity, wobbly gait, breathing abnormalities, feces small in size, decreased defecation, rough haircoat, hunched posture, unkempt appearance, urine stain, partially closed eyelids and dark material around the facial area. Body weight loss was noted for one 1.05 mg/L female rat during the study day 0-7 body weight interval. Body weight gain was noted for all other surviving animals during the test period. Gross internal necropsy findings observed in the animals that died included dark red lungs and congested meningeal vessels in the brain. No significant gross internal findings were observed at necropsy on study day 14.

Under the conditions of this test, the acute inhalation LC50 of Alkane 1 was estimated to be greater than 1.05 mg/L but less than 2.09 mg/L in the rat.

I. INTRODUCTION

This study was performed to assess the short-term toxicity of Alkane 1 in Sprague-Dawley rats when administered by a four-hour nose-only inhalation exposure. This study is intended to provide information on the potential health hazards of the test article with respect to inhalation exposure. Data from this study may serve as a basis for classification and/or labeling of the test article. This study was performed at Springborn Laboratories, Inc., 553 North Broadway, Spencerville, Ohio. The protocol was signed by the Study Director on October 21, 1997 (GLP initiation date). The in-life phase of the study was initiated with test article administration on November 12, 1997 and concluded with terminal euthanasia on December 8, 1997.

II. MATERIALS AND METHODS

A. Test Article

The test article was received from the Sponsor and identified as follows:

Sponsor's ID	Assigned SLI ID	Physical Description	Receipt Date	Expiration Date
Alkane 1 Lot No.: None provided	S97.004.3428	Clear colorless liquid	October 9, 1997	September 16, 2002

The test article was stored at room temperature. The Sponsor is responsible for any necessary evaluations related to identity, strength, purity, composition, stability and method of synthesis of the test material according to 40 CFR 160.105 and 40 CFR 792.105.

B. Retention Sample

The Sponsor was responsible for maintaining a retention sample of the test article.

C. Test Article Disposition

The remaining test article was returned to the Sponsor following completion of all studies with the test article.

D. Method of Test Article Preparation

The test article was utilized as received from the Sponsor.

E. Animals and Animal Husbandry

1. Description, Identification and Housing

Young adult, Sprague-Dawley Crl:CD®BR VAF/Plus® rats were received at SLI from Charles River Laboratories, Inc., Portage, Michigan. Upon receipt, metal ear tags displaying unique identification numbers were used to individually identify the animals. Cage cards displaying at least the study number, animal number and sex were affixed to each cage. The animals were housed individually in suspended stainless steel cages. All housing and care were based on the standards recommended by the Guide for the Care and Use of Laboratory Animals [1].

2. Environment

The temperature and relative humidity ranges in the animal room were 66-70°F and 29-55%, respectively. Environmental control equipment was monitored and adjusted as necessary to minimize fluctuations in the animal room environment. Light timers were set to maintain a 12-hour light/12-hour dark cycle and room ventilation was set to produce 10-15 air changes/hour. The animal room temperature and relative humidity were recorded a minimum of once daily.

3. Food

PMI Certified Rodent Chow #5002 (Purina Mills, Inc.) was provided ad libitum to the animals throughout the study (except during the time that the animals were maintained in the inhalation room for the tube acclimation and exposure procedures). The lot number and expiration date of each batch of diet used during the study were recorded. The feed was analyzed and certified by the supplier for nutritional components and environmental contaminants. Dietary limitations for various environmental contaminants, including heavy metals, pesticides, polychlorinated biphenyls and total aflatoxin are set by the manufacturer. Within these limits, contaminants which may have been present were not expected to compromise the purpose of this study. Results of the dietary analyses (Certificates of Analysis) are provided by the manufacturer for each lot of diet. These are maintained by SLI.

4. Water

Municipal tap water treated by reverse osmosis was available ad libitum throughout the study (except during the time that the animals were maintained in the inhalation

room for the tube acclimation and exposure procedures). The purified water was supplied by an automatic watering system. Monitoring of the drinking water for contaminants is conducted annually by SLI and the records are available for inspection. Within generally accepted limits, contaminants which may have been present were not expected to compromise the purpose of this study. The water meets the standards specified under the EPA National Drinking Water Regulations (40 CFR, Part 141).

5. Acclimation

Upon receipt, the animals were removed randomly from the shipping cartons, examined by qualified personnel, identified with metal ear tags and then acclimated to the laboratory conditions for a minimum of five days. The animals were observed daily for overt physical or behavioral abnormalities, general health/moribundity and mortality.

6. Animal Selection

The animals chosen for study use were arbitrarily selected from healthy stock animals to avoid potential bias. All animals received a detailed pretest observation prior to dosing. Only healthy animals were chosen for study use. Females were nulliparous and nonpregnant.

III. EXPERIMENTAL DESIGN AND PROCEDURES

A. Preliminary Procedures

1. Test Article Volatility Determination

The volatility of the test article relative to a distilled water standard was determined prior to experimental initiation. This procedure was performed in order to determine if the test article had sufficiently low volatility to allow for an accurate gravimetric determination of the aerosol concentration. A known quantity of the test article was placed on a preweighed filter disk and was allowed to evaporate for a total of ten minutes. The test article weight was determined each minute and the amount of evaporation of the test article was then determined. The results of this volatility trial indicated that the test article evaporation rate (0.03 mg/minute) was considerably less than the SLI determined distilled water evaporation rate (0.55 mg/minute) and thus standard gravimetric techniques would be sufficient.

2. Preliminary Aerosol Generation Trials

Prior to experimental initiation and the second exposure, preliminary aerosol generation trials were conducted. These trials were performed in order to determine the most efficient means of generating an aerosol of the appropriate concentration while utilizing equipment that would reduce the aerodynamic particle size. Data obtained during the preliminary aerosol generation trials are presented in Appendix A.

B. Test Article Exposure

1. Aerosol Generation Equipment

Each test aerosol was generated with a TSI Model 9306 6-Jet Atomizer. The test article was placed in a reservoir in the atomizer. The atomizer was connected to the chamber via tygon tubing. Conditioned high pressure external air was used in generating the test atmosphere. The aerosol was blown through the Unifab 100L nose-only inhalation chamber and then vented from the chamber to an air treatment system which consisted of a prefilter, a HEPA filter, a charcoal bed and a water scrubbing tower.

2. Dosing

On day 0, the animals chosen for the test were weighed, placed in a nose-only exposure tube and allowed to acclimate to the exposure tube for at least 1 hour. Animals that appeared to have been acclimated to the exposure tube (i.e., minimal struggling and no inversion) were removed from the exposure tube and returned to their cages until initiation of the aerosol exposure. Animals that did not appear to acclimate to the exposure tube were removed from the exposure tube and returned to their cages.

The acceptable animals were then placed into the exposure tubes and the tubes were inserted into the Unifab 100L nose-only inhalation chamber (Figure 1) and the test article aerosolized at the following levels:

Exposure Level (mg/L)	No. of Animals	
	Males	Females
1.05	5	5
2.09	5	5

Each aerosol exposure consisted of a T99 equilibration period, a 240 minute exposure period and a de-equilibration period. The following parameters were measured during each exposure:

a. Chamber Air Flow

Chamber air flow was measured indirectly by measuring the pressure differential across an orifice using a magnehelic gauge that was calibrated with a Teledyne/Hastings Air Flow Meter. Air flow readings were recorded at the initiation of the equilibration period, at approximate 30-minute intervals during the aerosol exposure and at the conclusion of the de-equilibration period. The inhalation chamber was maintained at a slightly negative pressure at all times.

b. Aerosol Concentration

The aerosol concentration was measured at the beginning of the aerosol exposure (after equilibration), at approximate 30-minute intervals during the aerosol exposure and at the conclusion of the aerosol exposure (before de-equilibration). The concentration of the test article aerosol was measured in the inhalation chamber by gravimetric technique. A sample of the aerosol was drawn from the breathing zone of the animals through a preweighed glass fiber filter. The change in weight of the filter (mg) was then determined and this value was divided by the volume of chamber atmosphere sampled (L) to yield the gravimetric concentration (mg/L). The average time-weighted gravimetric concentration of the test atmosphere was then calculated for the exposure.

c. Chamber Temperature and Humidity

The chamber temperature and humidity were measured electronically and recorded at approximate 30-minute intervals during the aerosol exposure.

d. Aerosol Aerodynamic Particle Size Distribution

The aerosol aerodynamic particle size distribution was determined twice during the aerosol exposure using the ITP 7 L/min. cascade impactor. Each stage of the impactor was fitted with a preweighed glass fiber filter. Seven liters per minute of the chamber air was drawn through the impactor and the change in weight of each filter was then determined and recorded. The mean of the two particle size distributions was subsequently plotted on three cycle logarithmic probability paper. The Mass Median Aerodynamic Diameter (MMAD), Geometric Standard Deviation (GSD) and percentage of particles $\leq 4.0\mu\text{m}$ were then determined. At least one hour passed between the first and second particle size analysis.

e. Chamber Oxygen

Chamber oxygen content was measured and recorded at approximate 30-minute intervals during the aerosol exposure.

After the aerosol exposure, animals were removed from the exposure tubes and the haircoat was wiped with a dry towel. The animals were then returned to ad libitum feed and water.

3. Clinical Observations

Test animals were observed for clinical abnormalities during the aerosol exposure, two times on study day 0 (postexposure) and daily thereafter (days 1-14). A general health/mortality check was performed twice daily (in the morning and in the afternoon).

4. Body Weights

Individual body weights were obtained for the test animals prior to dosing on day 0 and for all surviving animals on days 7 and 14. Animals found dead after day 0 were also weighed.

5. Gross Necropsy

All test animals that died or were euthanized by carbon dioxide inhalation at study termination (day 14) were necropsied. Body cavities (cranial, thoracic, abdominal and pelvic) were opened and examined. No tissues were retained.

C. Protocol Deviations

The relative humidity of the animal room (29-55%) was below the preferred range (30-70%) during this study on one day only. This occurrence was considered to have had no adverse effect on the outcome of this study.

IV. ANALYSIS OF DATA

Data from the tests were analyzed and the LC50 estimated as follows:

- < 50% Mortality: LC50 was estimated as greater than the administered dose.
- = 50% Mortality: LC50 was estimated as equal to the administered dose.
- > 50% Mortality: LC50 was estimated as less than the administered dose.

Body weight means and standard deviations were calculated separately for males and females for each level administered. The aerodynamic particle size distribution of the test article aerosol was plotted using three cycle logarithmic probability paper as per the ITP Cascade Impactor instruction manual.

V. MAINTENANCE OF RAW DATA AND RECORDS

All original paper data, the final report and magnetically encoded records were transferred to the SLI archives for a period of 10 years. The Sponsor will be contacted prior to final disposition of these items.

VI. RESULTS

A. Aerosol Generation and Chamber Environmental Data

1. Aerosol Generation Data

Summary Data: Table 1

Individual Data: Appendix B

Average time-weighted gravimetric concentrations for the aerosol exposures were determined to be 1.05 and 2.09 mg/L, respectively. The mass median aerodynamic diameter and geometric standard deviation of the sampled particles were $3.1\mu\text{m} \pm 1.8$ and $2.5\mu\text{m} \pm 1.8$, respectively. The percentage of particles $\leq 4.0\mu\text{m}$ was determined to be 67% and 79%, respectively.

2. Chamber Environmental Data

Summary Data: Table 1

Individual Data: Appendix B

Chamber temperature and relative humidity for the aerosol exposures ranged from 67.8-69.5°F and 9.2-25.2%, respectively. Oxygen content was maintained at 20.9-21.0% throughout the exposures.

B. Test Article Exposure Data

1. Mortality

Individual Data: Table 2

All mortality occurred by study day 2.

2. Clinical Observations

Individual Data: Table 2

The most notable clinical abnormalities observed during the study included decreased activity, wobbly gait, breathing abnormalities, feces small in size, decreased defecation, rough haircoat, hunched posture, unkempt appearance, urine stain, partially closed eyelids and dark material around the facial area.

3. Body Weight Data

Individual Data: Table 3

Body weight loss was noted for one 1.05 mg/L female rat during the study day 0-7 body weight interval. Body weight gain was noted for all other surviving animals during the test period.

4. Gross Necropsy

Individual Data: Table 4

Gross internal necropsy findings observed in the animals that died included dark red lungs and congested meningeal vessels in the brain. No significant gross internal findings were observed at necropsy on study day 14.

VII. CONCLUSION

Under the conditions of this test, the acute inhalation LC50 of Alkane 1 was estimated to be greater than 1.05 mg/L but less than 2.09 mg/L in the rat.



Deborah A. Douds, M.S.
Study Director

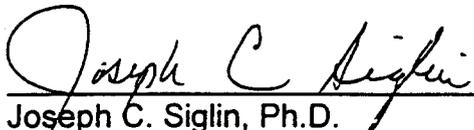
Date 4/23/98

VIII. REPORT REVIEW



Kimberly L. Bonbette, M.S., LATG
Manager of Acute Toxicology

Date 4/23/98



Joseph C. Siglin, Ph.D.
Director of Toxicology

Date 4/23/98

IX. REFERENCE

1. Guide for the Care and Use of Laboratory Animals, DHHS Publication No. (NIH) 96-03, 1996.

	1.05	EXPOSURE LEVEL (MG/L)	2.09
<u>CHAMBER AND EXPOSURE DATA</u>			
CHAMBER VOLUME (L):	100		100
MEAN AIR FLOW RATE (L/MIN):	117.50		62.30
MEAN AIR CHANGES PER HOUR:	70.59		37.27
T99 EQUILIBRATION TIME (MIN):	4		7
EXPOSURE TIME (MIN):	240		240
DE-EQUILIBRATION TIME (MIN):	4		7
<u>AEROSOL CONCENTRATIONS</u>			
CALCULATED NOMINAL CONCENTRATION (MG/L):	2.23		5.98
TIME-WEIGHTED MEAN GRAVIMETRIC CONCENTRATION (MG/L):	1.05		2.09
<u>AEROSOL PARTICLE SIZE ANALYSIS</u>			
MASS MEDIAN AERODYNAMIC DIAMETER (µm):	3.1		2.5
GEOMETRIC STANDARD DEVIATION:	± 1.8		± 1.8
PERCENTAGE OF PARTICLES ≤ 4.0µm (%):	67		79
<u>CHAMBER ENVIRONMENTAL DATA</u>			
TEMPERATURE RANGE (°F):	67.8 - 69.5		68.5 - 69.2
HUMIDITY RANGE (%):	9.2 - 15.1		18.1 - 25.2
OXYGEN CONTENT (%):	20.9 - 21.0		20.9

(17)

SLI STUDY NO.: 3428.4
 CLIENT CORPORATION

TABLE 2
 AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
 INDIVIDUAL CLINICAL OBSERVATIONS
 (POSITIVE FINDINGS)

CLINICAL OBSERVATIONS	DAY OF STUDY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANIMAL NO.: 13194 M 1.05 MG/L																
ACTIVITY DECREASED			P													
WOBBLY GAIT			P													
SHALLOW BREATHING			P													
FOUND DEAD			P													
ANIMAL NO.: 13208 M 1.05 MG/L																
ACTIVITY DECREASED																
WOBBLY GAIT																
SHALLOW BREATHING																
RAPID BREATHING																
CONGESTED BREATHING																
FECES SMALL IN SIZE																
ROUGH COAT																
SCHEDULED EUTHANASIA																P
ANIMAL NO.: 13335 M 1.05 MG/L																
FOUND DEAD																P
ANIMAL NO.: 13336 M 1.05 MG/L																
FOUND DEAD																P
ANIMAL NO.: 13339 M 1.05 MG/L																
ACTIVITY DECREASED																P

GRADE CODE: P -PRESENT

SLI STUDY NO.: 3428.4
 CLIENT: CORPORATION

TABLE 2
 AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
 INDIVIDUAL CLINICAL OBSERVATIONS
 (POSITIVE FINDINGS)

CLINICAL OBSERVATIONS	ANIMAL NO.:	SEX	DOSE (MG/L)	DAY OF STUDY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	13339	H	1.05	CONTINUED																
WOBBLY GAIT						P														
SHALLOW BREATHING						P														
FOUND DEAD						P														
	13149	H	2.09																	
FOUND DEAD						P														
	13150	H	2.09																	
ACTIVITY DECREASED						P	P	P												
WOBBLY GAIT						P	P	P												
RAPID BREATHING						P														
LABORED BREATHING						P	P													
SALIVATION						P														
FEW FECES								P	P	P										
ROUGH COAT								P	P	P	P									
HUNCHED POSTURE																				
UNKEPT APPEARANCE						P	P	P	P											
EYELIDS PARTIALLY CLOSED						P	P	P												
SCHEDULED EUTHANASIA						P														P
	13153	H	2.09																	
FOUND DEAD																				P

GRADE CODE: P -PRESENT

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

TABLE 2
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL CLINICAL OBSERVATIONS
(POSITIVE FINDINGS)

CLINICAL OBSERVATIONS	DAY OF STUDY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANIMAL NO.: 13155 H 2.09 MG/L																
SHALLOW BREATHING																
PROSTRATION																
FOUND DEAD																
ANIMAL NO.: 13156 H 2.09 MG/L																
ACTIVITY DECREASED																
WOBBLY GAIT																
RAPID BREATHING																
LABORED BREATHING																
GASPING																
EYELIDS PARTIALLY CLOSED																
FOUND DEAD																
ANIMAL NO.: 13173 F 1.05 MG/L																
WOBBLY GAIT																
SHALLOW BREATHING																
RAPID BREATHING																
FECES SMALL IN SIZE																
FEW FECES																
DARK MATERIAL AROUND NOSE																
SCHEDULED EUTHANASIA																
ANIMAL NO.: 13177 F 1.05 MG/L																
ACTIVITY DECREASED																
GRADE CODE: P -PRESENT																

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

TABLE 2
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL CLINICAL OBSERVATIONS
(POSITIVE FINDINGS)

CLINICAL OBSERVATIONS	DAY OF STUDY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANIMAL NO.: 13177 F 1.05 MG/L	CONTINUED															
WOBBLY GAIT			P													
SHALLOW BREATHING			P													
RAPID BREATHING			P													
FECES SMALL IN SIZE				P												
FEW FECES				P												
SCHEDULED EUTHANASIA																P
ANIMAL NO.: 13178 F 1.05 MG/L																
ACTIVITY DECREASED			P													
WOBBLY GAIT			P													
SHALLOW BREATHING			P													
RAPID BREATHING			P													
COOL TO THE TOUCH			P													
RALES										P						
PILORECTION			P													
ROUGH COAT			P													
UNKEMPT APPEARANCE			P													
URINE STAIN - MODERATE			P													
DARK MATERIAL AROUND EYE(S)																
DARK MATERIAL AROUND NOSE			P													
SCHEDULED EUTHANASIA																P
ANIMAL NO.: 13210 F 1.05 MG/L																
ACTIVITY DECREASED			P													
WOBBLY GAIT			P													

GRADE CODE: P -PRESENT

SLI STUDY NO.: 3428.4
 CLIENT: CORPORATION

TABLE 2
 AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
 INDIVIDUAL CLINICAL OBSERVATIONS
 (POSITIVE FINDINGS)

PAGE 5

CLINICAL OBSERVATIONS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANIMAL NO.: 13210 F 1.05 MG/L															
CONTINUED															
SHALLOW BREATHING															
RAPID BREATHING															
SCHEDULED EUTHANASIA															
ANIMAL NO.: 13211 F 1.05 MG/L															
ACTIVITY DECREASED															
WOBBLY GAIT															
SHALLOW BREATHING															
RAPID BREATHING															
DARK MATERIAL AROUND EYE(S)															
DARK MATERIAL AROUND NOSE															
SCHEDULED EUTHANASIA															
ANIMAL NO.: 13163 F 2.09 MG/L															
FOUND DEAD															
ANIMAL NO.: 13174 F 2.09 MG/L															
ACTIVITY DECREASED															
WOBBLY GAIT															
RAPID BREATHING															
LABORED BREATHING															
FEW FECES															
ROUGH COAT															
HUNCHED POSTURE															

GRADE CODE: P -PRESENT

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

PAGE 6

TABLE 2
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL CLINICAL OBSERVATIONS
(POSITIVE FINDINGS)

CLINICAL OBSERVATIONS	DAY OF STUDY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANIMAL NO.: 13174 F 2.09 MG/L	CONTINUED															
UNKEMPT APPEARANCE			P													
URINE STAIN - MODERATE			P													
EYELIDS PARTIALLY CLOSED			P													
FOUND DEAD				P												
ANIMAL NO.: 13175 F 2.09 MG/L																
FOUND DEAD																
ANIMAL NO.: 13179 F 2.09 MG/L																
FOUND DEAD																
ANIMAL NO.: 13181 F 2.09 MG/L																
ACTIVITY DECREASED																
WOBBLY GAIT																
RAPID BREATHING																
LABORED BREATHING																
HUNCHED POSTURE																
EYELIDS PARTIALLY CLOSED																
FOUND DEAD																
GRADE CODE: P -PRESENT																

SLI STUDY NO.: 3428.4
CLIENT CORPORATION

TABLE 3
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL BODY WEIGHTS (GRAMS)

PAGE 1

MALE GROUP: 1.05 MG/L

DAY 0 7 14

ANIMAL	0	7	14
13194	274	-	-
13208	276	308	336
13335	268	-	-
13336	288	-	-
13339	260	-	-
MEAN	273	308	336
S.D.	10.4	-	-
N	5	1	1

NOTE: THE STANDARD DEVIATION IS NOT CALCULATED WHEN N ≤ 2.

MALE GROUP: 2.09 MG/L

ANIMAL	(FOUND DEAD)			
	DAY 0	1	7	14
13149	266	-	-	-
13150	255	-	261	307
13153	253	-	-	-
13155	262	-	-	-
13156	256	237	-	-
MEAN	258	-	261	307
S.D.	5.4	-	-	-
N	5	1	1	1

NOTE: THE STANDARD DEVIATION IS NOT CALCULATED WHEN $N \leq 2$; THE MEAN IS NOT CALCULATED FOR ANIMALS FOUND DEAD.

SLI STUDY NO.: 3428.4
CORPORATION

TABLE 3
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL BODY WEIGHTS (GRAHS)

PAGE 3

FEMALE GROUP: 1.05 MG/L

DAY 0 7 14

ANIMAL

13173	230	239	245
13177	241	248	252
13178	237	223	232
13210	243	253	263
13211	234	240	250
MEAN	237	241	248
S.D.	5.2	11.4	11.3
N	5	5	5

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

TABLE 3
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL BODY WEIGHTS (GRAHS)

PAGE 4

FEMALE GROUP: 2.09 MG/L

DAY	(FOUND DEAD) (FOUND DEAD)			
	0	1	2	7
ANIMAL				
13163	240	-	-	-
13174	235	-	199	-
13175	238	-	-	-
13179	239	-	-	-
13181	248	222	-	-
MEAN	240	-	-	-
S.D.	4.8	-	-	-
N	5	-	-	-

NOTE: THE MEAN IS NOT CALCULATED FOR ANIMALS FOUND DEAD.

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

TABLE 4
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL GROSS NECROPSY OBSERVATIONS

PAGE 1

ANIMAL NO.	GROUP:	1.05 MG/L	MALE	FOUND DEAD	GRADE
				GROSS: MENINGEAL VESSELS CONGESTED	P
				GROSS: DARK RED	P
				ALL LOBES	
ANIMAL NO. 13194	GROUP:	1.05 MG/L	MALE	FOUND DEAD	P
				GROSS: DARK RED	
				ALL LOBES	
				GROSS: HAIRCOAT - WET MATTING	P
				AROUND EYES, NOSE, MOUTH, UROGENITAL AND ABDOMINAL AREAS, LIGHT YELLOW	
ANIMAL NO. 13335	GROUP:	1.05 MG/L	MALE	FOUND DEAD	P
				GROSS: DARK RED	
				ALL LOBES	
				GROSS: HAIRCOAT - WET MATTING	P
				AROUND EYES, NOSE, MOUTH, UROGENITAL AND ABDOMINAL AREAS, LIGHT YELLOW	
ANIMAL NO. 13336	GROUP:	1.05 MG/L	MALE	FOUND DEAD	P
				GROSS: DARK RED	
				ALL LOBES	
				GROSS: HAIRCOAT - WET MATTING	P
				AROUND NOSE AND MOUTH, CLEAR	
ANIMAL NO. 13339	GROUP:	1.05 MG/L	MALE	FOUND DEAD	P
				GROSS: MENINGEAL VESSELS CONGESTED	P
				GROSS: DARK RED	P
				ALL LOBES	
				GROSS: HAIRCOAT - WET MATTING	P
				AROUND NOSE; RED	
ANIMAL NO. 13149	GROUP:	2.09 MG/L	MALE	FOUND DEAD	P
				GROSS: MENINGEAL VESSELS CONGESTED	P
				GROSS: DARK RED	P
				ALL LOBES	
				GROSS: HAIRCOAT - WET MATTING	P
				PORTIONS OF ENTIRE BODY; TAN	

GROSS GRADE CODE: 1-SLIGHT, 2-MODERATE, 3-MARKED, P-PRESENT

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

TABLE 4
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL GROSS NECROPSY OBSERVATIONS

PAGE 2

ANIMAL NO.	GROUP:	MG/L	SEX	FOUNDED	GRADE
13153	GROUP:	2.09	MALE	FOUND DEAD	P
	LIVER			GROSS: BLACKISH-PURPLE ALL LOBES	
	LUNGS			GROSS: DARK RED	P
	EXT. APPEARANCE			ALL LOBES GROSS: HAIRCOAT - WET MATTING PORTIONS OF ENTIRE BODY; TAN	P
13155	GROUP:	2.09	MALE	FOUND DEAD	P
	LUNGS			GROSS: DARK RED	
	EXT. APPEARANCE			ALL LOBES GROSS: HAIRCOAT - WET MATTING PORTIONS OF ENTIRE BODY; TAN	P
13156	GROUP:	2.09	MALE	FOUND DEAD	P
	LUNGS			GROSS: DARK RED	
	EXT. APPEARANCE			ALL LOBES GROSS: HAIRCOAT - WET MATTING PORTIONS OF ENTIRE BODY; TAN	P
13163	GROUP:	2.09	FEMALE	FOUND DEAD	P
	LUNGS			GROSS: DARK RED	
	EXT. APPEARANCE			ALL LOBES GROSS: HAIRCOAT - WET MATTING PORTIONS OF ENTIRE BODY; TAN	P
13174	GROUP:	2.09	FEMALE	FOUND DEAD	P
	SMALL INTESTINE			GROSS: CONTENT ABNORMAL	
	LUNGS			JEJUNUM; DARK RED MUCOID GROSS: DARK RED	P
				ALL LOBES	

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GROSS GRADE CODE: 1-SLIGHT, 2-MODERATE, 3-MARKED, P-PRESENT

SLI STUDY NO.: 3428.4
CLIENT: CORPORATION

TABLE 4
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL GROSS NECROPSY OBSERVATIONS

PAGE 3

GRADE

ANIMAL NO. 13174 (CONTINUED)

STOMACH GROSS: CONTENT ABNORMAL
YELLOWISH-TAN MUCOID MATERIAL
EXT. APPEARANCE GROSS: HAIRCOAT - WET MATTING
UROGENITAL, INGUINAL AND ABDOMINAL AREAS; YELLOW
EXT. APPEARANCE GROSS: HAIRCOAT - DARK MATERIAL
AROUND EYES, NOSE AND MOUTH; RED

P
P
P

ANIMAL NO. 13175 GROUP: 2.09 MG/L FEMALE
BRAIN
LUNGS

FOUND DEAD
GROSS: MENINGEAL VESSELS CONGESTED
GROSS: DARK RED

P
P

EXT. APPEARANCE

ALL LOBES
GROSS: HAIRCOAT - WET MATTING
PORTIONS OF ENTIRE BODY; TAN

P

ANIMAL NO. 13179 GROUP: 2.09 MG/L FEMALE
BRAIN
LUNGS

FOUND DEAD
GROSS: MENINGEAL VESSELS CONGESTED
GROSS: DARK RED

P
P

EXT. APPEARANCE

ALL LOBES
GROSS: HAIRCOAT - WET MATTING
PORTIONS OF ENTIRE BODY; TAN

P

ANIMAL NO. 13181 GROUP: 2.09 MG/L FEMALE
LUNGS

FOUND DEAD
GROSS: DARK RED

P

EXT. APPEARANCE

ALL LOBES
GROSS: HAIRCOAT - WET MATTING
AROUND NOSE, MOUTH AND DORSAL HEAD; LIGHT RED
UROGENITAL AND VENTRAL ABDOMEN; YELLOW

P

GROSS GRADE CODE: 1-SLIGHT, 2-MODERATE, 3-MARKED, P-PRESENT

SLI STUDY NO.: 3428.4
CLIENT CORPORATION

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
INDIVIDUAL GROSS NECROPSY OBSERVATIONS

TABLE 4

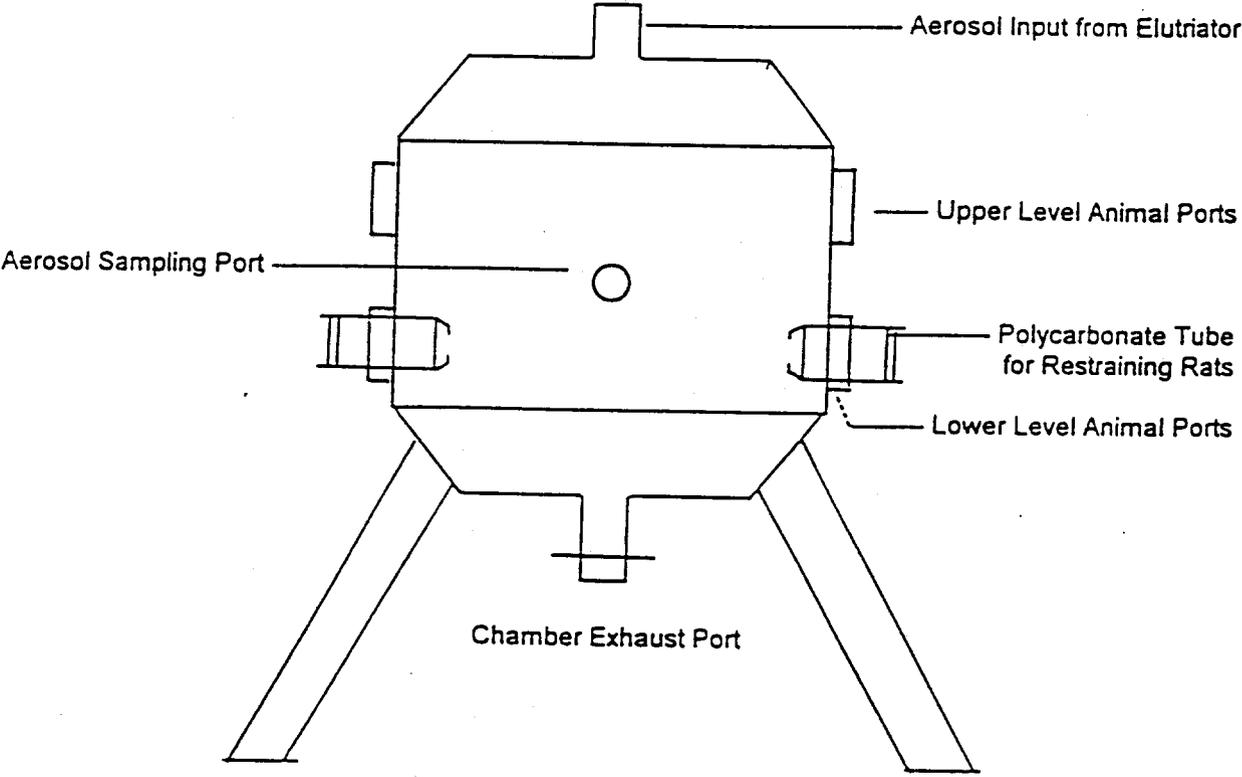
PAGE 4

GRADE

ANIMAL NO.	GROUP	DOSE (MG/L)	SEX	STATUS	GROSS OBSERVATIONS	GRADE
13208	1.05	MALE	SCHEDULED EUTHANASIA	GROSS: NO SIGNIFICANT CHANGES OBSERVED		
13150	2.09	MALE	SCHEDULED EUTHANASIA	GROSS: NO SIGNIFICANT CHANGES OBSERVED		
13173	1.05	FEMALE	SCHEDULED EUTHANASIA	GROSS: SCABBING AROUND NOSE	P	
13177	1.05	FEMALE	SCHEDULED EUTHANASIA	GROSS: MISSHAPEN	P	
13178	1.05	FEMALE	SCHEDULED EUTHANASIA	GROSS: NO SIGNIFICANT CHANGES OBSERVED		
13210	1.05	FEMALE	SCHEDULED EUTHANASIA	GROSS: PITTED	P	
13211	1.05	FEMALE	SCHEDULED EUTHANASIA	GROSS: NO SIGNIFICANT CHANGES OBSERVED		

GROSS GRADE CODE: 1-SLIGHT, 2-MODERATE, 3-MARKED, P-PRESENT

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SIDE VIEW



TOP VIEW

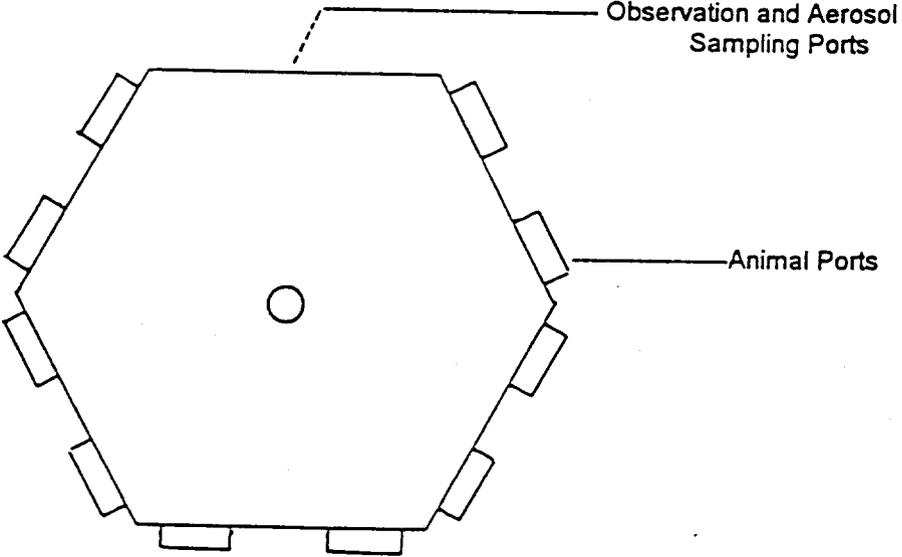


Figure 1: Unifab 100L Nose-Only Inhalation Chamber

APPENDIX A

Preliminary Aerosol Generation Trials

PRELIMINARY AEROSOL GENERATION TRIALS

Prior to experimental initiation and the second exposure, preliminary aerosol generation trials were conducted. These procedures were performed in order to determine the most efficient means of generating an aerosol of the test article. The type of equipment used during each aerosol trial procedure is presented below. In each trial, attempts were made to generate the highest concentration of the test article while utilizing equipment that would minimize the aerodynamic particle size of the aerosol.

Trial #1

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
15 L/min dilution air
100% test article concentration

Concentration: 3.24 mg/L

Trial #2

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
20 L/min dilution air
100% test article concentration

Concentration: 2.74 mg/L

Trial #3

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
28 L/min dilution air
100% test article concentration

Concentration: 2.22 mg/L

Trial #4

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
32 L/min dilution air
100% test article concentration

Concentration: 1.82 mg/L

Trial #5

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
30 L/min dilution air
100% test article concentration

Concentration: 2.00 mg/L

Trial #6

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
40 L/min dilution air
100% test article concentration

Concentration: 1.18 mg/L

Trial #7

Equipment Used: One Unifab 100L nose-only chamber
One TSI 9306 6-Jet Atomizer (1 jet used)
30 psi input air
44 L/min dilution air
100% test article concentration

Concentration: 1.06 mg/L

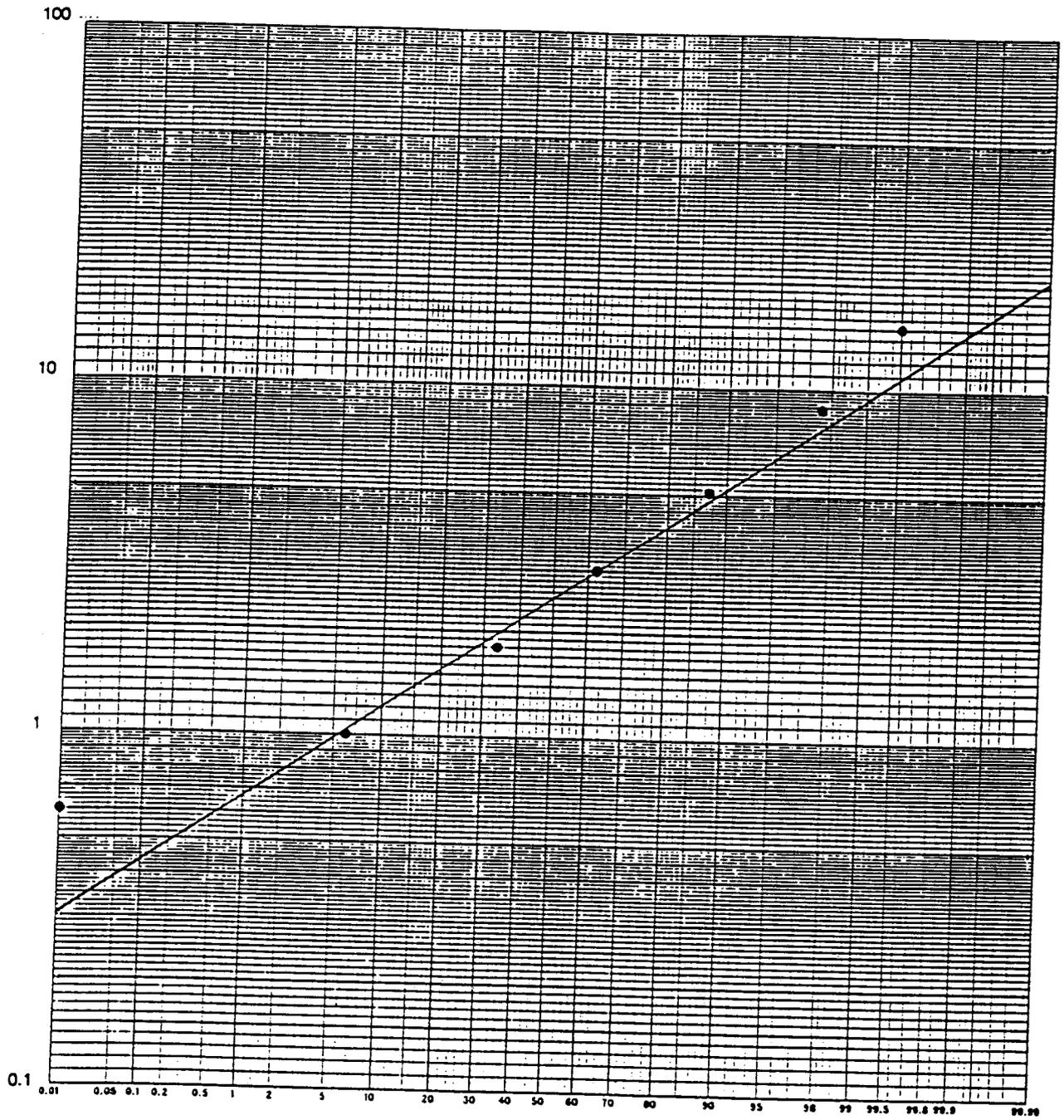
The results of the above procedure indicated that the equipment utilized during Trial #5 produced an aerosol concentration approximately equivalent to 2.00 mg/L. Therefore, this equipment design was used for the first limit test exposure. Using the equipment design determined by the aerosol generation trial the aerosol aerodynamic particle size distribution

was then determined utilizing the ITP 7 L/minute Cascade Impactor. The results of trials 6 and 7 indicated that the equipment utilized during Trial #7 produced an aerosol concentration approximately equivalent to 1.00 mg/L. Therefore, this equipment design was used for the second limit test exposure.

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE DATA
PRELIMINARY TRIAL NO. 5

Impactor Stage	Effective Cutoff Diameter (μm)	Filter Weight (mg)		Weight Change (mg)	% Particles in Size Range	Cumulative % Less than 100%
		Pre-sample	Post-sample			
1	≥ 15.0	73.2	73.4	0.2	0.52	99.5
2	8.8	72.8	73.5	0.7	1.84	97.6
3	5.1	72.3	76.2	3.9	10.24	87.4
4	3.0	72.5	82.0	9.5	24.93	62.5
5	1.8	71.5	82.5	11.0	28.87	33.6
6	1.0	73.5	84.0	10.5	27.56	6.0
7	0.6	71.6	73.9	2.3	6.04	0.0
Final Filter	0.0	118.5	118.5	0.0	0.00	0.0

Mass Median Aerodynamic Diameter = $2.5\mu\text{m}$
Geometric Standard Deviation = ± 1.8
Percentage $\leq 4.0\mu\text{m}$ = 79%



Particles Less Than Effective Cutoff Diameter (%)

Aerosol Particle Size Distribution

Preliminary Trial No. 5

APPENDIX B

**Individual Aerosol Generation and
Chamber Environmental Data**

SLI Study No. 3428.4

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1.05 mg/L Exposure Level

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
CHAMBER ENVIRONMENTAL DATA
EXPOSURE: 1.05 MG/L

TIME (MIN.)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	OXYGEN CONTENT (%)
0	67.8	15.1	20.9
30	67.8	12.1	21.0
60	68.1	13.1	21.0
90	68.2	11.8	21.0
120	68.6	9.4	21.0
150	68.9	10.5	21.0
185	68.8	9.4	21.0
212	68.9	11.5	21.0
240	69.5	9.2	21.0

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
 TIME WEIGHTED GRAVIMETRIC CONCENTRATION
 EXPOSURE: 1.05 mg/L

Sample No.	Sample Time (min.)	Aerosol Conc. (mg/L)	Mean Conc. Per Interval (mg/L)	Interval Length (min.)	Time Weighted Conc. Per Interval
1	0	1.24			
			1.12	21.00	23.52
2	21	1.00			
			1.00	9.00	9.00
3	30	1.00			
			1.03	30.00	30.90
4	60	1.06			
			1.05	30.00	31.50
5	90	1.04			
			1.04	30.00	31.20
6	120	1.04			
			1.05	30.00	31.50
7	150	1.06			
			1.07	35.00	37.45
8	185	1.08			
			1.04	27.00	28.08
9	212	1.00			
			1.03	28.00	28.84
10	240	1.06			
TOTAL				240.00	251.99
TIME WEIGHTED MEAN GRAVIMETRIC CONCENTRATION (MG/L)					1.05

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE DATASAMPLE NO.: A
EXPOSURE: 1.05 mg/L

Impactor Stage	Effective Cutoff Diameter (μm)	Filter Weight (mg)		Weight Change (mg)	% Particles in Size Range	Cumulative % Less than 100%
		Pre-sample	Post-sample			
1	≥ 15.0	72.1	72.3	0.2	1.03	99.0
2	8.8	71.4	71.8	0.4	2.06	96.9
3	5.1	72.2	75.1	2.9	14.95	82.0
4	3.0	73.3	79.9	6.6	34.02	47.9
5	1.8	73.0	77.9	4.9	25.26	22.7
6	1.0	72.3	76.0	3.7	19.07	3.6
7	0.6	72.8	73.5	0.7	3.61	0.0
Final Filter	0.0	119.3	119.3	0.0	0.00	0.0

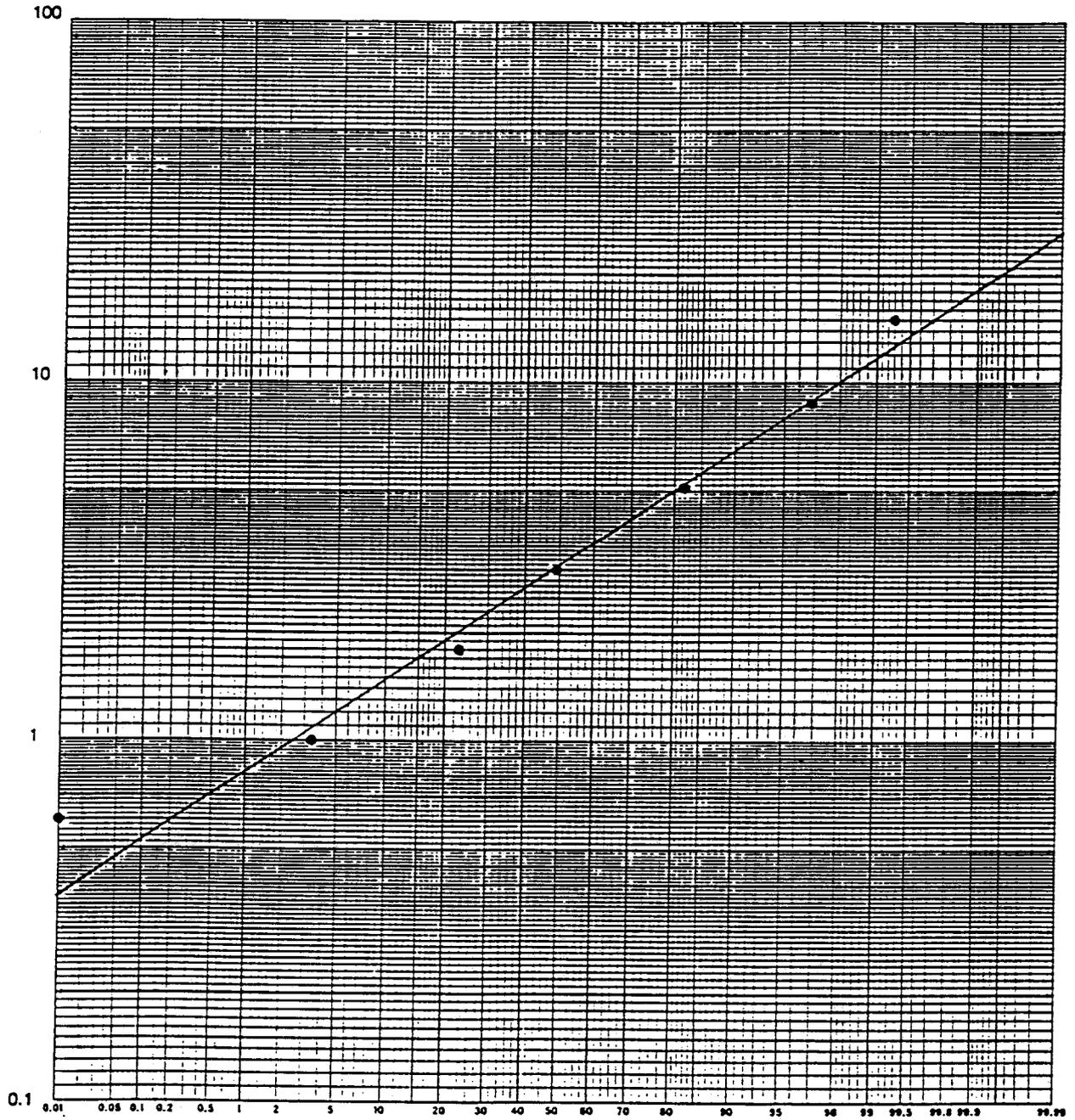
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE DATA
SAMPLE NO.: B
EXPOSURE: 1.05 mg/L

Impactor Stage	Effective Cutoff Diameter (μm)	Filter Weight (mg)		Weight Change (mg)	% Particles in Size Range	Cumulative % Less than 100%
		Pre-sample	Post-sample			
1	≥ 15.0	73.7	73.8	0.1	0.49	99.5
2	8.8	72.4	73.0	0.6	2.91	96.6
3	5.1	72.4	75.5	3.1	15.05	81.6
4	3.0	74.3	80.6	6.3	30.58	51.0
5	1.8	72.6	78.2	5.6	27.18	23.8
6	1.0	71.9	76.1	4.2	20.39	3.4
7	0.6	72.6	73.3	0.7	3.40	0.0
Final Filter	0.0	119.4	119.4	0.0	0.00	0.0

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE SUMMARY
EXPOSURE: 1.05 mg/L

Impactor Stage	Effective Cutoff Diameter (μm)	Cumulative % less than 100%		
		Sample A	Sample B	Mean
1	≥ 15.0	99.0	99.5	99.3
2	8.8	96.9	96.6	96.8
3	5.1	82.0	81.6	81.8
4	3.0	47.9	51.0	49.5
5	1.8	22.7	23.8	23.3
6	1.0	3.6	3.4	3.5
7	0.6	0.0	0.0	0.0
Final Filter	0.0	0.0	0.0	0.0

Mass Median Aerodynamic Diameter = $3.1\mu\text{m}$
Geometric Standard Deviation = ± 1.8
Percentage $\leq 4.0\mu\text{m}$ = 67%



Particles Less Than Effective Cutoff Diameter (%)

Aerosol Particle Size Distribution
1.05 mg/L Exposure

SLI Study No. 3428.4

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2.09 mg/L Exposure Level

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
CHAMBER ENVIRONMENTAL DATA
EXPOSURE: 2.09 MG/L

TIME (MIN.)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	OXYGEN CONTENT (%)
0	68.6	25.2	20.9
30	68.5	24.5	20.9
60	68.6	23.2	20.9
91	68.7	21.9	20.9
121	69.0	21.1	20.9
150	68.8	20.5	20.9
180	68.6	19.3	20.9
210	68.9	18.5	20.9
240	69.2	18.1	20.9

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
TIME WEIGHTED GRAVIMETRIC CONCENTRATION
EXPOSURE: 2.09 mg/L

Sample No.	Sample Time (min.)	Aerosol Conc. (mg/L)	Mean Conc. Per Interval (mg/L)	Interval Length (min.)	Time Weighted Conc. Per Interval
1	0	2.06			
			2.07	30.00	62.10
2	30	2.08			
			2.09	30.00	62.70
3	60	2.10			
			2.12	31.00	65.72
4	91	2.14			
			2.11	30.00	63.30
5	121	2.08			
			2.09	29.00	60.61
6	150	2.10			
			2.09	30.00	62.70
7	180	2.08			
			2.08	30.00	62.40
8	210	2.08			
			2.07	30.00	62.10
9	240	2.06			
TOTAL				240.00	501.63
TIME WEIGHTED MEAN GRAVIMETRIC CONCENTRATION (MG/L)					2.09

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE DATASAMPLE NO.: A
EXPOSURE: 2.09 mg/L

Impactor Stage	Effective Cutoff Diameter (μm)	Filter Weight (mg)		Weight Change (mg)	% Particles in Size Range	Cumulative % Less than 100%
		Pre-sample	Post-sample			
1	≥ 15.0	73.1	73.2	0.1	0.19	99.8
2	8.8	72.3	72.9	0.6	1.13	98.7
3	5.1	71.9	76.4	4.5	8.44	90.2
4	3.0	72.0	86.1	14.1	26.45	63.8
5	1.8	72.9	89.9	17.0	31.89	31.9
6	1.0	72.2	86.4	14.2	26.64	5.3
7	0.6	73.2	75.9	2.7	5.07	0.2
Final Filter	0.0	119.1	119.2	0.1	0.19	0.0

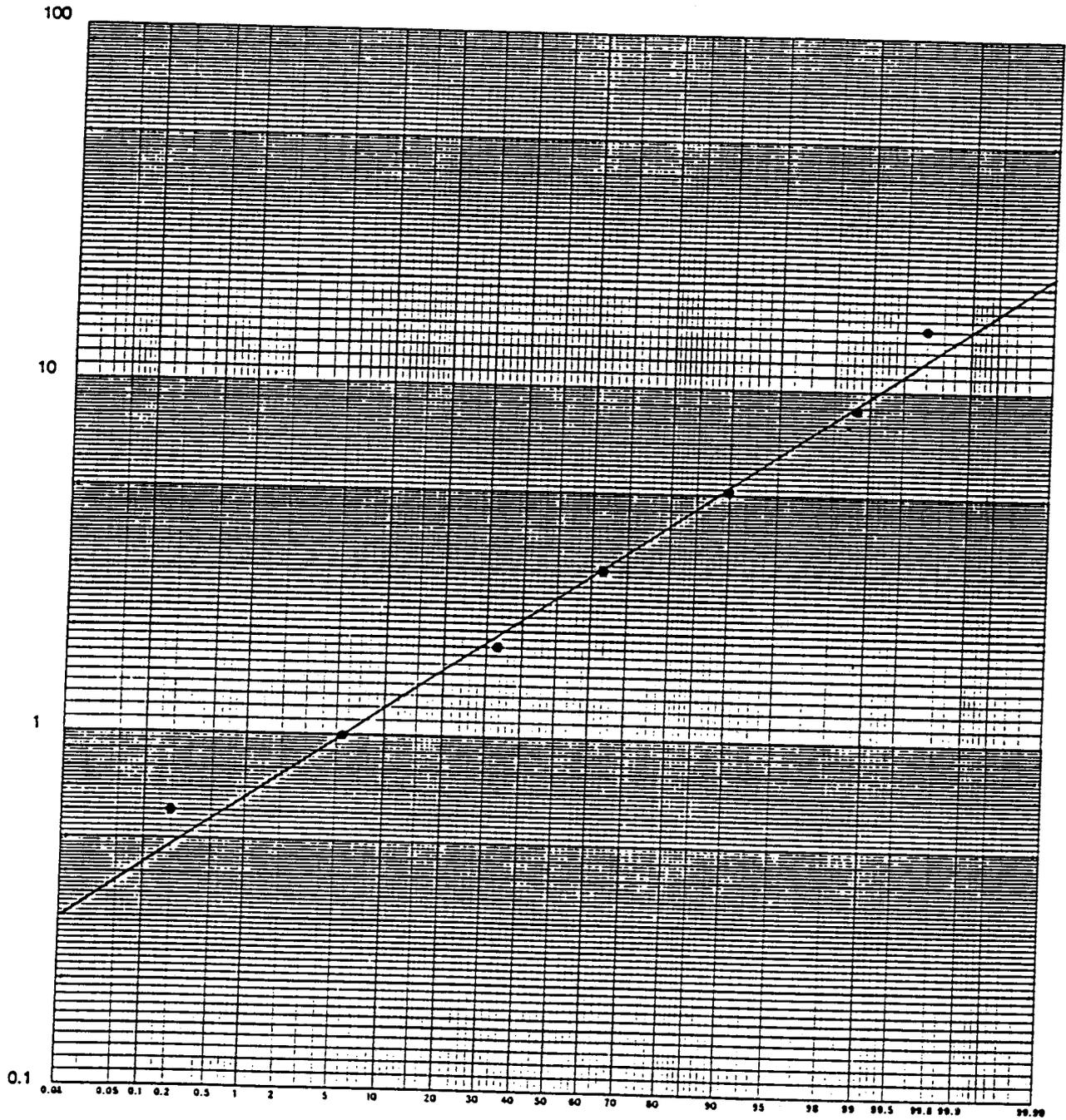
AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE DATASAMPLE NO.: B
EXPOSURE: 2.09 mg/L

Impactor Stage	Effective Cutoff Diameter (μm)	Filter Weight (mg)		Weight Change (mg)	% Particles in Size Range	Cumulative % Less than 100%
		Pre-sample	Post-sample			
1	≥ 15.0	72.8	73.0	0.2	0.36	99.6
2	8.8	72.3	72.8	0.5	0.90	98.7
3	5.1	72.4	77.5	5.1	9.17	89.6
4	3.0	73.8	88.6	14.8	26.62	63.0
5	1.8	73.3	89.5	16.2	29.14	33.8
6	1.0	71.0	86.7	15.7	28.24	5.6
7	0.6	72.2	75.2	3.0	5.40	0.2
Final Filter	0.0	123.7	123.8	0.1	0.18	0.0

AN ACUTE NOSE-ONLY INHALATION TOXICITY STUDY IN RATS
AERODYNAMIC PARTICLE SIZE SUMMARY
EXPOSURE: 2.09 mg/L

Impactor Stage	Effective Cutoff Diameter (μm)	Cumulative % less than 100%		
		Sample A	Sample B	Mean
1	≥ 15.0	99.8	99.6	99.7
2	8.8	98.7	98.7	98.7
3	5.1	90.2	89.6	89.9
4	3.0	63.8	63.0	63.4
5	1.8	31.9	33.8	32.9
6	1.0	5.3	5.6	5.5
7	0.6	0.2	0.2	0.2
Final Filter	0.0	0.0	0.0	0.0

Mass Median Aerodynamic Diameter = $2.5\mu\text{m}$
Geometric Standard Deviation = ± 1.8
Percentage $\leq 4.0\mu\text{m}$ = 79%



Particles Less Than Effective Cutoff Diameter (%)

Aerosol Particle Size Distribution
2.09 mg/L Exposure

APPENDIX C

SLI Personnel Responsibilities

SLI PERSONNEL RESPONSIBILITIES

Deborah A. Douds, M.S.	Study Director/Assistant Manager of Acute Toxicology
Kimberly L. Bonnette, M.S., LATG	Alternate Contact/Manager of Acute Toxicology
Robert C. Springborn, Ph.D.	President, Chairman and CEO
Malcolm Blair, Ph.D.	Vice President and Managing Director
Joseph C. Siglin, Ph.D., DABT	Director of Toxicology
Pamela S. Smith, ALAT	Unit Leader
Richard L. Woeller, B.S.	Primary Technician/Senior Acute Technician
Delores P. Knippen	Supervisor of Pharmacy
Steven H. Magness, B.S., LATG	Supervisor of Gross and Fetal Pathology
Jan K. Severt, B.S., ALAT	Supervisor of Acute Report Preparation
Anita M. Bosau, RQAP-GLP	Director of Compliance Assurance
Christopher W. Wilson, B.S., RQAP-GLP	Supervisor of Acute Quality Assurance
Deanna M. Talerico, RQAP-GLP	Supervisor of Nonacute Quality Assurance
J. Dale Thurman, D.V.M., M.S. DACVP	Director of Pathology