

STUDY NO. 03-6140
LIQUIFIED PETROLEUM GAS:
A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

Final Report

Performed by: Huntingdon Life Sciences (HLS)
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East Millstone, New Jersey 08875-2360

Submitted to: American Petroleum Institute (API)
1220 L Street, Northwest
Washington, D.C. 20005-4070

Attn: 

Date: 19 February 2010

GLP STATEMENT

This study was conducted in compliance with the United States Environmental Protection Agency's Good Laboratory Practice Standards 40 CFR Part 792 (TSCA) and Organization for Economic Cooperation and Development (OECD) Principles of Good Laboratory Practices ENV/MC/CHEM(98)17 with the exception of the following that was not considered to have affected the integrity of the study:

Test substance characterization and storage stability testing was not performed in a GLP compliant laboratory.



Study Director

19 Feb 10

Date



Sponsor Representative

2/19/10

Date

SIGNATURE PAGE**SCIENTIST**

The following Scientist was responsible for the overall conduct of this study. Departmental supervisory personnel are listed on the personnel page of this report (Appendix T).

19 FEB 10

Date

Study Director

SCIENTIFIC REVIEW

The following Scientist has reviewed and approved this report:

8 FEB 10

Date

Director, Developmental and Reproductive Toxicology¹

¹ Keith P. Hazelden was the original scientific reviewer of this report and is no longer employed at the Testing Facility. Robert M. Parker is assuming responsibility for final review of this report.

QUALITY ASSURANCE STATEMENT

Listed below are the dates that this study was inspected by the Quality Assurance Unit of Huntingdon Life Sciences, East Millstone, New Jersey, and the dates that findings were reported to the Study Director and Management. This report reflects the raw data as far as can be reasonably established.

Type of Inspection	Date(s) of Inspection	Reported to Study Director and Management
GLP Protocol Review	1 – 2 Sep 04	2 Sep 04
Exposure, Monitoring & Equipment Records	21 Oct 04	26 Oct 04
Concentration Measurement	28 Oct 04	28 Oct 04
Terminal Necropsy & Training Records	3 Nov 04	4 Nov 04
Formulation Chemistry Data and Report	7 Jan 05	10 Jan 05
Final Report & Study Data	4 – 10 Jan 05	10 Jan 05
Final Report Review	3 Apr 09	9 Apr 09
Protocol Amendment No. 1	29 Jan 10	29 Jan 10



Quality Assurance Group Leader

9 Feb 10

Date

**LIQUIFIED PETROLEUM GAS:
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IN THE RAT VIA WHOLE-BODY EXPOSURES**

SUMMARY

This study was designed to provide a preliminary assessment of the toxicity of Liquefied Petroleum Gas (LPG) when administered as a gas/vapor via whole-body inhalation to rats for 2 weeks in order to determine appropriate exposure levels for a subsequent 13 week inhalation study and developmental inhalation study. These studies are intended to be used by the Petroleum Gases HPV Test Group in the EPA HPV Challenge Program.

Male and time-mated pregnant female Sprague-Dawley CD[®] rats (10/sex/group) were exposed daily for six hours per day to 0 (Air Control), 100, 1000 or 10000 ppm LPG for 7 days per week for 2 consecutive weeks. Exposure levels were determined using an infrared spectrophotometer 4 times per chamber per day. Particle size distribution measurements were also made once per chamber per day using a TSI Aerodynamic Particle Sizer. At the end of the treatment period, all animals were euthanized and necropsied. The following parameters were evaluated: viability, clinical observations, body weights, feed consumption, organ weights, macroscopic observations and reproductive outcome.

The mean ($\pm$ standard deviation) analytical exposure concentrations of LPG were determined to be 0.0 ± 0.0 , 99.3 ± 9.8 , 999 ± 421 and 10000 ± 412 ppm for the Air Control and the exposure groups, respectively. Particle sizing results indicated that the atmospheres were essentially gas/vapor only, as expected, since there was no substantial difference between the test substance chambers and the Air Control chamber.

All animals survived to termination. The test animals were unremarkable during the daily exposure periods and the non-exposure periods. There were no exposure-related differences in body weights or in feed consumption or reproductive outcome in the test substance exposed animals compared to the Air Control animals. No gross abnormalities related to test substance exposure were evident at necropsy examination and there were no exposure-related differences in organ weights (absolute and relative to body weight or brain weight) in the test substance exposed animals compared to the Air Control animals.

In conclusion, two weeks of exposure of rats (males and time-mated pregnant females) to LPG at exposure levels of 100, 1000 and 10000 ppm resulted in no effects on the animals. Therefore, the 10000 ppm exposure level was a no observed effect level (NOEL) and was considered an acceptable high exposure level (limited by safety considerations for a flammable gas) for a subsequent developmental toxicity study and 13 week subchronic inhalation toxicity study.

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1. INTRODUCTION

The purpose of this study was to assess of the toxicity of Liquified Petroleum Gas when administered via whole-body inhalation to rats for 2 weeks in order to determine appropriate exposure levels for a subsequent 13 Week Inhalation Study 03-6141 and a Developmental Inhalation Study 03-4253. The studies are intended to be used by the Petroleum Gases HPV Test Group in the EPA HPV Challenge Program.

2. MATERIALS AND METHODS**2.1. STUDY MANAGEMENT****2.1.1. SPONSOR**

American Petroleum Institute (API)
1220 L Street, Northwest
Washington, D.C. 20005-4070

2.1.2. SPONSOR REPRESENTATIVE

[REDACTED]

2.1.3. TESTING FACILITY

Huntingdon Life Sciences (HLS)
100 Mettlers Road
East Millstone, New Jersey 08875-2360

2.1.4. STUDY DIRECTOR

[REDACTED]

2.2. STUDY DATES**2.2.1. STUDY INITIATION**

8 October 2004 (Date Study Director signed the Protocol)

2.2.2. DATE OF ANIMAL RECEIPT

7 October 2004 (Males)* - Experimental Start Date
15 & 18 October 2004 (Females)

2.2.3. EXPOSURE INITIATION

20 October 2004** (Experimental Start Date), 21 and 22 October
2004

2.2.4. EXPOSURE TERMINATION

2, 3 and 4 November 2004

2.2.5. TERMINAL SACRIFICES

3, 4 and 5 November 2004

2.2.6. EXPERIMENTAL TERMINATION

5 November 2004 (Date of Last Data Collection)

2.2.7. STUDY COMPLETION

19 February 2010 (Date Final Report is signed by the Study
Director)

*as per OECD GLPs; ** as per EPA GLPs

2.3. EXPERIMENTAL OUTLINE

Group	Test Substance	Exposure Level ^a	Number of Animals			
			Initial		Necropsy	
		ppm	M	F	M	F
1	Air Control	0	10	10	10	10
2	Liquified Petroleum Gas	100	10	10	10	10
3	Liquified Petroleum Gas	1000	10	10	10	10
4	Liquified Petroleum Gas	10000	10	10	10	10

^aExposures were 6 hours per day for 7 consecutive days per week for 2 weeks for a total of exactly 14 exposures. Exposure levels are expressed as ppm of test substance. The exposures were conducted via whole-body exposure.

M = male; F = female (these animals were timed-mated and were exposed from gestation days 6 to 19).

The first day of exposures was defined as day 0 of the study (males).

The first day of gestation was defined as day 0 of the study (females).

2.4. JUSTIFICATIONS

2.4.1. ROUTE, DURATION AND FREQUENCY OF ADMINISTRATION

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of the exposures were considered to be the minimum necessary for determining exposure levels for a subsequent 13 week inhalation study 03-6141 and a developmental inhalation study 03-4253.

2.4.2. EXPOSURE LEVEL SELECTION

The exposure levels were selected based on establishing (for safety reasons) the high exposure level as no more than 50% of the lower explosion limit (LEL = 2.1% = 21000 ppm) for the test substance.

2.4.3. TEST ANIMAL SELECTION

The rat is an animal model commonly utilized in toxicity studies as recommended in OECD and EPA guidelines and will be used in the subsequent subchronic toxicity study 03-6141. The female rats were time-mated because this study also served as a range-find study for a developmental toxicity study 03-4253. In addition, a historical database is available for comparative evaluation.

2.4.4. NUMBER OF ANIMALS

The number of animals in the study was considered to be the minimum necessary for scientific and statistical reasons in order to evaluate the data with sufficient confidence levels.

2.5. TEST SUBSTANCE

Liquified Petroleum Gas

2.5.1. TEST SUBSTANCE CATEGORY

Industrial Gas

2.5.2. SUPPLIER

ChevronTexaco Energy Research and Technology Co.
100 Chevron Way
Richmond, Virginia 94802

2.5.3. LOT NUMBER

120701-01

2.5.4. PURITY

100% LPG (see Chevron analytical report in Appendix Q)

2.5.5. DESCRIPTION

Colorless gas or liquid

2.5.6. DATE RECEIVED

30 August 2004

2.5.7. EXPIRATION DATE

31 December 2007

2.5.8. ANALYSIS

Documentation of the identity, strength, purity, composition, storage stability, and method of synthesis, fabrication, and/or derivation of the test substance and the maintenance of these records were the responsibility of the Sponsor.

2.5.9. STORAGE

Ambient conditions

2.5.10. ARCHIVAL SAMPLE

The sponsor arranged for storage of an archival sample at a contract archival facility (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA 20166). Since multiple studies (03-6141 & 03-4253) were conducted with the same test substance, a common archival sample was taken and appropriately labeled. The testing facility arranged for safe transportation on 15 September 2005 of the archival sample to the archival facility, in compliance with all applicable regulations.

2.5.11. DISPOSITION

Following completion of the final study with this test substance, the testing facility informed the sponsor of the volume of remaining test substance as well as the number of test substance containers. The sponsor then instructed the testing facility to ship the test substance and containers to Chevron and this was done on 11 January 2007. No test substance or container (even empty ones) will be disposed of until the issuance of the final report.

2.6. TEST ANIMALS**2.6.1. SPECIES**

Albino Rats (Outbred) VAF/Plus[®]
CD[®] (Sprague-Dawley derived) [CrI: CD[®] BR]
CrI: CD (SD) IGS BR

2.6.2. SUPPLIER

Charles River Laboratories
Kingston, New York 12484

2.6.3. NUMBER OF ANIMALS

Received:
88 total (44 males, 44 females)

Placed on test:
80 total (40 males, 40 females)

2.6.4. AGE AT RECEIPT

Approximately 6 weeks (males)
Approximately 75 to 85 days in age (females)

2.6.5. AGE AT INITIATION OF DOSING

Approximately 8 weeks (males)
Approximately 78 to 90 days in age (females)

2.6.6. WEIGHT AT INITIATION OF DOSING (GRAMS)

	Mean	Range
Male:	258	234 to 279
Female:	255	226 to 282

Individual weights of animals placed on test were within $\pm 20\%$ of the mean weight for each sex.

2.6.7. ACCLIMATION PERIOD

Animals were acclimated for approximately 2 weeks for male animals. Female animals were received on days 1, 2 or 3 of gestation and were quarantined until start of exposures on gestation day 6. All animals were checked for viability twice daily. Prior to assignment to study, all animals were examined to ascertain suitability for study.

2.7. ANIMAL ASSIGNMENT

More animals than required for the study were purchased and acclimated. Male animals considered suitable for study on the basis of pretest physical examinations, body weight data and any other pretest evaluations, were distributed into 4 groups of 10 males by a computerized random sort program so that body weights means for each group were comparable. Female animals considered suitable for study on the basis of pretest physical examinations were randomized into groups on gestation day 4 using a method that ranked the gestation day 4 body weights and randomly assigned each female animal within the block into groups. Disposition of all animals not utilized in the study is maintained in the study file.

2.8. ANIMAL IDENTIFICATION

Each animal was assigned a temporary identification number upon receipt. Each rat was identified with a metal ear tag bearing its assigned animal number. The assigned animal number plus the study number comprised the unique animal number for each animal. In addition, each cage was provided with a cage card that was color-coded for dose level identification and contained study number and animal number information.

2.9. VETERINARY CARE

Animals were monitored by the technical staff for any conditions requiring possible veterinary care and treated as necessary.

2.10. ANIMAL HUSBANDRY DURING NON-EXPOSURE PERIODS

2.10.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

Currently acceptable practices of good animal husbandry were followed e.g., *Guide for the Care and Use of Laboratory Animals*; National Academy Press, 1996. Huntingdon Life Sciences, East Millstone, New Jersey is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC).

2.10.2. HOUSING

Animals were individually housed in suspended, stainless steel wire mesh cages during the study.

2.10.3. FEED

Certified Rodent Diet, No. 5002 (Meal) (PMI Nutrition International, St. Louis, Missouri) was available without restriction 7 days a week except during exposures. Fresh feed was presented weekly.

2.10.4. FEED ANALYSIS

Analysis of each feed lot used during this study was performed by the manufacturer. Results are maintained on file by the Testing Facility. There were no known contaminants in the feed which were expected to interfere with the results of this study.

2.10.5. WATER

Water (Elizabethtown Water Company, Westfield, New Jersey) was available without restriction via an automated watering system.

2.10.6. WATER ANALYSIS

Water analyses are conducted by Elizabethtown Water Company, Westfield, New Jersey (Raritan-Millstone Plant) to ensure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR Part 141). In addition, water samples are collected biannually from representative rooms in the Testing Facility; chemical and microbiological water analyses are conducted on these samples by a subcontract laboratory. Results of all water analyses are maintained on file at the Testing Facility. There were no known contaminants in the water which were expected to interfere with the results of this study.

2.10.7. ENVIRONMENTAL CONDITIONS**Light/Dark Cycle**

A twelve hour light/dark cycle controlled via an automatic timer was provided.

Temperature

Temperature was monitored in accordance with Testing Facility SOPs and maintained within the specified range to the maximum extent possible.

Desired Range: 18 to 26 °C

Actual Range: 20 to 22°C

Daily Average Range: 21 to 22°C

Relative Humidity

Relative humidity was monitored in accordance with Testing Facility SOPs and maintained within the specified range to the maximum extent possible.

Desired Range: 30 to 70%

Actual Range: 45 to 67%

Daily Average Range: 51 to 57%

2.11. HUSBANDRY DURING EXPOSURE**2.11.1. HOUSING**

Animals were individually housed in stainless steel, wire mesh cages within 1000-Liter stainless steel and glass whole-body exposure chambers. The placement of each animal in the chamber was rotated at each exposure to ensure uniform exposure of the animals. A description of the animal rotation is included in the raw data.

2.11.2. FEED

None was provided during exposure.

2.11.3. WATER

None was provided during exposure.

2.11.4. ENVIRONMENTAL CONDITIONS

Chamber temperature and relative humidity were recorded every half-hour during exposure, and maintained, to the maximum extent possible, within the ranges presented below. Excursions in

humidity outside the specified range occurred a total of 71 times (out of 832 total readings) across the 4 groups and were not considered to have affected the integrity of the study.

Temperature

Desired Range: 20 to 24 °C

Actual Range: 20 to 24 °C

Relative Humidity

Desired Range: 40 to 60%

Actual Range: 42 to 68%

2.12. TEST SUBSTANCE PREPARATION

Test substance was received in cans and used as supplied.

2.13. TEST SUBSTANCE ADMINISTRATION AND CHAMBER OPERATION**2.13.1. ROUTE OF ADMINISTRATION**

Inhalation, as a gas/vapor, via whole-body exposure.

2.13.2. FREQUENCY AND DURATION OF ADMINISTRATION

The test substance was administered for 6 hours per day for 7 consecutive days per week for 14 days.

2.13.3. PRE-STUDY TRIALS

Trials were performed (at least two 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the targeted exposure levels. During this time, samples were taken to determine the distribution of the test substance in the exposure chamber.

2.13.4. CHAMBER OPERATION

The whole-body exposure chambers each had a volume of 1000 Liters. Each chamber was operated dynamically under slight negative pressure at a minimum calibrated flow rate of 180 Liters per minute. The final airflow was set to provide at least one air

change (calculated by dividing the chamber volume by the airflow rate) in 5.6 minutes (11 air changes/hour) and a T_{99} equilibrium time (calculated by multiplying the air change by the exponential factor 4.6) of at most 26 minutes. The chambers were recalibrated during the study due to discrepancies in the nominal vs. analytical concentrations, and the new air flows were used beginning day 7 for the remainder of the study. The chamber airflow rate, total flow rate, time for air change and 99% equilibrium time (T_{99}) for each group (initial conditions) are summarized below:

Group	Airflow Rate (Lpm)		Air Change (min)		T_{99} (min)	
Exposure No.	1-6	7-16	1-6	7-16	1-6	7-16
1	204	177	4.9	5.6	23	26
2	215	183	4.7	5.5	21	25
3	221	181	4.5	5.5	21	25
4	224	189	4.5	5.3	21	24

This chamber size and airflow rates were considered adequate to maintain the animal loading factor below 5% and the oxygen level at 19% or higher. At the end of the exposure, all animals remained in chamber for a minimum of the T_{99} equilibrium time. During this time, the chamber was operated at the same flow rate as used during the exposure using clean air only. Recordings of airflow rate and static pressure were made every half-hour during the exposure.

The chamber atmospheres were exhausted through the in-house filtering system, which consisted of a coarse filter, a HEPA filter, and an activated charcoal bed.

Refer to Figures 1 & 2 and Appendix M for equipment details.

2.13.5. EXPOSURE PROCEDURE

Group 1

Animals were exposed to room air only.

Groups 2, 3 and 4

Houseline nitrogen was delivered through a regulator and backpressure gauge via 1/4" tubing to the test substance cylinder to

pressurize it. The test substance flowed from the cylinder via the liquid outlet through a quick-connect fitting with toggle valve, through 1/8" copper tubing coil. The copper coil was maintained in a warm water bath, and monitored by a thermometer. From the coil, the test substance flowed through a metering valve to a mass flowmeter, via 1/8" or 1/4" tubing. The test substance exited the flowmeter and was directed via 1/8" or 1/4" tubing to the turret of a 1000 Liter stainless steel and glass exposure chamber, where it mixed with room air.

Refer to Figures 1 & 2 and Appendix M for equipment details.

2.14. EXPOSURE CHAMBER SAMPLING

2.14.1. CHAMBER SAMPLING

Determination of the exposure levels were made using a MIRAN[®] Ambient Air analyzer equipped with a strip chart recorder. The test atmosphere was drawn from the normal sampling portal through the MIRAN[®] and measurements were recorded at least 4 times during each exposure. The exposure levels were determined by comparison of the measured absorbance to a calibrated response curve constructed using the same instrument settings.

Additionally, one sample was taken per chamber per week (and pretest) using a gas tight syringe for analysis by gas chromatography (GC) to characterize at least 5 major components of the test substance (comprising at least 90% by weight of the test substance). These samples were performed to show test substance stability and comparison between the neat test substance and the test atmospheres.

Refer to Appendix M for equipment details.

2.14.2. PARTICLE SIZE DISTRIBUTION ANALYSIS

Particle size samples were drawn once during each exposure for the chambers and room air using a TSI Aerodynamic Particle Sizer. The samples were drawn for 20 seconds at a rate of 5.0 Lpm. The mass median aerodynamic diameter, geometric standard deviation and total mass concentration were calculated. A computer was used to program the system to the appropriate

settings prior to sampling. The particle size distributions were calculated by the computer and printed out.

Refer to Appendix M for equipment details.

2.14.3. NOMINAL CONCENTRATION

The nominal exposure concentration (ppm) was calculated as follows:

$$\text{Conc (ppm)} = \frac{\text{amount consumed (g)} \times 1000 \text{ (mg/g)} \times 1000 \text{ (}\mu\text{g/mg)} \times 22.4 \text{ (}\mu\text{L}/\mu\text{mole)} \times 295^\circ\text{K}}{\text{exposure duration (min)} \times \text{airflow (Lpm)} \times \text{MW (}\mu\text{g}/\mu\text{mole)} \times 273^\circ\text{K}}$$

where average MW = 44 $\mu\text{g}/\mu\text{mole}$

2.14.4. CHAMBER AND EXPOSURE ROOM ENVIRONMENT

Chamber oxygen levels (maintained at least 19%) were measured pretest and at the beginning, middle and end of the study. Air samples were taken in the vapor generation area pretest and at the beginning, middle and end of the study. Light (maintained approximately 30 to 40 foot-candles at 1.0 meter above the floor) and noise levels (maintained below 85 decibels) in the exposure room were measured pretest and at the beginning, middle and end of the study.

Refer to Appendix M for equipment details and results in Appendix P.

2.15. EXPERIMENTAL EVALUATIONS

2.15.1. VIABILITY CHECKS (CAGE-SIDE)

Animals were observed in their cages twice daily (once in the morning and once in the afternoon) for mortality and signs of severe toxic or pharmacologic effects.

2.15.2. PHYSICAL EXAMINATIONS

All animals were observed as a group at least once during each exposure.

Each animal was removed from its cage and examined at least twice pretest and during each week of the study period.

Examinations included observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of clonic or tonic movements, stereotypy (e.g., excessive grooming, repetitive circling) or bizarre behavior (e.g., self-mutilation, walking backward) was recorded.

2.15.3. BODY WEIGHT

Animals were removed from their cages and weighed at least once pretest (on gestation day 4 for the females) and once per week (on gestation day 6, 13, and 20 for the females) during the study period. Terminal, fasted body weights were obtained just prior to necropsy (males only).

2.15.4. FEED CONSUMPTION

Feed consumption was measured (weighed) during the week prior to treatment initiation and once per week during the study period. Feed was available without restriction 7 days/week except during exposures. Animals were presented with weighed feeders at the scheduled intervals. After 6 or 7 days (males) or 2, 4 or 7 days (females) the feeders were reweighed and the resulting weight subtracted from the initial feeder weight to obtain the grams of feed consumed per animal per day. The grams consumed per kilogram of body weight per day was then calculated for each animal.

Calculation

Feed Consumption (g/kg/day) =

$$\frac{\text{grams of feed consumed}}{\text{body weight (kg)}^a} \div \text{\# days (see above)}$$

^aAn average of the current and previous weights was used for the males, and the previous weight or an average of the current and previous weights was used for the females.

2.16. POSTMORTEM

2.16.1. NECROPSY INFORMATION

Necropsy was performed on 10 animals/sex/group after animals were treated for 14 days. Male animals only were fasted overnight prior to necropsy. A necropsy schedule was established to ensure that approximately equal numbers of males and females were examined on each day of necropsy and that examination of animals of both sexes were performed at similar times of the day throughout the necropsy period.

Method of Euthanasia

Exsanguination following carbon dioxide inhalation. All live fetuses were euthanized by an intraperitoneal overdose of sodium pentobarbital.

2.16.2. MACROSCOPIC EXAMINATIONS

Complete macroscopic examinations were performed on all animals. The macroscopic examination included examination of the external surface and all orifices; the external surfaces of the brain and spinal cord; the organs and tissues of the cranial, thoracic, abdominal and pelvic cavities and neck; and the remainder of the carcass for the presence of macroscopic morphologic abnormalities.

2.16.3. ORGAN WEIGHTS

Organs indicated in Table I (page 24) were weighed for all animals at the scheduled sacrifice interval. Prior to weighing, the organs were carefully dissected and properly trimmed to remove adipose and other contiguous tissues in a uniform manner. Organs were weighed as soon as possible after dissection in order to avoid drying. Paired organs were weighed together.

2.16.4. TISSUES PRESERVED AND EXAMINED HISTOPATHOLOGICALLY

The tissues listed in Table I (page 24) were obtained at necropsy and preserved for all animals.

No microscopic examination was performed.

TABLE I

ORGAN NAME	WEIGHED	PRESERVED FOR MALES	PRESERVED FOR FEMALES
adrenal glands	X	X	X
aorta (thoracic)		X	
bone marrow smear (rib) ^a		X	
bone (sternum, femur with joint)		X	
bone marrow (sternum, femur)		X	
brain (medulla, pons, cerebrum and cerebellum)	X	X	X
epididymides	X	X	
esophagus		X	
eyes (with optic nerves)		X	
heart	X	X	X
kidneys	X	X	X
lacrimal gland		X	
large intestine (cecum, colon, rectum)		X	
larynx		X	
liver	X	X	X
lungs (with mainstem bronchi)	X	X	X
lymph nodes (mesenteric, mediastinal)		X	
mammary gland (inguinal)		X	
muscle (biceps femoris)		X	
nasopharyngeal tissue		X	
nerve (sciatic)		X	
ovaries			X
pancreas		X	
pituitary gland	X ^b	X	X
prostate gland		X	
salivary gland with submandibular lymph node		X	
seminal vesicles	X	X	

ORGAN NAME	WEIGHED	PRESERVED FOR MALES	PRESERVED FOR FEMALES
skin		X	
small intestine (duodenum, ileum, jejunum)		X	
spinal cord (cervical, thoracic, lumbar)		X	
spleen	X	X	X
stomach		X	
testes	X	X	
thymus	X	X	X
thyroid/parathyroid glands		X	
trachea		X	
urinary bladder		X	
uterus (body/horns) with cervix			X
Zymbal's gland		X	X
gross lesions		X	X

^aSmears were prepared but will only be examined if needed.

^bWeighed post-fixation.

Preservatives

All tissues - 10% neutral buffered formalin.

Eyes, testes and epididymides were placed in Modified Davidson's solution initially and then retained in 10% formalin. Lungs and urinary bladder were infused with formalin prior to their immersion into a larger volume of the same fixative.

Smear preparations of the marrow from the rib were air dried and fixed in absolute methanol.

2.17. EVALUATION OF DAMS AND PUPS

A macroscopic postmortem examination was performed on all the dams.

Females that were apparently not pregnant had implantation data (i.e., number of fetuses and early/late embryo-fetal deaths) determined at necropsy (Salewski's test, Salewski, 1964). Corpora lutea were not counted for these animals.

Any dams initiating delivery on GD 20 were immediately euthanized and the fetuses processed with the other GD 20 fetuses. Dams surviving on GD 20 had the following examinations of their pregnancies:

The intact uteri (ovaries attached) was removed from the abdominal cavity and weighed intact. Corpora lutea were counted (without dissection) and the number per ovary recorded. The number of the following were recorded:

- live fetuses
- dead fetuses (no significant degeneration)
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- early embryonic deaths (evidence of implantation but no recognizable fetus)

The maternal carcass was then discarded.

All live fetuses were weighed individually. Each (live and dead) fetus was given a macroscopic external examination for defects including observation of the palate. The sex was determined by external examination only. Fetuses with obvious external malformations were preserved (10% neutral buffered formalin) for possible future examination. All other fetuses, and intra-uterine deaths, were discarded.

2.18. STATISTICAL ANALYSIS

The following parameters were analyzed statistically:

mean body weight values
mean feed consumption values
mean terminal organ weights, organ/body and organ/brain weight ratios
number of implantation sites and corpora lutea
pre- and post-implantation loss
number of pups per litter
number of male and female pups per litter
average pup weight per litter as a composite for both sexes
total litter weight

2.18.1. METHOD OF ANALYSIS

Mean values of all exposure groups were compared to the mean value for the control group at each time interval.

Evaluation of equality of group means was made by the appropriate statistical method, followed by a multiple comparison test if needed. Bartlett's test (Snedecor and Cochran, 1967) was performed to determine if groups had equal variances. For all parameters except organ weights, if the variances were equal, parametric procedures were used; if not, nonparametric procedures were used. Organ weight data was analyzed only by parametric methods. The parametric method was the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Dunlap and Duffy, 1975). If significant differences among the means were indicated, additional tests were used to determine which means were significantly different from the control: Dunnett's (Dunlap et al., 1981). The nonparametric method was the Kruskal-Wallis test (Siegal, 1956) and if differences were indicated a Pairwise Comparison (Siegal, 1956) were used to determine which means differed from control. Bartlett's test for equality of variance was conducted at the 1% significance level; all other statistical tests were conducted at the 5% and 1% significance levels.

2.19. DATA STORAGE

All raw data, preserved specimens, and retained samples, as well as the original study protocol and the original final report are to be maintained in the Archives of the Testing Facility upon completion of the study. The Sponsor will determine the final disposition of these materials.

2.20. REGULATORY REFERENCES

2.20.1. TEST GUIDELINES

This study was not designed to meet regulatory requirements. It was designed to assess the toxicity of the test substance in order to determine appropriate exposure levels for a subsequent 13-Week Inhalation Study 03-6141 and a Developmental Inhalation Study

03-4253. The studies are intended to be used by the Petroleum Gases HPV Test Group in the EPA HPV Challenge Program

2.20.2. GOOD LABORATORY PRACTICES

This study was conducted in compliance with Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

2.20.3. ANIMAL WELFARE ACT COMPLIANCE

This study complied with all appropriate parts of the Animal Welfare Act Regulations: 9 CFR Parts 1 and 2 Final Rules, Federal Register, Volume 54, No. 168, August 31, 1989, pp. 36112-36163 effective October 30, 1989 and 9 CFR Part 3 Animal Welfare Standards; Final Rule, Federal Register, Volume 56, No. 32, February 15, 1991, pp. 6426-6505 effective March 18, 1991.

2.21. PROTOCOL DEVIATIONS

The following protocol deviations occurred during the study but were not considered to have compromised the validity or integrity of the study:

1. Animal 4035 had a gross exam performed. However, due to oversight, the technician did not record the animal properly in the computer system. At this time, it can no longer be determined if the animal was within normal limits as the exam records are incomplete.
2. Due to oversight, during the first test week for the females, feed consumption was weighed for only 4 days instead of at least 5 days as per protocol.

3. RESULTS AND DISCUSSION

3.1. CHAMBER MONITORING

(Appendices A, N, O & P)

Pre-study chamber distribution analyses (see Appendix O) showed that the test substance was evenly distributed within each chamber. Chamber monitoring (see Appendix O) showed that the chamber oxygen levels were at least 19%. Chamber room monitoring (see Appendix P) showed that no test substance was present in the room and that the sound and light levels were acceptable.

The target and mean ($\pm$ standard deviation) analytical (IR) and nominal concentrations (see Appendix A) are summarized as follows:

Group	Test Substance	Target Concentration (ppm)	Analytical Concentration (ppm)	Nominal Concentration (ppm)
1	Air Control	0	0.00 ± 0.00	0 ± 0
2	Liquified Petroleum Gas	100	99.3 ± 9.8	154 ± 54.5
3	Liquified Petroleum Gas	1000	999 ± 421	953 ± 217
4	Liquified Petroleum Gas	10000	10000 ± 412	9440 ± 643

The analytically measured (IR) exposure levels of the airborne test substance were acceptably close, in the opinion of the study director, to the targeted exposure levels. The differences between measured and nominal concentrations varied somewhat from the expected 1:1 ratio for this type of gas/vapor exposure, especially for the Group 2. The exact cause of the differences for the Group 2 was not determined but was probably a result of a combination of slight variances in the calibration of the chamber airflows and the calibration of the IR monitor as well as the 'dead-space' in the system that had to be refilled at the start of each exposure day. A considerable amount of sample-to-sample variability was seen, especially for the Group 3. These differences for the Group 3 appeared to be caused

by technical (e.g. metering valves) problems that were not resolved until the final 2 exposure days. Chamber environmental conditions averaged 23°C temperature and 53% relative humidity.

Mean particle size distribution measurements for the exposures (see Appendix A) are summarized as follows:

Group	Test Substance	Mass Median Aerodynamic Diameter (µm)	Geometric Standard Deviation	Total Mass Concentration (mg/m ³)
1	Air Control	2.064	1.920	1.74E-03
2	Liquified Petroleum Gas	1.755	1.804	1.57E-03
3	Liquified Petroleum Gas	2.436	2.034	1.61E-03
4	Liquified Petroleum Gas	1.112	1.877	2.83E-03

These results indicated that the atmospheres were essentially gas/vapor only, as expected, since there was no substantial difference between the test substance chambers and the air control chamber.

Analysis of the major components in the neat test substance and the test atmospheres (see Appendix Q) showed a reasonably close comparison between the neat test substance and the vaporized test substance. This data demonstrated that the test animals were exposed, as expected, to all of the major components of the test substance in their reasonably proper proportion. The data was consistent from pretest and during the study indicating stability of the test substance and the atmosphere generation techniques.

3.2. MORTALITY AND PREGNANCY

(Table 1 & Appendix B)

All animals survived to termination. There was no effect of test substance exposures on pregnancies as at least 9 of 10 dams in each test group

(1 non-pregnant in the 100 ppm group) were found pregnant and delivered viable fetuses.

3.3. CLINICAL OBSERVATIONS

3.3.1. EXPOSURE PERIODS

(Table 2)

The test animals were unremarkable during the exposure periods.

3.3.2. NON-EXPOSURE PERIODS

(Table 3 & Appendix C)

The test animals were generally unremarkable during the non-exposure periods. Scattered observations such as red nasal discharge were noted but the scattered low incidence did not increase with the exposure level.

3.4. BODY WEIGHTS

(Figures 3-4, Tables 4-5 & Appendices D - E)

There were no statistically significant or exposure-related differences in absolute body weights or in body weight gains in the test substance exposed animals, compared to the Air Control animals.

3.5. FEED CONSUMPTION

(Figure 5-6, Table 6 & Appendix F)

There were no statistically significant or exposure-related differences in feed consumption in the test substance exposed animals, compared to the Air Control animals.

3.6. ORGAN WEIGHTS

(Table 7 & Appendix G)

There were no statistically significant or exposure-related differences in organ weights (absolute and relative to body weight or brain weight) in the test substance exposed animals, compared to the Air Control animals.

3.7. MACROSCOPIC PATHOLOGY

(Table 8 & Appendix H)

No gross abnormalities related to test substance exposure were evident at necropsy examination. The macroscopic lesions noted were similar to those routinely encountered in animals of this age and species or were represented by individual animals and considered incidental findings.

3.8. CESAREAN SECTION DATA

(Tables 9-10 & Appendices I-J)

There were no statistically significant or exposure-related differences in gravid uterine weights, pre- or post-implantation loss, live litter size or in fetal weight in the test substance exposed animals, compared to the Air Control animals.

3.9. FETAL EXTERNAL EXAMINATION DATA

(Table 11 & Appendix K)

There were no statistically significant or exposure-related differences in the incidence of external findings in the fetuses from the test substance exposed animals, compared to the fetuses from the Air Control animals.

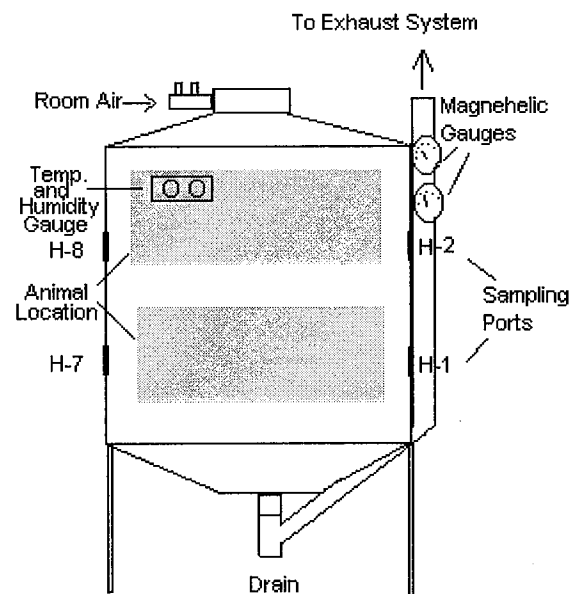
4. CONCLUSION

Two weeks of exposure of rats (males and time-mated pregnant females) to LPG at exposure levels of 100, 1000 and 10000 ppm resulted in no effects on the animals. Therefore, the 10000 ppm exposure level was a no observed effect level (NOEL) and was considered an acceptable high exposure level (limited by safety considerations for a flammable gas) for a subsequent developmental toxicity study and 13 week subchronic inhalation toxicity study.

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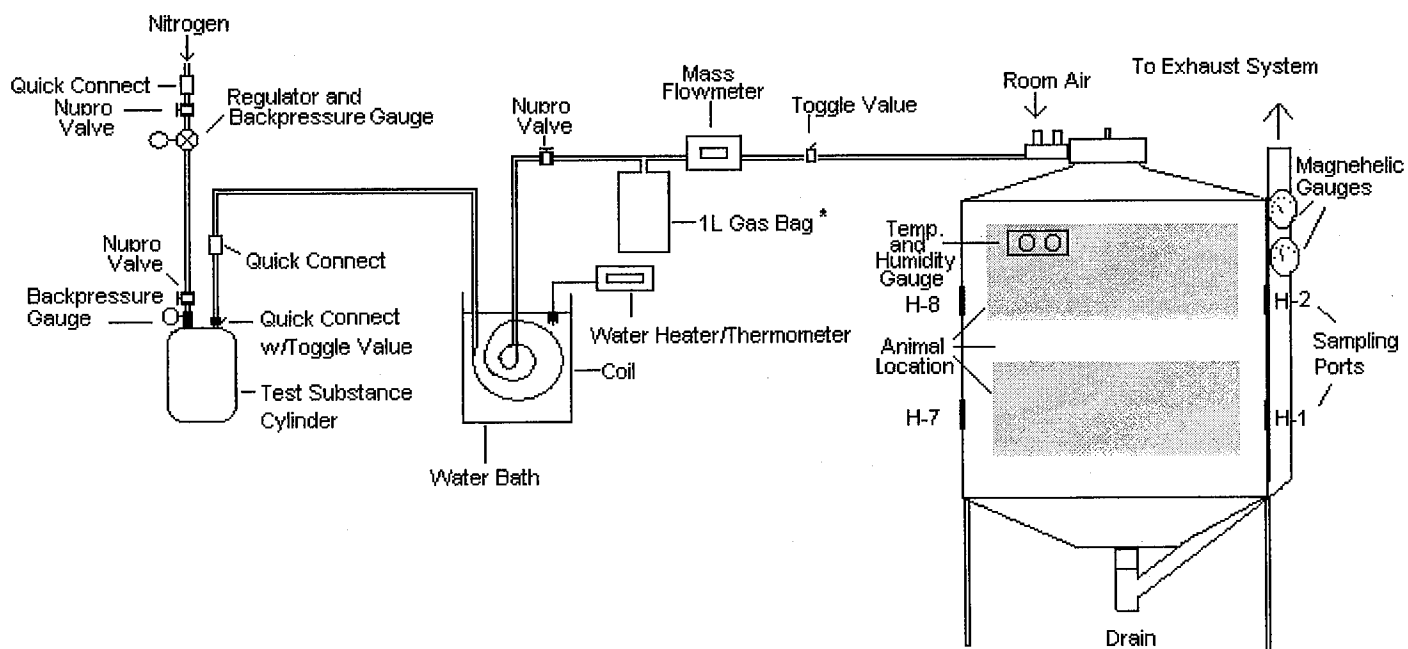
Group 1	Diagram of 1000-Liter Whole-Body Exposure Chamber and Generation System	Figure 1
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Group 2, 3 & 4

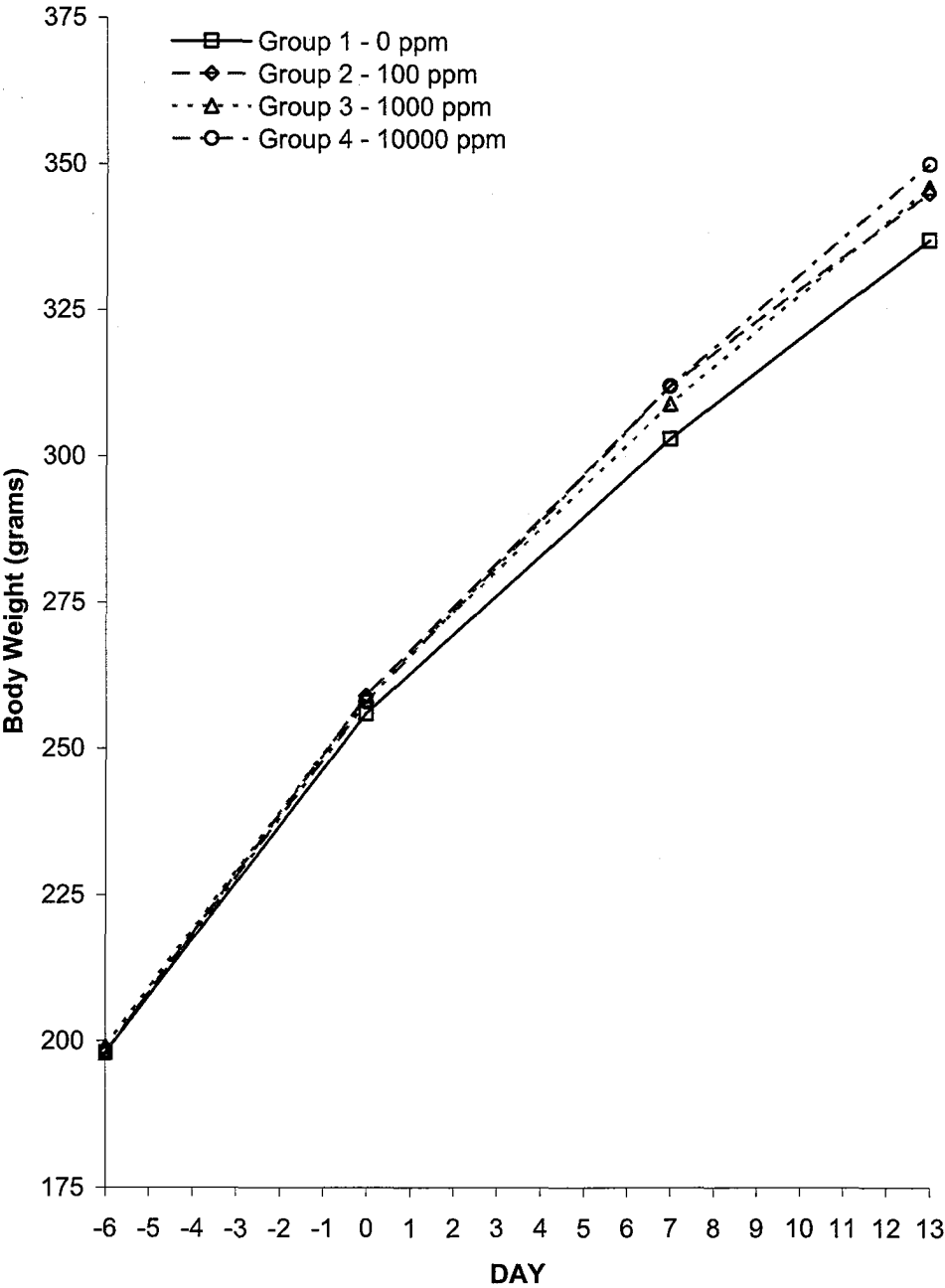
Diagram of 1000 Liter Whole-Body Exposure
Chamber and Generation System

Figure 2

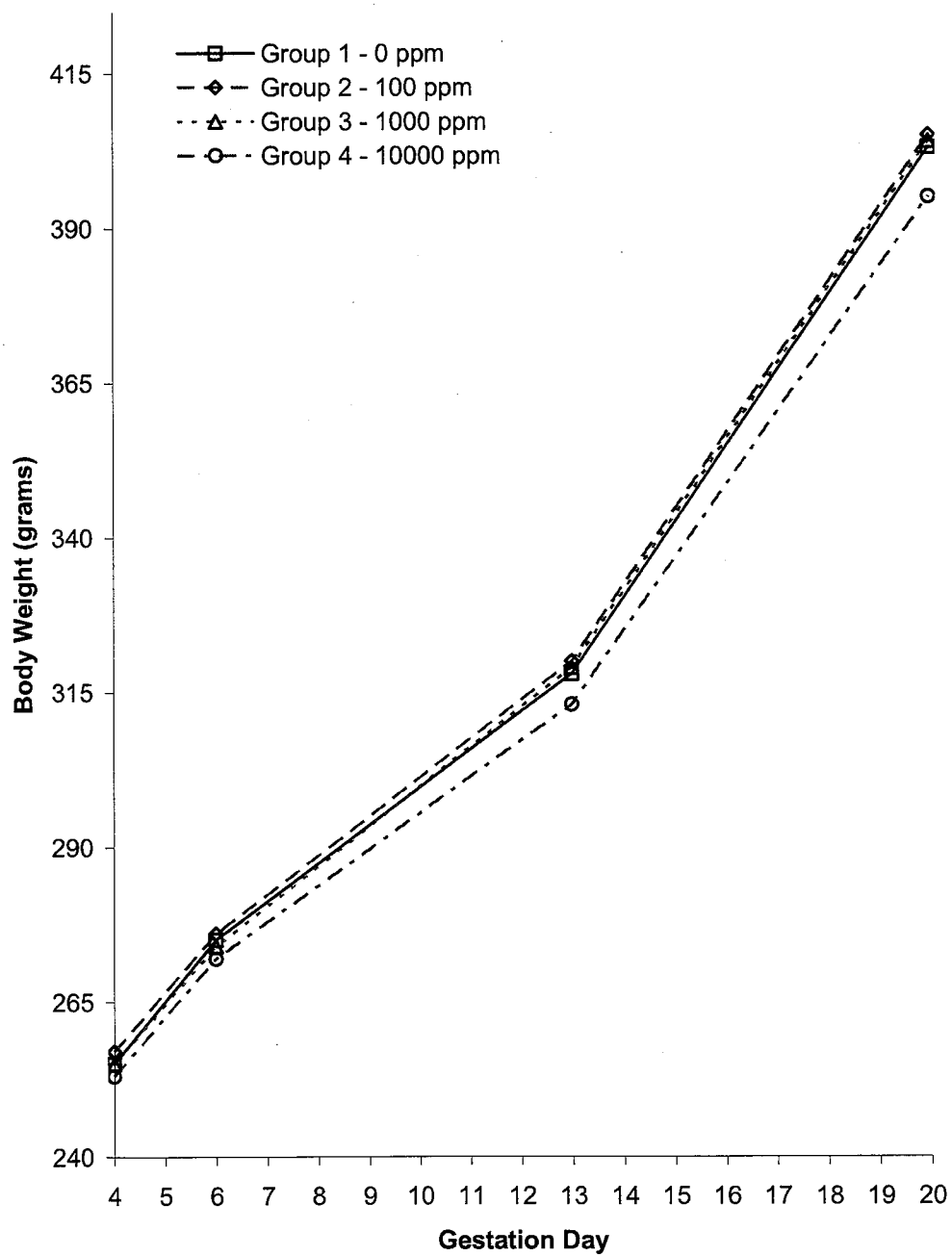


* = Not used for Group 4

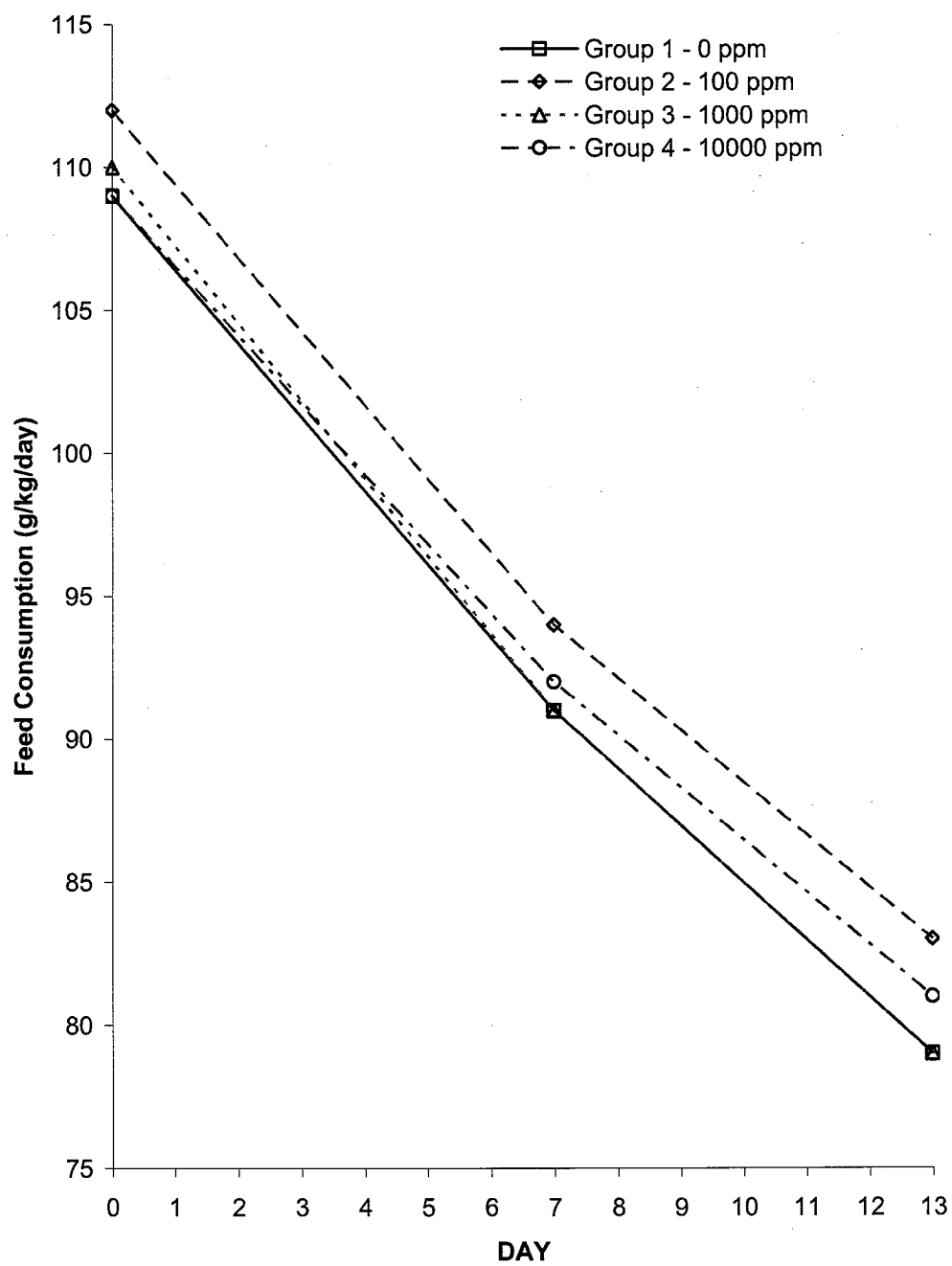
Males	Mean Body Weights (grams)	Figure 3
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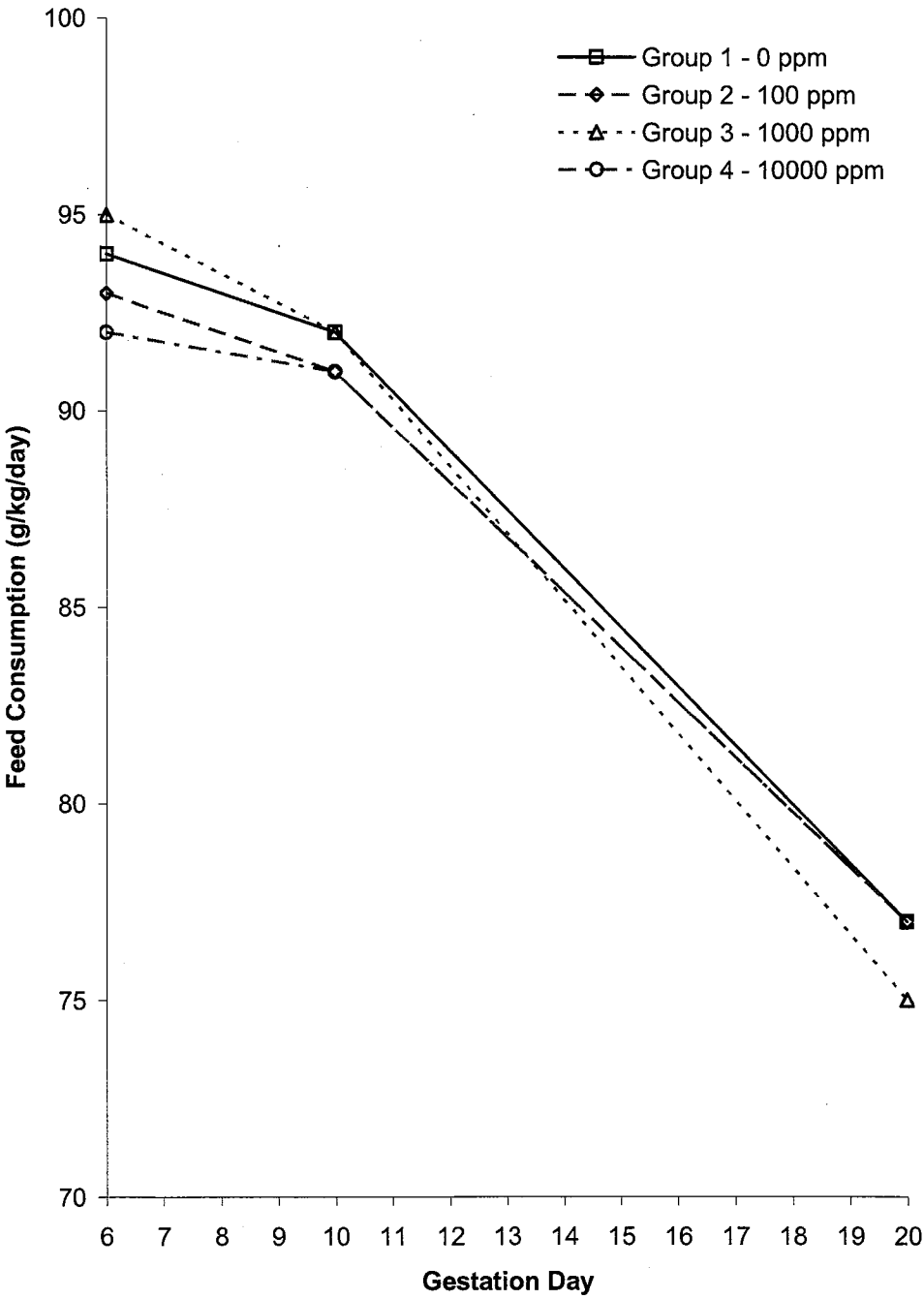
Females	Mean Body Weights (grams)	Figure 4
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Males	Mean Feed Consumption (grams/kg/day)	Figure 5
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Females	Mean Feed Consumption (grams/kg/day)	Figure 6
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TABLE 1

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF SURVIVAL AND PREGNANCY

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
No. of females mated	N	10	10	10	10
Pregnant	N	10	9	10	10
- Died/sacrificed moribund	N	0	0	0	0
- Elective sacrifice	N	0	0	0	0
Nonpregnant	N	0	1	0	0
- Died/sacrificed moribund	N	0	0	0	0
- Elective sacrifice	N	0	0	0	0
Total no. of females died/ sacrificed moribund	N %	0 0.0	0 0.0	0 0.0	0 0.0
Examined at scheduled c-section	N	10	10	10	10
- Nonpregnant	N	0	1	0	0
- With total implant loss	N %	0 0.0	0 0.0	0 0.0	0 0.0
- With viable fetuses	N %	10 100.0	9 90.0	10 100.0	10 100.0

No statistically significant differences

	Summary of In-Chamber Observations											Table 2			
Exposure Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group 1 – 0 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 2 – 100 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 3 – 1000 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 4 – 10000 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All

All = 100% of the animals exhibiting a given observation.

	Summary of Clinical Observations Preface	Table 3
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Summary of Clinical Observation (Males).....	43
Summary of Clinical Observations During Gestation (Females).....	44

Number of animals examined represents the total number of animals observed and animals which were killed at a scheduled sacrifice for a given interval.

For summarization purposes, descriptive comments [i.e., location of scab(s) and/or sore(s), etc.] are not presented in this table. These data are contained in the study raw data if needed.

Total represents a cumulative total of all animals with the indicated observation one or more times during the study.

Corresponding exposure levels for each group were as follows:

Group 1	-	0 ppm
Group 2	-	100 ppm
Group 3	-	1000 ppm
Group 4	-	10000 ppm

Note: Due to computer limitation, Group numbers are presented as Roman numerals instead of Arabic numerals.

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TABLE 3

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES

SUMMARY OF CLINICAL OBSERVATIONS

	GROUP#	DAY OF STUDY						TOTAL
		-6	0	7	13	14	15	
# OF ANIMALS EXAMINED	I	10	10	10	10	5	5	
	II	10	10	10	10	5	5	
	III	10	10	10	10	5	5	
	IV	10	10	10	10	5	5	
Normal								
WITHIN NORMAL LIMITS	I	10	10	10	10	0	0	10
	II	10	10	7	7	0	0	10
	III	10	10	8	8	0	0	10
	IV	10	10	9	9	0	0	10
Dead								
TERMINAL SACRIFICE	I	0	0	0	0	5	5	10
	II	0	0	0	0	5	5	10
	III	0	0	0	0	5	5	10
	IV	0	0	0	0	5	5	10
Dermal-General								
SCABS	I	0	0	0	0	0	0	0
	II	0	0	0	1	0	0	1
	III	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	0
ALOPECIA - GENERAL	I	0	0	0	0	0	0	0
	II	0	0	0	1	0	0	1
	III	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	0
Oral/Buccal								
NASAL DISCHARGE - RED	I	0	0	0	0	0	0	0
	II	0	0	3	2	0	0	4
	III	0	0	2	2	0	0	2
	IV	0	0	1	1	0	0	1

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TABLE 3

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

DOSE GROUP DOSE LEVEL (PPM)	1 0	2 100	3 1000	4 10000
DAY 4 to 20				
Normal				

WITHIN NORMAL LIMITS	39/10	39/10	36/10	37/10
TERMINAL SACRIFICE	10/10	10/10	10/10	10/10
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	0/ 0	0/ 0	2/ 1	0/ 0
Oral/Buccal				

NASAL DISCHARGE - RED	1/ 1	1/ 1	2/ 2	3/ 2

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TABLE 4

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES			MEAN BODY WEIGHT VALUES (GRAMS)			
DOSE GROUP DOSE LEVEL (PPM)			1 0	2 100	3 1000	4 10000
DAY -6	MEAN		198	198	199	198
	S.D.		8.5	8.7	7.1	8.4
	N		10	10	10	10
DAY 0	MEAN		256	259	259	258
	S.D.		12.2	13.8	10.2	11.9
	N		10	10	10	10
DAY 7	MEAN		303	312	309	312
	S.D.		18.4	21.3	15.3	15.4
	N		10	10	10	10
DAY 13	MEAN		337	345	346	350
	S.D.		20.3	27.5	20.3	24.4
	N		10	10	10	10

No statistically significant differences

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TABLE 4

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

		SUMMARY OF GESTATION BODY WEIGHTS (GRAMS)			
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
DAY 4	MEAN	255	257	255	253
	S.D.	15.4	11.7	13.3	11.4
	N	10	9	10	10
DAY 6	MEAN	275	276	274	272
	S.D.	14.6	12.4	15.3	13.0
	N	10	9	10	10
DAY 13	MEAN	318	320	319	313
	S.D.	15.6	11.4	17.1	15.9
	N	10	9	10	10
DAY 20	MEAN	403	405	404	395
	S.D.	19.1	14.6	34.0	30.2
	N	10	9	10	10

No statistically significant differences

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TABLE 5

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES				MEAN BODY WEIGHT GAIN (GRAMS)			
DOSE GROUP				1	2	3	4
DOSE LEVEL (PPM)				0	100	1000	10000
DAY	-6 TO	0	MEAN	58	61	61	60
			S.D.	5.0	6.5	6.2	5.7
			N	10	10	10	10
DAY	0 TO	7	MEAN	46	52	50	55
			S.D.	8.2	9.2	7.1	7.7
			N	10	10	10	10
DAY	7 TO	13	MEAN	34	33	37	38
			S.D.	5.3	7.5	6.2	9.5
			N	10	10	10	10
DAY	0 TO	13	MEAN	80	85	87	93
			S.D.	10.1	15.1	11.3	15.3
			N	10	10	10	10

No statistically significant differences

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TABLE 5

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GESTATION BODY WEIGHT GAIN (GRAMS)

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
DAYS 4 TO 6	MEAN	20	19	19	18
	S.D.	5.0	5.6	6.9	5.8
	N	10	9	10	10
DAYS 6 TO 13	MEAN	43	44	45	41
	S.D.	8.6	6.4	6.9	6.5
	N	10	9	10	10
DAYS 13 TO 20	MEAN	84	85	85	82
	S.D.	7.6	11.3	19.1	19.3
	N	10	9	10	10
DAYS 4 TO 20	MEAN	148	148	149	141
	S.D.	12.5	11.5	26.7	23.6
	N	10	9	10	10

No statistically significant differences

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TABLE 6

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES			MEAN FEED CONSUMPTION (GRAMS/KG/DAY)			
DOSE GROUP			1	2	3	4
DOSE LEVEL (PPM)			0	100	1000	10000
DAY 0	MEAN		109	112	110	109
	S.D.		3.6	2.8	4.3	4.7
	N		10	10	10	10
DAY 7	MEAN		91	94	91	92
	S.D.		3.7	3.7	4.2	3.1
	N		10	10	10	10
DAY 13	MEAN		79	83	79	81
	S.D.		2.3	4.1	3.3	2.4
	N		10	10	10	10

No statistically significant differences

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TABLE 6

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GESTATION FEED CONSUMPTION (GRAMS/KG/DAY)

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
DAYS 4 TO 6	MEAN	94	93	95	92
	S.D.	8.6	6.7	6.3	7.8
	N	10	9	10	10
DAYS 6 TO 10	MEAN	92	91	92	91
	S.D.	8.6	5.6	4.6	4.8
	N	10	9	10	9
DAYS 13 TO 20	MEAN	77	77	75	77
	S.D.	6.6	3.7	5.6	3.1
	N	10	9	10	10

No statistically significant differences

	Mean Organ Weights Preface	Table 7
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Summary of Organ Weight to Body Weight Ratio (Females).....	60
Summary of Organ Weight to Brain Weight Ratio (Females)	62

Key to Abbreviations:

g	=	Grams
kg	=	kilograms
wt.	=	Weight
observ.	=	Observed
Sem. Ves	=	Seminal Vesicles

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	308	318	317	319
	S.D.	17.9	24.1	17.9	18.9
	N	10	10	10	10
ADRENALS g	MEAN	0.0643	0.0623	0.0644	0.0604
	S.D.	.00961	.00744	.01070	.00463
	N	10	10	10	10
BRAIN g	MEAN	2.0556	2.0116	2.0584	1.9960
	S.D.	.09435	.09132	.09451	.03736
	N	10	10	10	10
EPIDIDYIMIDES g	MEAN	0.8090	0.8354	0.8119	0.8175
	S.D.	.08359	.08189	.04993	.08589
	N	10	10	10	10
HEART WITH THYROID g	MEAN	1.3190	1.3461	1.2903	1.3334
	S.D.	.13463	.09991	.09998	.10524
	N	10	10	10	10
KIDNEYS g	MEAN	3.0760	3.2939	3.1497	3.1558
	S.D.	.31839	.37461	.20386	.29758
	N	10	10	10	10
LIVER g	MEAN	11.277	11.654	12.353	11.623
	S.D.	1.2255	1.4192	1.7224	.88314
	N	10	10	10	10
LUNGS g	MEAN	1.7794	1.8453	1.7649	1.9070
	S.D.	.23417	.25344	.21840	.34224
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
PITUITARY g	MEAN	0.0100	0.0104	0.0100	0.0102
	S.D.	.00222	.00323	.00149	.00151
	N	10	10	10	10
SEM.VES & CO.GL. g	MEAN	1.3280	1.0965	1.2916	1.0354
	S.D.	.51375	.19078	.53085	.10064
	N	10	10	10	10
SPLEEN g	MEAN	0.7123	0.7998	0.6800	0.7561
	S.D.	.12190	.14820	.05797	.10582
	N	10	10	10	10
TESTES g	MEAN	3.1013	3.0632	3.1036	3.0792
	S.D.	.26239	.24954	.19008	.11383
	N	10	10	10	10
THYMUS g	MEAN	0.6155	0.6150	0.5683	0.6315
	S.D.	.09257	.08966	.09949	.11304
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	308	318	317	319
	S.D.	17.9	24.1	17.9	18.9
	N	10	10	10	10
ADRENALS Ratio	MEAN	0.0002	0.0002	0.0002	0.0002
	S.D.	.00002	.00002	.00002	.00001
	N	10	10	10	10
BRAIN Ratio	MEAN	0.0067	0.0063	0.0065	0.0063
	S.D.	.00041	.00034	.00041	.00039
	N	10	10	10	10
EPIDIDYMIDES Ratio	MEAN	0.0026	0.0026	0.0026	0.0026
	S.D.	.00032	.00023	.00019	.00031
	N	10	10	10	10
HEART WITH THYROID Ratio	MEAN	0.0043	0.0042	0.0041	0.0042
	S.D.	.00034	.00016	.00033	.00026
	N	10	10	10	10
KIDNEYS Ratio	MEAN	0.0100	0.0103	0.0099	0.0099
	S.D.	.00074	.00068	.00065	.00079
	N	10	10	10	10
LIVER Ratio	MEAN	0.0365	0.0366	0.0390	0.0365
	S.D.	.00273	.00348	.00523	.00217
	N	10	10	10	10
LUNGS Ratio	MEAN	0.0058	0.0058	0.0056	0.0060
	S.D.	.00064	.00066	.00062	.00082
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
PITUITARY Ratio	MEAN	0.0000	0.0000	0.0000	0.0000
	S.D.	.00001	.00001	.00000	.00000
	N	10	10	10	10
SEM.VES & CO.GL. Ratio	MEAN	0.0044	0.0034	0.0042	0.0033
	S.D.	.00212	.00054	.00206	.00047
	N	10	10	10	10
SPLEEN Ratio	MEAN	0.0023	0.0025	0.0021	0.0024
	S.D.	.00038	.00034	.00018	.00034
	N	10	10	10	10
TESTES Ratio	MEAN	0.0101	0.0097	0.0098	0.0097
	S.D.	.00081	.00093	.00088	.00043
	N	10	10	10	10
THYMUS Ratio	MEAN	0.0020	0.0019	0.0018	0.0020
	S.D.	.00027	.00025	.00029	.00035
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BRAIN WEIGHT RATIO

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
ADRENALS Ratio	MEAN	0.0312	0.0310	0.0313	0.0302
	S.D.	.00400	.00355	.00524	.00224
	N	10	10	10	10
EPIDIDYIMIDES Ratio	MEAN	0.3934	0.4158	0.3945	0.4094
	S.D.	.03403	.04158	.01809	.04028
	N	10	10	10	10
HEART WITH THYROID Ratio	MEAN	0.6431	0.6691	0.6271	0.6682
	S.D.	.07481	.03763	.04372	.05340
	N	10	10	10	10
KIDNEYS Ratio	MEAN	1.4967	1.6341	1.5352	1.5818
	S.D.	.14177	.12762	.15136	.15419
	N	10	10	10	10
LIVER Ratio	MEAN	5.4934	5.7867	6.0280	5.8267
	S.D.	.64026	.59501	1.0015	.47949
	N	10	10	10	10
LUNGS Ratio	MEAN	0.8649	0.9184	0.8578	0.9556
	S.D.	.09921	.12770	.10414	.17203
	N	10	10	10	10
PITUITARY Ratio	MEAN	0.0049	0.0052	0.0048	0.0051
	S.D.	.00119	.00158	.00070	.00077
	N	10	10	10	10
SEM.VES & CO.GL. Ratio	MEAN	0.6500	0.5446	0.6315	0.5187
	S.D.	.27008	.08811	.27422	.05057
	N	10	10	10	10

No statistically significant differences

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BRAIN WEIGHT RATIO

MALES

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
SPLEEN Ratio	MEAN	0.3468	0.3964	0.3307	0.3787
	S.D.	.05984	.06307	.02837	.05189
	N	10	10	10	10
TESTES Ratio	MEAN	1.5108	1.5235	1.5081	1.5428
	S.D.	.13857	.11444	.07076	.05470
	N	10	10	10	10
THYMUS Ratio	MEAN	0.3005	0.3061	0.2753	0.3158
	S.D.	.05287	.04560	.04069	.05280
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	403	405	404	395
	S.D.	19.1	14.6	34.0	30.2
	N	10	9	10	10
ADRENALS g	MEAN	0.0809	0.0967	0.0868	0.0929
	S.D.	.00947	.01558	.00933	.02150
	N	10	9	10	10
BRAIN g	MEAN	2.0464	2.0174	2.0534	1.9873
	S.D.	.05223	.06238	.07592	.04910
	N	10	9	10	10
HEART WITH THYROID g	MEAN	1.0482	1.0954	1.0832	1.0903
	S.D.	.07587	.08577	.08025	.08820
	N	10	9	10	10
KIDNEYS g	MEAN	2.3710	2.3639	2.4699	2.4341
	S.D.	.19796	.12339	.32104	.31909
	N	10	9	10	10
LIVER g	MEAN	18.072	17.506	17.390	17.045
	S.D.	1.2801	1.1557	1.2789	2.1024
	N	10	9	10	10
LUNGS g	MEAN	1.6129	1.6120	1.6167	1.6055
	S.D.	.19866	.18531	.10381	.16078
	N	10	9	10	10
PITUITARY g	MEAN	0.0126	0.0121	0.0143	0.0137
	S.D.	.00312	.00292	.00261	.00321
	N	10	9	10	9

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
SPLEEN g	MEAN	0.7110	0.7196	0.7462	0.7481
	S.D.	.08505	.13745	.10194	.09036
	N	10	9	10	10
THYMUS g	MEAN	0.4916	0.4022	0.4907	0.4955
	S.D.	.05725	.08007	.09602	.13910
	N	10	9	10	10

No statistically significant differences

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	403	405	404	395
	S.D.	19.1	14.6	34.0	30.2
	N	10	9	10	10
ADRENALS Ratio	MEAN	0.0002	0.0002	0.0002	0.0002
	S.D.	.00002	.00003	.00003	.00005
	N	10	9	10	10
BRAIN Ratio	MEAN	0.0051	0.0050	0.0051	0.0051
	S.D.	.00029	.00022	.00049	.00042
	N	10	9	10	10
HEART WITH THYROID Ratio	MEAN	0.0026	0.0027	0.0027	0.0028
	S.D.	.00018	.00022	.00019	.00022
	N	10	9	10	10
KIDNEYS Ratio	MEAN	0.0059	0.0058	0.0062	0.0062
	S.D.	.00059	.00032	.00108	.00125
	N	10	9	10	10
LIVER Ratio	MEAN	0.0449	0.0432	0.0431	0.0432
	S.D.	.00355	.00221	.00193	.00430
	N	10	9	10	10
LUNGS Ratio	MEAN	0.0040	0.0040	0.0040	0.0041
	S.D.	.00043	.00041	.00042	.00028
	N	10	9	10	10
PITUITARY Ratio	MEAN	0.0000	0.0000	0.0000	0.0000
	S.D.	.00001	.00001	.00001	.00001
	N	10	9	10	9

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

FEMALES

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
SPLEEN Ratio	MEAN	0.0018	0.0018	0.0018	0.0019
	S.D.	.00019	.00029	.00021	.00022
	N	10	9	10	10
THYMUS Ratio	MEAN	0.0012	0.0010	0.0012	0.0013
	S.D.	.00015	.00020	.00028	.00043
	N	10	9	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ORGAN WEIGHT TO BRAIN WEIGHT RATIO

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
ADRENALS Ratio	MEAN	0.0396	0.0480	0.0423	0.0468
	S.D.	.00481	.00822	.00471	.01074
	N	10	9	10	10
HEART WITH THYROID Ratio	MEAN	0.5126	0.5432	0.5273	0.5488
	S.D.	.04111	.04296	.03031	.04440
	N	10	9	10	10
KIDNEYS Ratio	MEAN	1.1587	1.1727	1.2053	1.2251
	S.D.	.09229	.07122	.17642	.15902
	N	10	9	10	10
LIVER Ratio	MEAN	8.8399	8.6815	8.4749	8.5878
	S.D.	.71909	.58805	.62678	1.1569
	N	10	9	10	10
LUNGS Ratio	MEAN	0.7878	0.8005	0.7891	0.8076
	S.D.	.08861	.10126	.07126	.07587
	N	10	9	10	10
PITUITARY Ratio	MEAN	0.0062	0.0060	0.0069	0.0069
	S.D.	.00154	.00150	.00116	.00157
	N	10	9	10	9
SPLEEN Ratio	MEAN	0.3481	0.3566	0.3632	0.3763
	S.D.	.04654	.06768	.04558	.04292
	N	10	9	10	10
THYMUS Ratio	MEAN	0.2401	0.2001	0.2403	0.2494
	S.D.	.02614	.04252	.05265	.07092
	N	10	9	10	10

No statistically significant differences

	Summary of Necropsy Observations Preface	Table 8
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TABLE 8

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF NECROPSY OBSERVATIONS					
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
MALES	N	10	10	10	10
GROSS EXAM	N	0	0	1	1
CONGENITAL ANOMALY	N	0	0	1	0
	%	0.0	0.0	10.0	0.0
EXAMINATION NOT COMPLETE	N	0	0	0	1
	%	0.0	0.0	0.0	10.0
KIDNEY	N	1	1	0	0
CYSTIC KIDNEY	N	1	0	0	0
	%	10.0	0.0	0.0	0.0
DILATED RENAL PELVIS	N	0	1	0	0
	%	0.0	10.0	0.0	0.0

No statistically significant differences

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TABLE 8

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF MATERNAL NECROPSY OBSERVATIONS					
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
FEMALES	N	10	10	10	10
KIDNEY	N	0	0	0	1
DILATED RENAL PELVIS	N	0	0	0	1
	%	0.0	0.0	0.0	10.0
No statistically significant differences					

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TABLE 9

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CESAREAN SECTION DATA					
DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
Pregnant (at scheduled sacrifice)	N	10	9	10	10
Dams with no Viable Fetuses	N	0	0	0	0
Dams with Viable Fetuses	N	10	9	10	10
Corpora Lutea	TOTAL	145	133	144	137
No. per animal	MEAN	14.5	14.8	14.4	13.7
	S.D.	2.22	2.68	1.96	2.98
Implantation Sites	TOTAL	139	126	135	127
No. per animal	MEAN	13.9	14.0	13.5	12.7
	S.D.	2.47	2.69	2.51	4.30
Preimplantation Loss	TOTAL	6	7	9	10
No. per animal	MEAN	0.6	0.8	0.9	1.0
	S.D.	0.70	1.09	0.99	1.49
% per animal	MEAN%	4.5	5.3	6.7	11.7
	S.D.	5.29	7.40	7.38	25.39
Live Fetuses	TOTAL	134	125	127	123
No. per animal	MEAN	13.4	13.9	12.7	12.3
	S.D.	2.55	2.52	3.16	4.11
Males	TOTAL	58	62	62	72
	MEAN%	43.6	49.5	49.7	52.7
	S.D.	12.36	8.45	13.80	25.47
Females	TOTAL	76	63	65	51
	MEAN%	56.4	50.5	50.3	47.3
	S.D.	12.36	8.45	13.80	25.47

No statistically significant differences

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TABLE 9

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CESAREAN SECTION DATA					
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
Postimplantation Loss	TOTAL	5	1	8	4
	No. per animal				
	MEAN	0.5	0.1	0.8	0.4
	S.D.	1.08	0.33	1.32	0.52
% implants per animal	MEAN%	3.4	0.6	7.1	2.7
	S.D.	7.35	1.85	13.80	3.54
Dead Fetuses	TOTAL	0	0	0	0
	No. per animal				
	MEAN	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
% of implants per animal	MEAN%	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
Resorptions: Early	TOTAL	5	1	8	4
	No. per animal				
	MEAN	0.5	0.1	0.8	0.4
	S.D.	1.08	0.33	1.32	0.52
% of implants per animal	MEAN%	3.4	0.6	7.1	2.7
	S.D.	7.35	1.85	13.80	3.54
Resorptions: Late	TOTAL	0	0	0	0
	No. per animal				
	MEAN	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
% of implants per animal	MEAN%	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00

No statistically significant differences

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TABLE 9

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CESAREAN SECTION DATA					
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
Fetal Body Weight (g)	MEAN	4.1	4.1	4.1	4.2
	S.D.	0.36	0.23	0.20	0.25
	N	10	9	10	10
Male Fetuses	MEAN	4.2	4.2	4.2	4.3
	S.D.	0.36	0.24	0.24	0.20
Female Fetuses	MEAN	4.0	4.0	4.0	4.0
	S.D.	0.36	0.23	0.22	0.31

No statistically significant differences

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TABLE 10

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
NET BODY WT. CHANGE	MEAN	127	129	130	123
	S.D.	10.8	10.6	22.0	21.4
	N	10	9	10	10
GRAVID UTERINE WT.	MEAN	85	87	82	79
	S.D.	11.6	13.6	19.7	25.9
	N	10	9	10	10
NET WEIGHT CHANGE	MEAN	42	42	48	44
	S.D.	15.2	9.7	9.3	10.9
	N	10	9	10	10

No statistically significant differences

NET BODY WT. CHANGE = TERMINAL BODY WT. MINUS DAY 6 BODY WEIGHT

NET WEIGHT CHANGE = NET BODY WT. CHANGE MINUS UTERINE WEIGHT

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TABLE 11

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF FETAL EXTERNAL OBSERVATIONS

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
Litters Evaluated	N	10	9	10	10
Fetuses Evaluated	N	134	125	127	123
Live	N	134	125	127	123
Dead	N	0	0	0	0
GROSS EXAM					
Litter Incidence	N	0	0	1	0
Fetal Incidence	N	0	0	1	0
M EDEMATOUS					
Fetal Incidence	N	0	0	1	0
	%	0.0	0.0	0.8	0.0
Litter Incidence	N	0	0	1	0
	%	0.0	0.0	10.0	0.0

No statistically significant differences
OBSERVATION CODE: M-MALFORMATION V-VARIATION

	Chamber Monitoring Results	Appendix A
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Cumulative Exposure Record Group 1 - 0 ppm (Air Control)													
Day	Date	Exposure Number	Analytical Chamber Concentration						Particle Size			Chamber Environment	
			Nominal (ppm)	Analytical Chamber Concentration					Determinations			Mean	
				Mean (ppm)	Individual (ppm)				MMAD (µm)	GSD	TMC (mg/m ³)	Temperature (°C)	Humidity (%)
0	20-Oct-04	1	0	0.00	0.00	0.00	0.00	0.00	1.097	1.551	9.98E-04	22	54
1	21-Oct-04	2	0	0.00	0.00	0.00	0.00	0.00	1.387	1.789	1.08E-03	22	56
2	22-Oct-04	3	0	0.00	0.00	0.00	0.00	0.00	3.290	2.184	1.16E-03	23	54
3	23-Oct-04	4	0	0.00	0.00	0.00	0.00	0.00	4.982	2.165	2.71E-03	23	53
4	24-Oct-04	5	0	0.00	0.00	0.00	0.00	0.00	2.080	1.986	1.26E-03	23	57
5	25-Oct-04	6	0	0.00	0.00	0.00	0.00	0.00	1.388	1.923	1.18E-03	23	56
6	26-Oct-04	7	0	0.00	0.00	0.00	0.00	0.00	0.9332	1.832	4.10E-03	23	53
7	27-Oct-04	8	0	0.00	0.00	0.00	0.00	0.00	0.8596	1.664	1.26E-03	23	57
8	28-Oct-04	9	0	0.00	0.00	0.00	0.00	0.00	3.082	2.085	3.11E-03	23	53
9	29-Oct-04	10	0	0.00	0.00	0.00	0.00	0.00	1.260	2.003	1.30E-03	23	56
10	30-Oct-04	11	0	0.00	0.00	0.00	0.00	0.00	0.8124	1.263	3.47E-03	23	60
11	31-Oct-04	12	0	0.00	0.00	0.00	0.00	0.00	5.005	2.934	2.25E-03	23	53
12	1-Nov-04	13	0	0.00	0.00	0.00	0.00	0.00	3.525	1.987	8.53E-04	23	53
13	2-Nov-04	14	0	0.00	0.00	0.00	0.00	0.00	1.432	1.873	6.03E-04	23	57
14	3-Nov-04	15	0	0.00	0.00	0.00	0.00	0.00	0.8615	1.879	1.70E-03	22	51
15	4-Nov-04	16	0	0.00	0.00	0.00	0.00	0.00	1.037	1.594	8.81E-04	20	42
Mean			0		0.00				2.064	1.920	1.74E-03	22.6	54.1
S.D.			0		0.00				1.450	0.362	1.06E-03	0.8	3.9

	Chamber Monitoring Results	Appendix A
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Cumulative Exposure Record Group 2 - 100 ppm													
Day	Date	Exposure Number	Analytical Chamber Concentration						Particle Size Determinations			Chamber Environment	
												Mean	
			Nominal (ppm)	Mean (ppm)	Individual (ppm)				MMAD (µm)	GSD	TMC (mg/m ³)	Temperature (°C)	Humidity (%)
0	20-Oct-04	1	250	83.0	79	81	87	85	1.764	1.980	1.41E-03	21	54
1	21-Oct-04	2	120	83.3	88	82	78	85	1.699	1.836	1.10E-03	22	57
2	22-Oct-04	3	86	97.8	99	100	92	100	1.593	1.820	9.45E-04	22	55
3	23-Oct-04	4	180	100	91	100	110	100	2.087	2.177	1.13E-03	22	54
4	24-Oct-04	5	110	92.8	91	85	95	100	2.337	2.168	1.23E-03	22	58
5	25-Oct-04	6	140	96.8	100	87	100	100	1.171	1.591	9.19E-04	22	56
6	26-Oct-04	7	150	108	120	100	110	100	0.9057	1.449	3.71E-03	23	54
7	27-Oct-04	8	180	106	85	110	110	120	0.8642	1.735	1.26E-03	23	55
8	28-Oct-04	9	300	105	110	100	110	100	1.799	2.014	1.79E-03	22	53
9	29-Oct-04	10	160	98.8	99	100	96	100	1.096	1.576	1.23E-03	22	57
10	30-Oct-04	11	140	107	110	120	100	97	0.8269	1.471	4.00E-03	23	60
11	31-Oct-04	12	150	102	110	97	99	100	0.9052	1.501	7.27E-04	22	54
12	1-Nov-04	13	120	103	110	100	100	100	5.242	2.068	2.27E-03	23	55
13	2-Nov-04	14	120	108	110	110	110	100	3.688	2.136	1.04E-03	22	58
14	3-Nov-04	15	110	94.0	86	95	95	100	0.7943	1.520	1.26E-03	21	51
15	4-Nov-04	16	140	105	100	110	110	100	1.309	1.817	1.04E-03	20	50
Mean			153.5		99.3				1.755	1.804	1.57E-03	22.0	55.1
S.D.			54.5		9.8				1.194	0.263	9.65E-04	0.8	2.6

	Chamber Monitoring Results	Appendix A
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Cumulative Exposure Record Group 3 - 1000 ppm													
Day	Date	Exposure Number							Particle Size			Chamber Environment	
			Nominal (ppm)	Analytical Chamber Concentration					Determinations			Mean	
				Mean (ppm)	Individual (ppm)				MMAD (µm)	GSD	TMC (mg/m ³)	Temperature (°C)	Humidity (%)
0	20-Oct-04	1	740	1060	1100	1100	1200	840	1.272	1.847	1.25E-03	22	50
1	21-Oct-04	2	840	1080	1200	1000	1000	1100	7.320	2.303	3.88E-03	23	54
2	22-Oct-04	3	890	1110	1100	1500	1200	620	1.358	1.514	5.81E-04	23	54
3	23-Oct-04	4	620	585	610	500	560	670	5.384	2.331	1.32E-03	23	52
4	24-Oct-04	5	660	813	730	810	780	930	4.063	2.487	1.59E-03	23	57
5	25-Oct-04	6	770	920	980	920	950	830	2.463	2.492	1.29E-03	23	55
6	26-Oct-04	7	820	890	840	840	870	1000	0.9241	1.689	3.97E-03	23	54
7	27-Oct-04	8	920	938	860	930	970	990	1.047	2.008	1.74E-03	23	54
8	28-Oct-04	9	1000	1230	1100	580	2600	630	1.966	2.075	1.93E-03	23	50
9	29-Oct-04	10	890	840	720	780	760	1100	1.773	1.954	1.83E-03	23	55
10	30-Oct-04	11	1200	863	630	910	910	1000	0.8356	1.492	4.18E-04	23	60
11	31-Oct-04	12	1200	1150	890	2100	790	800	1.495	2.085	1.09E-03	24	54
12	1-Nov-04	13	1100	1120	1200	1300	1000	990	5.121	2.051	1.06E-03	24	54
13	2-Nov-04	14	1400	1230	380	1200	3000	350	1.450	2.021	1.14E-03	24	59
14	3-Nov-04	15	1100	1080	1000	1100	1100	1100	0.8081	2.140	1.30E-03	23	51
15	4-Nov-04	16	1100	1100	1100	1100	1100	1100	1.702	2.055	1.34E-03	22	48
Mean			953		999				2.436	2.034	1.61E-03	23.1	53.8
S.D.			217		421				1.956	0.296	9.88E-04	0.6	3.2

	Chamber Monitoring Results	Appendix A
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Cumulative Exposure Record Group 4 - 10000 ppm													
Day	Date	Exposure Number	Analytical Chamber Concentration						Particle Size			Chamber Environment	
			Nominal (ppm)	Analytical Chamber Concentration					Determinations			Mean	
				Mean (ppm)	Individual (ppm)				MMAD (µm)	GSD	TMC (mg/m ³)	Temperature (°C)	Humidity (%)
0	20-Oct-04	1	9000	10300	10000	11000	10000	10000	0.8475	1.567	1.72E-03	23	50
1	21-Oct-04	2	8800	10200	9800	11000	10000	10000	0.8634	1.566	2.35E-03	22	47
2	22-Oct-04	3	9100	10000	10000	10000	10000	10000	1.086	1.843	1.54E-03	23	49
3	23-Oct-04	4	8800	10300	10000	10000	10000	11000	0.9885	2.125	2.41E-03	23	48
4	24-Oct-04	5	8800	9730	9500	9800	9600	10000	1.308	1.870	9.60E-04	23	51
5	25-Oct-04	6	8700	9950	10000	10000	10000	9800	0.9081	1.694	2.13E-03	23	50
6	26-Oct-04	7	10000	9930	9700	10000	10000	10000	0.9592	1.932	4.84E-03	23	49
7	27-Oct-04	8	10000	9780	9700	9800	9800	9800	0.9277	1.998	2.96E-03	23	50
8	28-Oct-04	9	9700	9900	10000	11000	9300	9300	1.807	2.035	1.72E-03	23	47
9	29-Oct-04	10	8200	9830	8300	11000	10000	10000	0.9320	1.987	3.88E-03	23	51
10	30-Oct-04	11	10000	10000	10000	10000	10000	10000	0.8478	1.682	8.07E-03	23	57
11	31-Oct-04	12	10000	10000	10000	10000	10000	10000	0.8962	2.076	2.90E-03	23	50
12	1-Nov-04	13	10000	10000	10000	10000	10000	10000	0.8478	1.740	1.89E-03	24	49
13	2-Nov-04	14	10000	10000	10000	10000	10000	10000	2.782	1.889	2.10E-03	23	52
14	3-Nov-04	15	10000	10300	11000	10000	10000	10000	0.8209	1.788	2.65E-03	22	47
15	4-Nov-04	16	10000	9980	10000	10000	9900	10000	0.9665	2.241	3.09E-03	22	46
Mean			9440		10000				1.112	1.877	2.83E-03	22.9	49.6
S.D.			643		412				0.509	0.197	1.69E-03	0.5	2.6

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

MALES GROUP 1 0 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
1032	TERMINAL SACRIFICE	3-NOV-04	14
1033	TERMINAL SACRIFICE	3-NOV-04	14
1034	TERMINAL SACRIFICE	3-NOV-04	14
1035	TERMINAL SACRIFICE	3-NOV-04	14
1036	TERMINAL SACRIFICE	3-NOV-04	14
1037	TERMINAL SACRIFICE	4-NOV-04	15
1038	TERMINAL SACRIFICE	4-NOV-04	15
1039	TERMINAL SACRIFICE	4-NOV-04	15
1040	TERMINAL SACRIFICE	4-NOV-04	15
1041	TERMINAL SACRIFICE	4-NOV-04	15

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

MALES GROUP 2 100 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
2032	TERMINAL SACRIFICE	3-NOV-04	14
2033	TERMINAL SACRIFICE	3-NOV-04	14
2034	TERMINAL SACRIFICE	3-NOV-04	14
2035	TERMINAL SACRIFICE	3-NOV-04	14
2036	TERMINAL SACRIFICE	3-NOV-04	14
2037	TERMINAL SACRIFICE	4-NOV-04	15
2038	TERMINAL SACRIFICE	4-NOV-04	15
2039	TERMINAL SACRIFICE	4-NOV-04	15
2040	TERMINAL SACRIFICE	4-NOV-04	15
2041	TERMINAL SACRIFICE	4-NOV-04	15

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

MALES GROUP 3 1000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
3032	TERMINAL SACRIFICE	3-NOV-04	14
3033	TERMINAL SACRIFICE	3-NOV-04	14
3034	TERMINAL SACRIFICE	3-NOV-04	14
3035	TERMINAL SACRIFICE	3-NOV-04	14
3036	TERMINAL SACRIFICE	3-NOV-04	14
3037	TERMINAL SACRIFICE	4-NOV-04	15
3038	TERMINAL SACRIFICE	4-NOV-04	15
3039	TERMINAL SACRIFICE	4-NOV-04	15
3040	TERMINAL SACRIFICE	4-NOV-04	15
3041	TERMINAL SACRIFICE	4-NOV-04	15

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

MALES GROUP 4 10000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
4032	TERMINAL SACRIFICE	3-NOV-04	14
4033	TERMINAL SACRIFICE	3-NOV-04	14
4034	TERMINAL SACRIFICE	3-NOV-04	14
4035	TERMINAL SACRIFICE	3-NOV-04	14
4036	TERMINAL SACRIFICE	3-NOV-04	14
4037	TERMINAL SACRIFICE	4-NOV-04	15
4038	TERMINAL SACRIFICE	4-NOV-04	15
4039	TERMINAL SACRIFICE	4-NOV-04	15
4040	TERMINAL SACRIFICE	4-NOV-04	15
4041	TERMINAL SACRIFICE	4-NOV-04	15

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 1 0 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
1532	TERMINAL SACRIFICE	3-NOV-04	20	P
1533	TERMINAL SACRIFICE	3-NOV-04	20	P
1534	TERMINAL SACRIFICE	3-NOV-04	20	P
1535	TERMINAL SACRIFICE	4-NOV-04	20	P
1536	TERMINAL SACRIFICE	4-NOV-04	20	P
1537	TERMINAL SACRIFICE	4-NOV-04	20	P
1538	TERMINAL SACRIFICE	5-NOV-04	20	P
1539	TERMINAL SACRIFICE	5-NOV-04	20	P
1540	TERMINAL SACRIFICE	5-NOV-04	20	P
1541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 2 100 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
2532	TERMINAL SACRIFICE	3-NOV-04	20	P
2533	TERMINAL SACRIFICE	3-NOV-04	20	P
2534	TERMINAL SACRIFICE	3-NOV-04	20	P
2535	TERMINAL SACRIFICE	4-NOV-04	20	NP
2536	TERMINAL SACRIFICE	4-NOV-04	20	P
2537	TERMINAL SACRIFICE	4-NOV-04	20	P
2538	TERMINAL SACRIFICE	5-NOV-04	20	P
2539	TERMINAL SACRIFICE	5-NOV-04	20	P
2540	TERMINAL SACRIFICE	5-NOV-04	20	P
2541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 3 1000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
3532	TERMINAL SACRIFICE	3-NOV-04	20	P
3533	TERMINAL SACRIFICE	3-NOV-04	20	P
3534	TERMINAL SACRIFICE	3-NOV-04	20	P
3535	TERMINAL SACRIFICE	4-NOV-04	20	P
3536	TERMINAL SACRIFICE	4-NOV-04	20	P
3537	TERMINAL SACRIFICE	4-NOV-04	20	P
3538	TERMINAL SACRIFICE	5-NOV-04	20	P
3539	TERMINAL SACRIFICE	5-NOV-04	20	P
3540	TERMINAL SACRIFICE	5-NOV-04	20	P
3541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 4 10000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
4532	TERMINAL SACRIFICE	3-NOV-04	20	P
4533	TERMINAL SACRIFICE	3-NOV-04	20	P
4534	TERMINAL SACRIFICE	3-NOV-04	20	P
4535	TERMINAL SACRIFICE	4-NOV-04	20	P
4536	TERMINAL SACRIFICE	4-NOV-04	20	P
4537	TERMINAL SACRIFICE	4-NOV-04	20	P
4538	TERMINAL SACRIFICE	5-NOV-04	20	P
4539	TERMINAL SACRIFICE	5-NOV-04	20	P
4540	TERMINAL SACRIFICE	5-NOV-04	20	P
4541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 1 0 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY					
			-	1	1	1	
			6	0	7	3	4 5
1032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1040	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
1041	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 2 100 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1
			6	0	7	3 4 5
2032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
2033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P	P	P
2034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
2035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE SCABS TOP OF HEAD ALOPECIA - GENERAL		P	P	P	P
2036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P	P	P
2037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
2038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P	P	P
2039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 2 100 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1
			6	0	7	3 4 5
2040	WITHIN NORMAL LIMITS		P	P	P	
	TERMINAL SACRIFICE					P
	NASAL DISCHARGE - RED			P		
2041	WITHIN NORMAL LIMITS		P	P	P	P
	TERMINAL SACRIFICE					P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES GROUP 3 1000 PPM

INDIVIDUAL CLINICAL OBSERVATIONS

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1
			6	0	7	3
3032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P		P
3034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3040	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3041	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P		P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 4 10000 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1
			6	0	7	3 4 5
4032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P		P
4039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4040	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
4041	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 1 0 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2																									
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
1532	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1533	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1534	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1537	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P								P									P	
1541	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																	P									P	

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 2 100 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2																								
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4
2532	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2533	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2534	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS						P	P						P											P		
2535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2537	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
2541	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P						P											P		
CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT																											

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 3 1000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2																										
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	
3532	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	
3533	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS						P	P					P														P	P	
3534	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS						P	P					3														3	3	
3535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	
3536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	
3537	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS						P	P					P														P	P	
3538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	
3539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	
3540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	
3541	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P														P	P	

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 4 10000 PPM

FEMALE#	OBSERVATIONS	DAY OF	1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2																									
		GESTATION	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
4532	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS							P	P										P									P
4533	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS							P	P										P									P
4534	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4537	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P
4541	TERMINAL SACRIFICE WITHIN NORMAL LIMITS							P	P										P									P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES	GROUP 1	0 PPM			
ANIMAL#		DAY OF STUDY			
		-6	0	7	13
1032		192	249	290	328
1033		208	269	308	345
1034		199	254	299	335
1035		203	272	328	356
1036		210	272	325	360
1037		200	258	310	344
1038		204	258	306	351
1039		187	244	294	326
1040		197	254	304	336
1041		184	234	263	289
MEAN		198	256	303	337
S.D.		8.5	12.2	18.4	20.3
N		10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 2 100 PPM

ANIMAL#	DAY OF STUDY			
	-6	0	7	13
2032	197	262	325	354
2033	212	279	331	371
2034	182	241	282	303
2035	203	260	315	347
2036	207	271	336	383
2037	199	262	311	339
2038	204	273	331	369
2039	200	265	319	356
2040	190	242	293	324
2041	192	241	276	304
MEAN	198	259	312	345
S.D.	8.7	13.8	21.3	27.5
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 3 1000 PPM

ANIMAL#	DAY OF STUDY			
	-6	0	7	13
3032	195	264	323	362
3033	192	252	298	330
3034	204	265	312	357
3035	194	260	318	356
3036	207	264	320	353
3037	208	264	309	347
3038	198	256	293	327
3039	202	269	322	366
3040	201	264	318	363
3041	186	234	276	302
MEAN	199	259	309	346
S.D.	7.1	10.2	15.3	20.3
N	10	10	10	10

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 4 10000 PPM

ANIMAL#	DAY OF STUDY			
	-6	0	7	13
4032	206	277	348	406
4033	206	265	313	353
4034	202	260	318	362
4035	197	263	313	349
4036	192	246	304	338
4037	183	238	288	309
4038	187	248	311	347
4039	208	270	318	357
4040	197	257	305	338
4041	201	253	303	345
MEAN	198	258	312	350
S.D.	8.4	11.9	15.4	24.4
N	10	10	10	10

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

GROUP 1 0 PPM

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
1532	258	281	334	431
1533	261	277	309	393
1534	265	283	321	403
1535	229	254	294	371
1536	237	250	293	379
1537	282	300	330	419
1538	247	273	330	401
1539	249	271	313	394
1540	256	283	333	416
1541	267	282	328	421
MEAN	255	275	318	403
S.D.	15.4	14.6	15.6	19.1
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

GROUP 2 100 PPM

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
2532	250	271	309	398
2533	262	274	329	415
2534	267	283	324	410
2535x NP	226	241	262	278
2536	242	252	299	374
2537	276	294	329	414
2538	244	271	317	406
2539	249	271	318	403
2540	262	280	321	426
2541	265	288	338	401
MEAN	257	276	320	405
S.D.	11.7	12.4	11.4	14.6
N	9	9	9	9

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 3 1000 PPM INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
3532	240	259	309	386
3533	264	285	324	427
3534	282	296	352	453
3535	236	256	304	389
3536	250	265	314	393
3537	254	269	307	394
3538	247	262	312	386
3539	253	263	298	339
3540	258	293	340	444
3541	266	289	328	428
MEAN	255	274	319	404
S.D.	13.3	15.3	17.1	34.0
N	10	10	10	10

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
4532	257	280	323	405
4533	262	287	330	425
4534	266	274	306	385
4535	230	249	277	350
4536	250	268	310	344
4537	254	265	310	397
4538	242	254	304	381
4539	253	278	321	419
4540	254	273	318	404
4541	268	288	331	435
MEAN	253	272	313	395
S.D.	11.4	13.0	15.9	30.2
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)

MALES	GROUP 1	0 PPM			
ANIMAL#	DAY OF STUDY				
	-6-0	0-7	7-13	0-13	
1032	57	41	38	78	
1033	61	39	37	76	
1034	55	45	36	81	
1035	69	57	28	84	
1036	62	53	35	87	
1037	59	52	34	86	
1038	54	48	44	93	
1039	57	50	31	82	
1040	57	50	32	82	
1041	50	29	26	55	
MEAN	58	46	34	80	
S.D.	5.0	8.2	5.3	10.1	
N	10	10	10	10	

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)

MALES GROUP 2 100 PPM

ANIMAL#	DAY OF STUDY			
	-6-0	0-7	7-13	0-13
2032	65	64	29	92
2033	68	52	41	92
2034	58	42	21	63
2035	57	55	32	87
2036	65	65	47	112
2037	63	49	28	77
2038	69	59	37	96
2039	64	54	37	91
2040	53	51	32	82
2041	50	35	28	62
MEAN	61	52	33	85
S.D.	6.5	9.2	7.5	15.1
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)

MALES GROUP 3 1000 PPM

ANIMAL#	DAY OF STUDY			
	-6-0	0-7	7-13	0-13
3032	69	59	39	98
3033	60	47	31	78
3034	60	47	45	92
3035	66	58	38	96
3036	57	56	33	89
3037	56	45	38	82
3038	58	38	34	72
3039	66	53	44	97
3040	64	53	45	98
3041	48	42	26	69
MEAN	61	50	37	87
S.D.	6.2	7.1	6.2	11.3
N	10	10	10	10

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)

MALES GROUP 4 10000 PPM

ANIMAL#	DAY OF STUDY			
	-6-0	0-7	7-13	0-13
4032	71	71	58	129
4033	59	49	40	89
4034	58	58	45	102
4035	66	50	36	86
4036	54	58	35	92
4037	55	51	21	72
4038	61	63	35	99
4039	62	48	39	87
4040	59	49	32	81
4041	52	50	42	92
MEAN	60	55	38	93
S.D.	5.7	7.7	9.5	15.3
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1 0 PPM INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
1532	23	53	97	173
1533	16	32	84	132
1534	18	38	82	138
1535	25	40	77	142
1536	13	43	86	142
1537	18	31	89	137
1538	26	57	70	153
1539	22	42	81	145
1540	27	50	84	161
1541	15	46	93	154
MEAN	20	43	84	148
S.D.	5.0	8.6	7.6	12.5
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 2 100 PPM INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
2532	21	38	89	148
2533	13	55	86	153
2534	16	40	86	143
2535x NP	15	21	15	52
2536	10	48	75	132
2537	18	34	85	138
2538	27	46	89	162
2539	22	47	85	154
2540	18	41	105	164
2541	24	50	63	136
MEAN	19	44	85	148
S.D.	5.6	6.4	11.3	11.5
N	9	9	9	9

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 3 1000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
3532	19	49	78	146
3533	22	39	103	164
3534	15	56	102	172
3535	20	49	84	153
3536	15	49	79	143
3537	15	38	87	141
3538	15	50	74	139
3539	10	35	42	86
3540	35	48	103	186
3541	23	39	101	162
MEAN	19	45	85	149
S.D.	6.9	6.9	19.1	26.7
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
4532	22	44	82	147
4533	25	43	96	163
4534	8	32	79	119
4535	19	28	73	120
4536	19	42	34	95
4537	11	44	88	143
4538	12	50	77	139
4539	25	44	98	166
4540	20	45	85	150
4541	21	43	104	167
MEAN	18	41	82	141
S.D.	5.8	6.5	19.3	23.6
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

MALES GROUP 1 0 PPM

ANIMAL#	DAY OF STUDY		
	0	7	13
1032	108	89	80
1033	108	90	80
1034	105	86	78
1035	113	98	78
1036	110	90	77
1037	110	91	78
1038	104	89	78
1039	112	91	82
1040	116	96	84
1041	107	86	79
MEAN	109	91	79
S.D.	3.6	3.7	2.3
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

MALES GROUP 2 100 PPM

ANIMAL#	DAY OF STUDY		
	0	7	13
2032	114	99	90
2033	110	92	80
2034	109	88	75
2035	116	93	83
2036	111	93	87
2037	112	96	82
2038	114	97	84
2039	115	98	84
2040	111	95	82
2041	107	90	80
MEAN	112	94	83
S.D.	2.8	3.7	4.1
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

MALES GROUP 3 1000 PPM

ANIMAL#	DAY OF STUDY		
	0	7	13
3032	110	92	78
3033	103	83	74
3034	110	89	83
3035	115	98	82
3036	106	88	78
3037	110	90	82
3038	109	87	77
3039	118	96	84
3040	113	91	80
3041	112	91	76
MEAN	110	91	79
S.D.	4.3	4.2	3.3
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

MALES GROUP 4 10000 PPM

ANIMAL#	DAY OF STUDY		
	0	7	13
4032	110	93	85
4033	107	91	79
4034	105	88	79
4035	114	92	81
4036	103	90	78
4037	114	98	84
4038	115	93	79
4039	106	87	80
4040	114	94	80
4041	106	91	81
MEAN	109	92	81
S.D.	4.7	3.1	2.4
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 1 0 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
1532	104	99	85	96
1533	78	77	64	73
1534	94	92	76	87
1535	100	100	86	95
1536	95	96	76	89
1537	89	80	71	80
1538	99	101	83	94
1539	90	89	76	85
1540	104	100	75	93
1541	84	87	76	82
MEAN	94	92	77	88
S.D.	8.6	8.6	6.6	7.5
N	10	10	10	10

CF=Contaminated Feeder

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 2 100 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
2532	96	92	75	88
2533	84	86	73	81
2534	88	85	73	82
2535x NP	100	94	87	94
2536	98	93	74	88
2537	84	84	72	80
2538	105	102	79	95
2539	92	91	82	88
2540	94	93	81	89
2541	93	95	78	89
MEAN	93	91	77	87
S.D.	6.7	5.6	3.7	4.9
N	9	9	9	9

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 3 1000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
3532	96	93	76	88
3533	102	97	68	89
3534	87	88	72	82
3535	101	95	84	93
3536	99	90	76	88
3537	93	84	78	85
3538	95	98	70	88
3539	85	89	83	86
3540	104	95	69	89
3541	92	88	74	85
MEAN	95	92	75	87
S.D.	6.3	4.6	5.6	3.0
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
4532	96	95	76	89
4533	90	86	76	84
4534	76	84	78	79
4535	104	89	72	88
4536	96	93	83	91
4537	97	98	76	90
4538	83		75	79
4539	94	97	81	91
4540	91	91	77	86
4541	90	90	77	86
MEAN	92	91	77	86
S.D.	7.8	4.8	3.1	4.3
N	10	9	10	10

	Organ and Final Body Weights Preface	Appendix G
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Key to Abbreviations:

g = Grams
Sem. Ves = Seminal Vesicals

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1032	297	0.0529	0.0002	0.0252	2.1018	0.0071	1.0000	0.8045	0.0027	0.3828	1.1757	0.0040	0.5594
1033	304	0.0652	0.0002	0.0302	2.1578	0.0071	1.0000	1.0020	0.0033	0.4644	1.2614	0.0042	0.5846
1034	305	0.0584	0.0002	0.0279	2.0905	0.0069	1.0000	0.7563	0.0025	0.3618	1.3429	0.0044	0.6424
1035	324	0.0841	0.0003	0.0379	2.2198	0.0068	1.0000	0.8213	0.0025	0.3700	1.3469	0.0042	0.6068
1036	322	0.0734	0.0002	0.0365	2.0132	0.0063	1.0000	0.7344	0.0023	0.3648	1.6505	0.0051	0.8198
1037	319	0.0699	0.0002	0.0339	2.0641	0.0065	1.0000	0.7592	0.0024	0.3678	1.2834	0.0040	0.6218
1038	328	0.0653	0.0002	0.0322	2.0291	0.0062	1.0000	0.8196	0.0025	0.4039	1.3584	0.0041	0.6695
1039	304	0.0586	0.0002	0.0309	1.8934	0.0062	1.0000	0.7154	0.0024	0.3778	1.3347	0.0044	0.7049
1040	315	0.0613	0.0002	0.0302	2.0296	0.0064	1.0000	0.8834	0.0028	0.4353	1.2656	0.0040	0.6236
1041	267	0.0535	0.0002	0.0273	1.9566	0.0073	1.0000	0.7936	0.0030	0.4056	1.1703	0.0044	0.5981

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2032	330	0.0628	0.0002	0.0314	1.9970	0.0060	1.0000	0.8651	0.0026	0.4332	1.4353	0.0043	0.7187
2033	336	0.0658	0.0002	0.0331	1.9895	0.0059	1.0000	0.8290	0.0025	0.4167	1.3631	0.0041	0.6851
2034	282	0.0612	0.0002	0.0327	1.8714	0.0066	1.0000	0.7734	0.0027	0.4133	1.2567	0.0045	0.6715
2035	317	0.0613	0.0002	0.0312	1.9678	0.0062	1.0000	0.9391	0.0030	0.4772	1.2457	0.0039	0.6330
2036	352	0.0578	0.0002	0.0269	2.1494	0.0061	1.0000	0.8749	0.0025	0.4070	1.4611	0.0042	0.6798
2037	313	0.0731	0.0002	0.0366	1.9993	0.0064	1.0000	0.8054	0.0026	0.4028	1.3321	0.0043	0.6663
2038	338	0.0690	0.0002	0.0337	2.0505	0.0061	1.0000	0.9862	0.0029	0.4810	1.4911	0.0044	0.7272
2039	332	0.0692	0.0002	0.0318	2.1735	0.0066	1.0000	0.7432	0.0022	0.3419	1.3899	0.0042	0.6395
2040	301	0.0549	0.0002	0.0282	1.9464	0.0065	1.0000	0.7350	0.0024	0.3776	1.2966	0.0043	0.6662
2041	281	0.0482	0.0002	0.0245	1.9708	0.0070	1.0000	0.8030	0.0029	0.4074	1.1889	0.0042	0.6033

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3032	327	0.0565	0.0002	0.0274	2.0651	0.0063	1.0000	0.7801	0.0024	0.3778	1.2456	0.0038	0.6032
3033	306	0.0607	0.0002	0.0285	2.1272	0.0069	1.0000	0.8344	0.0027	0.3923	1.4606	0.0048	0.6866
3034	324	0.0653	0.0002	0.0300	2.1790	0.0067	1.0000	0.7764	0.0024	0.3563	1.2827	0.0040	0.5887
3035	321	0.0648	0.0002	0.0319	2.0327	0.0063	1.0000	0.8385	0.0026	0.4125	1.2903	0.0040	0.6348
3036	325	0.0685	0.0002	0.0355	1.9279	0.0059	1.0000	0.7580	0.0023	0.3932	1.3197	0.0041	0.6845
3037	314	0.0637	0.0002	0.0306	2.0786	0.0066	1.0000	0.8592	0.0027	0.4134	1.3019	0.0041	0.6263
3038	302	0.0562	0.0002	0.0283	1.9852	0.0066	1.0000	0.8061	0.0027	0.4061	1.3227	0.0044	0.6663
3039	340	0.0833	0.0002	0.0421	1.9785	0.0058	1.0000	0.7791	0.0023	0.3938	1.2058	0.0036	0.6095
3040	335	0.0785	0.0002	0.0353	2.2210	0.0066	1.0000	0.9166	0.0027	0.4127	1.3849	0.0041	0.6235
3041	278	0.0467	0.0002	0.0235	1.9892	0.0071	1.0000	0.7702	0.0028	0.3872	1.0884	0.0039	0.5472

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4032	362	0.0678	0.0002	0.0340	1.9958	0.0055	1.0000	0.9274	0.0026	0.4647	1.5692	0.0043	0.7863
4033	322	0.0633	0.0002	0.0317	1.9947	0.0062	1.0000	0.7995	0.0025	0.4008	1.3414	0.0042	0.6725
4034	321	0.0518	0.0002	0.0262	1.9780	0.0062	1.0000	0.7667	0.0024	0.3876	1.3756	0.0043	0.6954
4035	318	0.0641	0.0002	0.0321	1.9948	0.0063	1.0000	0.7501	0.0024	0.3760	1.4194	0.0045	0.7116
4036	301	0.0587	0.0002	0.0290	2.0215	0.0067	1.0000	0.9729	0.0032	0.4813	1.3609	0.0045	0.6732
4037	290	0.0564	0.0002	0.0288	1.9575	0.0067	1.0000	0.7813	0.0027	0.3991	1.2587	0.0043	0.6430
4038	314	0.0632	0.0002	0.0313	2.0175	0.0064	1.0000	0.9024	0.0029	0.4473	1.2345	0.0039	0.6119
4039	326	0.0621	0.0002	0.0311	1.9993	0.0061	1.0000	0.7248	0.0022	0.3625	1.2296	0.0038	0.6150
4040	308	0.0588	0.0002	0.0284	2.0699	0.0067	1.0000	0.8070	0.0026	0.3899	1.2878	0.0042	0.6222
4041	325	0.0573	0.0002	0.0297	1.9314	0.0059	1.0000	0.7433	0.0023	0.3849	1.2568	0.0039	0.6507

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1032	297	2.5407	0.0085	1.2088	10.6737	0.0359	5.0784	1.5840	0.0053	0.7536	0.0088	0.0000	0.0042
1033	304	3.1221	0.0103	1.4469	10.9952	0.0362	5.0956	1.7646	0.0058	0.8178	0.0113	0.0000	0.0052
1034	305	3.4100	0.0112	1.6312	12.1977	0.0400	5.8348	1.7581	0.0058	0.8410	0.0093	0.0000	0.0044
1035	324	3.4254	0.0106	1.5431	11.5414	0.0356	5.1993	2.1906	0.0068	0.9868	0.0106	0.0000	0.0048
1036	322	3.3612	0.0105	1.6696	11.3651	0.0353	5.6453	1.9696	0.0061	0.9783	0.0051	0.0000	0.0025
1037	319	3.0217	0.0095	1.4639	11.3344	0.0355	5.4912	1.7421	0.0055	0.8440	0.0102	0.0000	0.0049
1038	328	3.1660	0.0097	1.5603	12.3488	0.0377	6.0859	2.0802	0.0063	1.0252	0.0113	0.0000	0.0056
1039	304	2.8869	0.0095	1.5247	12.1570	0.0400	6.4207	1.4946	0.0049	0.7894	0.0137	0.0000	0.0072
1040	315	3.2361	0.0103	1.5945	11.9973	0.0381	5.9112	1.5166	0.0048	0.7472	0.0093	0.0000	0.0046
1041	267	2.5899	0.0097	1.3237	8.1621	0.0306	4.1716	1.6935	0.0063	0.8655	0.0106	0.0000	0.0054

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2032	330	3.3199	0.0101	1.6624	11.0622	0.0335	5.5394	2.1158	0.0064	1.0595	0.0103	0.0000	0.0052
2033	336	3.4317	0.0102	1.7249	11.3201	0.0337	5.6899	1.8051	0.0054	0.9073	0.0105	0.0000	0.0053
2034	282	3.0249	0.0107	1.6164	9.6011	0.0340	5.1304	1.8898	0.0067	1.0098	0.0068	0.0000	0.0036
2035	317	3.1978	0.0101	1.6251	11.5444	0.0364	5.8667	1.9931	0.0063	1.0129	0.0125	0.0000	0.0064
2036	352	3.6894	0.0105	1.7165	12.8386	0.0365	5.9731	2.0451	0.0058	0.9515	0.0134	0.0000	0.0062
2037	313	3.2526	0.0104	1.6269	14.2107	0.0454	7.1078	1.6784	0.0054	0.8395	0.0170	0.0001	0.0085
2038	338	3.4522	0.0102	1.6836	13.0875	0.0387	6.3826	2.1891	0.0065	1.0676	0.0060	0.0000	0.0029
2039	332	3.9815	0.0120	1.8318	12.0911	0.0365	5.5630	1.6520	0.0050	0.7601	0.0094	0.0000	0.0043
2040	301	2.8515	0.0095	1.4650	10.5787	0.0352	5.4350	1.7322	0.0058	0.8900	0.0086	0.0000	0.0044
2041	281	2.7371	0.0098	1.3888	10.2060	0.0364	5.1786	1.3520	0.0048	0.6860	0.0100	0.0000	0.0051

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3032	327	3.1535	0.0097	1.5270	10.9098	0.0334	5.2829	1.7306	0.0053	0.8380	0.0092	0.0000	0.0045
3033	306	2.9719	0.0097	1.3971	10.8893	0.0355	5.1191	1.9016	0.0062	0.8939	0.0093	0.0000	0.0044
3034	324	2.9880	0.0092	1.3713	11.4878	0.0354	5.2721	1.5847	0.0049	0.7273	0.0106	0.0000	0.0049
3035	321	3.1390	0.0098	1.5443	14.9211	0.0465	7.3405	1.8929	0.0059	0.9312	0.0105	0.0000	0.0052
3036	325	3.5229	0.0109	1.8273	13.5564	0.0418	7.0317	2.0551	0.0063	1.0660	0.0081	0.0000	0.0042
3037	314	3.2540	0.0104	1.5655	10.0976	0.0322	4.8579	1.7931	0.0057	0.8626	0.0080	0.0000	0.0038
3038	302	3.3346	0.0110	1.6797	14.3158	0.0474	7.2113	1.5408	0.0051	0.7761	0.0113	0.0000	0.0057
3039	340	3.2630	0.0096	1.6492	14.0026	0.0412	7.0774	1.5470	0.0046	0.7819	0.0118	0.0000	0.0060
3040	335	3.0513	0.0091	1.3738	12.4171	0.0371	5.5908	2.0974	0.0063	0.9443	0.0121	0.0000	0.0054
3041	278	2.8191	0.0101	1.4172	10.9327	0.0393	5.4960	1.5055	0.0054	0.7568	0.0089	0.0000	0.0045

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4032	362	3.6590	0.0101	1.8333	12.1977	0.0337	6.1117	2.7992	0.0077	1.4025	0.0132	0.0000	0.0066
4033	322	3.4379	0.0107	1.7235	12.4265	0.0386	6.2298	1.6128	0.0050	0.8085	0.0100	0.0000	0.0050
4034	321	3.1457	0.0098	1.5903	12.4559	0.0388	6.2972	2.0394	0.0064	1.0310	0.0081	0.0000	0.0041
4035	318	3.0940	0.0097	1.5510	10.6193	0.0334	5.3235	1.8139	0.0057	0.9093	0.0090	0.0000	0.0045
4036	301	3.1382	0.0104	1.5524	11.3354	0.0377	5.6074	1.9007	0.0063	0.9402	0.0117	0.0000	0.0058
4037	290	3.1597	0.0109	1.6142	10.2468	0.0353	5.2346	1.8515	0.0064	0.9458	0.0104	0.0000	0.0053
4038	314	2.6488	0.0084	1.3129	12.0166	0.0383	5.9562	1.5701	0.0050	0.7782	0.0112	0.0000	0.0056
4039	326	3.4480	0.0106	1.7246	12.4083	0.0380	6.2063	1.8222	0.0056	0.9114	0.0094	0.0000	0.0047
4040	308	2.9219	0.0095	1.4116	10.4456	0.0339	5.0464	1.8999	0.0062	0.9179	0.0089	0.0000	0.0043
4041	325	2.9052	0.0089	1.5042	12.0791	0.0372	6.2541	1.7602	0.0054	0.9114	0.0105	0.0000	0.0054

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1032	297	1.3381	0.0045	0.6366	0.8257	0.0028	0.3929	3.1772	0.0107	1.5117	0.6140	0.0021	0.2921
1033	304	1.1517	0.0038	0.5337	0.6376	0.0021	0.2955	3.0655	0.0101	1.4207	0.6190	0.0020	0.2869
1034	305	1.3913	0.0046	0.6655	0.8870	0.0029	0.4243	3.0421	0.0100	1.4552	0.6155	0.0020	0.2944
1035	324	1.3205	0.0041	0.5949	0.7034	0.0022	0.3169	3.0238	0.0093	1.3622	0.5826	0.0018	0.2625
1036	322	1.0234	0.0032	0.5083	0.6522	0.0020	0.3240	3.6722	0.0114	1.8241	0.6563	0.0020	0.3260
1037	319	0.9790	0.0031	0.4743	0.6273	0.0020	0.3039	2.9805	0.0093	1.4440	0.5517	0.0017	0.2673
1038	328	1.1267	0.0034	0.5553	0.7055	0.0022	0.3477	3.4145	0.0104	1.6828	0.6888	0.0021	0.3395
1039	304	1.2001	0.0040	0.6338	0.7637	0.0025	0.4033	2.7760	0.0091	1.4661	0.7899	0.0026	0.4172
1040	315	1.0166	0.0032	0.5009	0.8415	0.0027	0.4146	2.9185	0.0093	1.4380	0.6075	0.0019	0.2993
1041	267	2.7322	0.0102	1.3964	0.4789	0.0018	0.2448	2.9424	0.0110	1.5038	0.4299	0.0016	0.2197

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2032	330	1.0471	0.0032	0.5243	0.7367	0.0022	0.3689	2.7705	0.0084	1.3873	0.5860	0.0018	0.2934
2033	336	1.1165	0.0033	0.5612	0.7554	0.0022	0.3797	2.9333	0.0087	1.4744	0.8027	0.0024	0.4035
2034	282	1.1994	0.0042	0.6409	0.6544	0.0023	0.3497	3.0917	0.0110	1.6521	0.5878	0.0021	0.3141
2035	317	0.8011	0.0025	0.4071	0.9339	0.0029	0.4746	3.4254	0.0108	1.7407	0.7221	0.0023	0.3670
2036	352	1.3687	0.0039	0.6368	1.0680	0.0030	0.4969	3.1058	0.0088	1.4450	0.6517	0.0019	0.3032
2037	313	1.1606	0.0037	0.5805	0.8858	0.0028	0.4431	3.0881	0.0099	1.5446	0.5060	0.0016	0.2531
2038	338	1.3647	0.0040	0.6655	0.8527	0.0025	0.4158	3.0179	0.0089	1.4718	0.5630	0.0017	0.2746
2039	332	1.0813	0.0033	0.4975	0.8563	0.0026	0.3940	3.5238	0.0106	1.6213	0.6274	0.0019	0.2887
2040	301	0.8456	0.0028	0.4344	0.6894	0.0023	0.3542	2.8998	0.0096	1.4898	0.5517	0.0018	0.2834
2041	281	0.9800	0.0035	0.4973	0.5651	0.0020	0.2867	2.7759	0.0099	1.4085	0.5520	0.0020	0.2801

*FBW = ORGAN WEIGHT/BODY WEIGHT *Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES.			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3032	327	0.9260	0.0028	0.4484	0.6766	0.0021	0.3276	2.8687	0.0088	1.3891	0.4493	0.0014	0.2176
3033	306	1.0369	0.0034	0.4874	0.7233	0.0024	0.3400	3.2460	0.0106	1.5259	0.5944	0.0019	0.2794
3034	324	1.1838	0.0037	0.5433	0.6294	0.0019	0.2888	3.3713	0.0104	1.5472	0.7345	0.0023	0.3371
3035	321	1.2408	0.0039	0.6104	0.7819	0.0024	0.3847	2.9673	0.0093	1.4598	0.6693	0.0021	0.3293
3036	325	0.8579	0.0026	0.4450	0.7065	0.0022	0.3665	3.0498	0.0094	1.5819	0.5537	0.0017	0.2872
3037	314	1.2965	0.0041	0.6237	0.6707	0.0021	0.3227	3.2938	0.0105	1.5846	0.5584	0.0018	0.2686
3038	302	1.5984	0.0053	0.8052	0.6002	0.0020	0.3023	3.1291	0.0104	1.5762	0.5162	0.0017	0.2600
3039	340	1.1141	0.0033	0.5631	0.6462	0.0019	0.3266	2.8004	0.0082	1.4154	0.4912	0.0014	0.2483
3040	335	0.9855	0.0029	0.4437	0.7421	0.0022	0.3341	3.2610	0.0097	1.4683	0.6746	0.0020	0.3037
3041	278	2.6758	0.0096	1.3452	0.6229	0.0022	0.3131	3.0486	0.0110	1.5326	0.4412	0.0016	0.2218

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4032	362	1.0016	0.0028	0.5019	0.8149	0.0023	0.4083	3.2819	0.0091	1.6444	0.7078	0.0020	0.3546
4033	322	1.0164	0.0032	0.5096	0.6469	0.0020	0.3243	3.0980	0.0096	1.5531	0.5796	0.0018	0.2906
4034	321	0.9558	0.0030	0.4832	0.6487	0.0020	0.3280	2.9571	0.0092	1.4950	0.4865	0.0015	0.2460
4035	318	1.0146	0.0032	0.5086	0.7504	0.0024	0.3762	3.0804	0.0097	1.5442	0.6445	0.0020	0.3231
4036	301	1.1117	0.0037	0.5499	0.9053	0.0030	0.4478	3.1907	0.0106	1.5784	0.7027	0.0023	0.3476
4037	290	1.2474	0.0043	0.6372	0.6005	0.0021	0.3068	2.8768	0.0099	1.4696	0.4452	0.0015	0.2274
4038	314	0.9630	0.0031	0.4773	0.8900	0.0028	0.4411	3.0984	0.0099	1.5358	0.7442	0.0024	0.3689
4039	326	1.0966	0.0034	0.5485	0.8181	0.0025	0.4092	3.1339	0.0096	1.5675	0.7503	0.0023	0.3753
4040	308	1.0610	0.0034	0.5126	0.6919	0.0022	0.3343	3.0340	0.0099	1.4658	0.7239	0.0024	0.3497
4041	325	0.8855	0.0027	0.4585	0.7943	0.0024	0.4113	3.0407	0.0094	1.5744	0.5307	0.0016	0.2748

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1532	431	0.0954	0.0002	0.0483	1.9760	0.0046	1.0000	1.1412	0.0027	0.5775	2.2676	0.0053	1.1476
1533	393	0.0828	0.0002	0.0400	2.0701	0.0053	1.0000	1.0219	0.0026	0.4936	1.9640	0.0050	0.9487
1534	403	0.0809	0.0002	0.0387	2.0931	0.0052	1.0000	1.0980	0.0027	0.5246	2.4369	0.0060	1.1643
1535	371	0.0866	0.0002	0.0423	2.0449	0.0055	1.0000	0.9996	0.0027	0.4888	2.4619	0.0066	1.2039
1536	379	0.0828	0.0002	0.0404	2.0490	0.0054	1.0000	1.0115	0.0027	0.4937	2.4370	0.0064	1.1894
1537	419	0.0755	0.0002	0.0377	2.0008	0.0048	1.0000	1.0497	0.0025	0.5246	2.4191	0.0058	1.2091
1538	401	0.0714	0.0002	0.0351	2.0366	0.0051	1.0000	1.1969	0.0030	0.5877	2.6023	0.0065	1.2778
1539	394	0.0615	0.0002	0.0304	2.0215	0.0051	1.0000	0.9469	0.0024	0.4684	2.4158	0.0061	1.1951
1540	416	0.0876	0.0002	0.0435	2.0119	0.0048	1.0000	0.9898	0.0024	0.4920	2.1279	0.0051	1.0577
1541	421	0.0850	0.0002	0.0394	2.1598	0.0051	1.0000	1.0261	0.0024	0.4751	2.5771	0.0061	1.1932

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2532	398	0.1055	0.0003	0.0518	2.0371	0.0051	1.0000	1.2882	0.0032	0.6324	2.2609	0.0057	1.1099
2533	415	0.1056	0.0003	0.0546	1.9351	0.0047	1.0000	1.0242	0.0025	0.5293	2.2821	0.0055	1.1793
2534	410	0.0872	0.0002	0.0425	2.0521	0.0050	1.0000	1.0818	0.0026	0.5272	2.5271	0.0062	1.2315
2535x NP	278	0.0747	0.0003	0.0363	2.0588	0.0074	1.0000	1.1300	0.0041	0.5489	2.6629	0.0096	1.2934
2536	374	0.0741	0.0002	0.0375	1.9764	0.0053	1.0000	1.0038	0.0027	0.5079	2.2126	0.0059	1.1195
2537	414	0.0911	0.0002	0.0426	2.1369	0.0052	1.0000	1.0441	0.0025	0.4886	2.3039	0.0056	1.0782
2538	406	0.0923	0.0002	0.0473	1.9525	0.0048	1.0000	1.1005	0.0027	0.5636	2.5186	0.0062	1.2899
2539	403	0.1037	0.0003	0.0516	2.0100	0.0050	1.0000	1.0553	0.0026	0.5250	2.5161	0.0062	1.2518
2540	426	0.1269	0.0003	0.0636	1.9945	0.0047	1.0000	1.1561	0.0027	0.5796	2.2991	0.0054	1.1527
2541	401	0.0836	0.0002	0.0405	2.0623	0.0051	1.0000	1.1044	0.0028	0.5355	2.3544	0.0059	1.1416

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

NP=NOT PREGNANT x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3532	386	0.0773	0.0002	0.0396	1.9538	0.0051	1.0000	1.0467	0.0027	0.5357	3.2749	0.0085	1.6762
3533	427	0.0914	0.0002	0.0480	1.9030	0.0045	1.0000	0.9996	0.0023	0.5253	2.2068	0.0052	1.1596
3534	453	0.0781	0.0002	0.0375	2.0832	0.0046	1.0000	1.2010	0.0026	0.5765	2.4314	0.0054	1.1671
3535	389	0.0939	0.0002	0.0451	2.0840	0.0054	1.0000	1.0959	0.0028	0.5259	2.5687	0.0066	1.2326
3536	393	0.1058	0.0003	0.0511	2.0719	0.0053	1.0000	1.0364	0.0026	0.5002	2.4991	0.0064	1.2062
3537	394	0.0805	0.0002	0.0384	2.0981	0.0053	1.0000	1.1370	0.0029	0.5419	2.3095	0.0059	1.1008
3538	386	0.0827	0.0002	0.0415	1.9941	0.0052	1.0000	0.9684	0.0025	0.4856	2.1519	0.0056	1.0791
3539	339	0.0921	0.0003	0.0437	2.1084	0.0062	1.0000	1.0243	0.0030	0.4858	2.5194	0.0074	1.1949
3540	444	0.0771	0.0002	0.0365	2.1110	0.0048	1.0000	1.1904	0.0027	0.5639	2.5240	0.0057	1.1956
3541	428	0.0894	0.0002	0.0420	2.1262	0.0050	1.0000	1.1319	0.0026	0.5324	2.2129	0.0052	1.0408

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4532	405	0.0823	0.0002	0.0429	1.9162	0.0047	1.0000	1.1036	0.0027	0.5759	2.2413	0.0055	1.1697
4533	425	0.0916	0.0002	0.0470	1.9506	0.0046	1.0000	1.0023	0.0024	0.5138	2.2917	0.0054	1.1749
4534	385	0.0716	0.0002	0.0368	1.9460	0.0051	1.0000	1.0157	0.0026	0.5219	2.1656	0.0056	1.1128
4535	350	0.0706	0.0002	0.0350	2.0174	0.0058	1.0000	1.0003	0.0029	0.4958	3.2124	0.0092	1.5923
4536	344	0.0782	0.0002	0.0404	1.9364	0.0056	1.0000	1.0582	0.0031	0.5465	2.7042	0.0079	1.3965
4537	397	0.1154	0.0003	0.0573	2.0126	0.0051	1.0000	1.2327	0.0031	0.6125	2.3577	0.0059	1.1715
4538	381	0.0921	0.0002	0.0448	2.0581	0.0054	1.0000	0.9990	0.0026	0.4854	2.1485	0.0056	1.0439
4539	419	0.1402	0.0003	0.0711	1.9709	0.0047	1.0000	1.1940	0.0028	0.6058	2.4317	0.0058	1.2338
4540	404	0.0855	0.0002	0.0419	2.0385	0.0051	1.0000	1.1230	0.0028	0.5509	2.3003	0.0057	1.1284
4541	435	0.1019	0.0002	0.0503	2.0267	0.0047	1.0000	1.1737	0.0027	0.5791	2.4871	0.0057	1.2272

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1532	431	19.5915	0.0455	9.9147	1.7589	0.0041	0.8901	0.0071	0.0000	0.0036	0.7936	0.0018	0.4016
1533	393	16.4331	0.0418	7.9383	1.3717	0.0035	0.6626	0.0113	0.0000	0.0055	0.7194	0.0018	0.3475
1534	403	18.9403	0.0470	9.0489	1.5722	0.0039	0.7511	0.0123	0.0000	0.0059	0.6445	0.0016	0.3079
1535	371	18.8221	0.0508	9.2044	1.5836	0.0043	0.7744	0.0110	0.0000	0.0054	0.6541	0.0018	0.3199
1536	379	16.7815	0.0443	8.1901	1.5234	0.0040	0.7435	0.0124	0.0000	0.0061	0.5498	0.0015	0.2683
1537	419	17.2751	0.0413	8.6341	1.5065	0.0036	0.7529	0.0131	0.0000	0.0065	0.7201	0.0017	0.3599
1538	401	20.2858	0.0506	9.9606	1.4395	0.0036	0.7068	0.0193	0.0000	0.0095	0.8315	0.0021	0.4083
1539	394	17.2750	0.0438	8.5456	1.7060	0.0043	0.8439	0.0123	0.0000	0.0061	0.7912	0.0020	0.3914
1540	416	18.0116	0.0433	8.9525	1.5914	0.0038	0.7910	0.0153	0.0000	0.0076	0.7440	0.0018	0.3698
1541	421	17.2992	0.0411	8.0096	2.0762	0.0049	0.9613	0.0119	0.0000	0.0055	0.6616	0.0016	0.3063

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2532	398	17.3406	0.0436	8.5124	1.5808	0.0040	0.7760	0.0072	0.0000	0.0035	0.6721	0.0017	0.3299
2533	415	16.6999	0.0403	8.6300	1.5139	0.0036	0.7823	0.0099	0.0000	0.0051	0.8248	0.0020	0.4262
2534	410	17.4088	0.0425	8.4834	1.5056	0.0037	0.7337	0.0140	0.0000	0.0068	0.8258	0.0020	0.4024
2535x NP	278	13.8793	0.0500	6.7415	1.6462	0.0059	0.7996	0.0148	0.0001	0.0072	0.7016	0.0025	0.3408
2536	374	15.0764	0.0403	7.6282	1.5174	0.0041	0.7678	0.0114	0.0000	0.0058	0.5037	0.0013	0.2549
2537	414	17.4354	0.0421	8.1592	1.3695	0.0033	0.6409	0.0105	0.0000	0.0049	0.8072	0.0020	0.3777
2538	406	17.8739	0.0441	9.1544	1.6597	0.0041	0.8500	0.0156	0.0000	0.0080	0.5649	0.0014	0.2893
2539	403	19.0292	0.0472	9.4673	1.6225	0.0040	0.8072	0.0112	0.0000	0.0056	0.8079	0.0020	0.4019
2540	426	18.6830	0.0438	9.3673	2.0277	0.0048	1.0166	0.0165	0.0000	0.0083	0.8766	0.0021	0.4395
2541	401	18.0064	0.0449	8.7312	1.7113	0.0043	0.8298	0.0124	0.0000	0.0060	0.5936	0.0015	0.2878

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

NP=NOT PREGNANT x=EXCLUDED FROM MEAN

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 3

1000 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3532	386	16.2025	0.0419	8.2928	1.5314	0.0040	0.7838	0.0132	0.0000	0.0068	0.6290	0.0016	0.3219
3533	427	17.7216	0.0415	9.3125	1.8433	0.0043	0.9686	0.0095	0.0000	0.0050	0.7374	0.0017	0.3875
3534	453	18.6918	0.0412	8.9726	1.5277	0.0034	0.7333	0.0158	0.0000	0.0076	0.6528	0.0014	0.3134
3535	389	18.3339	0.0472	8.7975	1.5012	0.0039	0.7203	0.0186	0.0000	0.0089	0.7715	0.0020	0.3702
3536	393	16.1527	0.0411	7.7961	1.5140	0.0039	0.7307	0.0146	0.0000	0.0070	0.8251	0.0021	0.3982
3537	394	17.1157	0.0434	8.1577	1.6332	0.0041	0.7784	0.0165	0.0000	0.0079	0.7836	0.0020	0.3735
3538	386	16.7330	0.0433	8.3913	1.6567	0.0043	0.8308	0.0138	0.0000	0.0069	0.6901	0.0018	0.3461
3539	339	15.3748	0.0453	7.2922	1.6702	0.0049	0.7922	0.0153	0.0000	0.0073	0.6154	0.0018	0.2919
3540	444	19.3410	0.0436	9.1620	1.6330	0.0037	0.7736	0.0142	0.0000	0.0067	0.9395	0.0021	0.4450
3541	428	18.2318	0.0426	8.5748	1.6561	0.0039	0.7789	0.0111	0.0000	0.0052	0.8177	0.0019	0.3846

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4532	405	21.6458	0.0535	11.2962	1.5775	0.0039	0.8232	0.0154	0.0000	0.0080	0.7602	0.0019	0.3967
4533	425	17.1226	0.0403	8.7781	1.6551	0.0039	0.8485	0.0100	0.0000	0.0051	0.7162	0.0017	0.3672
4534	385	14.7968	0.0384	7.6037	1.4185	0.0037	0.7289	EX			0.5773	0.0015	0.2967
4535	350	15.5379	0.0444	7.7019	1.4368	0.0041	0.7122	0.0110	0.0000	0.0055	0.6578	0.0019	0.3261
4536	344	14.9205	0.0434	7.7053	1.3580	0.0039	0.7013	0.0128	0.0000	0.0066	0.7305	0.0021	0.3772
4537	397	17.4798	0.0440	8.6852	1.6712	0.0042	0.8304	0.0120	0.0000	0.0060	0.7512	0.0019	0.3732
4538	381	16.6520	0.0437	8.0910	1.6765	0.0044	0.8146	0.0130	0.0000	0.0063	0.8610	0.0023	0.4183
4539	419	18.4855	0.0441	9.3792	1.8562	0.0044	0.9418	0.0147	0.0000	0.0075	0.8491	0.0020	0.4308
4540	404	15.4364	0.0382	7.5724	1.7853	0.0044	0.8758	0.0210	0.0001	0.0103	0.7240	0.0018	0.3552
4541	435	18.3718	0.0423	9.0649	1.6199	0.0037	0.7993	0.0135	0.0000	0.0067	0.8537	0.0020	0.4212

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

EX = Excluded

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 1 0 PPM

THYMUS				

Animal	FINAL BODY	-----		
Number	WEIGHT	Weight	%FBW	%Brain
	g	g		

1532	431	0.4674	0.0011	0.2365
1533	393	0.4575	0.0012	0.2210
1534	403	0.5417	0.0013	0.2588
1535	371	0.4565	0.0012	0.2232
1536	379	0.4680	0.0012	0.2284
1537	419	0.3747	0.0009	0.1873
1538	401	0.5375	0.0013	0.2639
1539	394	0.5593	0.0014	0.2767
1540	416	0.5088	0.0012	0.2529
1541	421	0.5445	0.0013	0.2521

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 2 100 PPM

THYMUS				
Animal Number	FINAL BODY WEIGHT g	Weight g	%FBW	%Brain
2532	398	0.4412	0.0011	0.2166
2533	415	0.4272	0.0010	0.2208
2534	410	0.3072	0.0007	0.1497
2535x NP	278	0.6962	0.0025	0.3382
2536	374	0.3492	0.0009	0.1767
2537	414	0.2901	0.0007	0.1358
2538	406	0.4281	0.0011	0.2193
2539	403	0.5484	0.0014	0.2728
2540	426	0.4490	0.0011	0.2251
2541	401	0.3797	0.0009	0.1841

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

NP=NOT PREGNANT x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 3 1000 PPM

THYMUS				
Animal	FINAL BODY	-----		
Number	WEIGHT	Weight	%FBW	%Brain
	g	g		

3532	386	0.6148	0.0016	0.3147
3533	427	0.5627	0.0013	0.2957
3534	453	0.5756	0.0013	0.2763
3535	389	0.5100	0.0013	0.2447
3536	393	0.5064	0.0013	0.2444
3537	394	0.3911	0.0010	0.1864
3538	386	0.4955	0.0013	0.2485
3539	339	0.5485	0.0016	0.2601
3540	444	0.3866	0.0009	0.1831
3541	428	0.3162	0.0007	0.1487

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 4 10000 PPM

THYMUS				
Animal Number	FINAL BODY WEIGHT g	Weight g	%FBW	%Brain
4532	405	0.3820	0.0009	0.1994
4533	425	0.4960	0.0012	0.2543
4534	385	0.3755	0.0010	0.1930
4535	350	0.3836	0.0011	0.1901
4536	344	0.7928	0.0023	0.4094
4537	397	0.4790	0.0012	0.2380
4538	381	0.6191	0.0016	0.3008
4539	419	0.5016	0.0012	0.2545
4540	404	0.5814	0.0014	0.2852
4541	435	0.3439	0.0008	0.1697

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 1 0 PPM

ANIMAL#	ORGAN	OBSERVATION
1032		NO REMARKABLE OBSERVATIONS
1033		NO REMARKABLE OBSERVATIONS
1034		NO REMARKABLE OBSERVATIONS
1035		NO REMARKABLE OBSERVATIONS
1036		NO REMARKABLE OBSERVATIONS
1037	KIDNEY	CYSTIC KIDNEY; SLIGHT; RIGHT CLEAR FLUID
1038		NO REMARKABLE OBSERVATIONS
1039		NO REMARKABLE OBSERVATIONS
1040		NO REMARKABLE OBSERVATIONS
1041		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 2 100 PPM

ANIMAL#	ORGAN	OBSERVATION
2032		NO REMARKABLE OBSERVATIONS
2033		NO REMARKABLE OBSERVATIONS
2034		NO REMARKABLE OBSERVATIONS
2035	EXTERNAL EXAM	SCABS ON TOP OF HEAD EXTERNAL FINDING CONFIRMED TISSUE SAVED
	EXTERNAL EXAM	ALOPECIA GENERAL EXTERNAL FINDING NOT CONFIRMED
2036		NO REMARKABLE OBSERVATIONS
2037		NO REMARKABLE OBSERVATIONS
2038		NO REMARKABLE OBSERVATIONS
2039	KIDNEY	DILATED RENAL PELVIS; MODERATE; RIGHT
2040		NO REMARKABLE OBSERVATIONS

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 3 1000 PPM

ANIMAL#	ORGAN	OBSERVATION
3032		NO REMARKABLE OBSERVATIONS
3033		NO REMARKABLE OBSERVATIONS
3034		NO REMARKABLE OBSERVATIONS
3035		NO REMARKABLE OBSERVATIONS
3036		NO REMARKABLE OBSERVATIONS
3037		NO REMARKABLE OBSERVATIONS
3038		NO REMARKABLE OBSERVATIONS
3039		NO REMARKABLE OBSERVATIONS
3040		NO REMARKABLE OBSERVATIONS
3041	GROSS EXAM	CONGENITAL ANOMALY ENLARGED THORACIC VERTEBRAL ARCH - 2ND, 0.7CM.

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 4 10000 PPM

ANIMAL#	ORGAN	OBSERVATION
4032		NO REMARKABLE OBSERVATIONS
4033		NO REMARKABLE OBSERVATIONS
4034		NO REMARKABLE OBSERVATIONS
4035	GROSS EXAM	EXAMINATION NOT COMPLETE
4036		NO REMARKABLE OBSERVATIONS
4037		NO REMARKABLE OBSERVATIONS
4038		NO REMARKABLE OBSERVATIONS
4039		NO REMARKABLE OBSERVATIONS
4040		NO REMARKABLE OBSERVATIONS
4041		NO REMARKABLE OBSERVATIONS

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 1 0 PPM

ANIMAL#	ORGAN	OBSERVATION
1532		NO REMARKABLE OBSERVATIONS
1533		NO REMARKABLE OBSERVATIONS
1534		NO REMARKABLE OBSERVATIONS
1535		NO REMARKABLE OBSERVATIONS
1536		NO REMARKABLE OBSERVATIONS
1537		NO REMARKABLE OBSERVATIONS
1538		NO REMARKABLE OBSERVATIONS
1539		NO REMARKABLE OBSERVATIONS
1540		NO REMARKABLE OBSERVATIONS
1541		NO REMARKABLE OBSERVATIONS

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 2 100 PPM

ANIMAL#	ORGAN	OBSERVATION
2532		NO REMARKABLE OBSERVATIONS
2533		NO REMARKABLE OBSERVATIONS
2534		NO REMARKABLE OBSERVATIONS
2535	NP	NO REMARKABLE OBSERVATIONS
2536		NO REMARKABLE OBSERVATIONS
2537		NO REMARKABLE OBSERVATIONS
2538		NO REMARKABLE OBSERVATIONS
2539		NO REMARKABLE OBSERVATIONS
2540		NO REMARKABLE OBSERVATIONS
2541		NO REMARKABLE OBSERVATIONS

NP=NOT PREGNANT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 3 1000 PPM

ANIMAL#	ORGAN	OBSERVATION
3532		NO REMARKABLE OBSERVATIONS
3533		NO REMARKABLE OBSERVATIONS
3534	EXTERNAL EXAM	ALOPECIA-EXTREMITIES/SNOUT EXTERNAL FINDING NOT CONFIRMED
3535		NO REMARKABLE OBSERVATIONS
3536		NO REMARKABLE OBSERVATIONS
3537		NO REMARKABLE OBSERVATIONS
3538		NO REMARKABLE OBSERVATIONS
3539		NO REMARKABLE OBSERVATIONS
3540		NO REMARKABLE OBSERVATIONS
3541		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 4 10000 PPM

ANIMAL#	ORGAN	OBSERVATION
4532		NO REMARKABLE OBSERVATIONS
4533	KIDNEY EXTERNAL EXAM	DILATED RENAL PELVIS; EXTREME; RIGHT NASAL DISCHARGE-RED EXTERNAL FINDINGS CONFIRMED
4534		NO REMARKABLE OBSERVATIONS
4535		NO REMARKABLE OBSERVATIONS
4536		NO REMARKABLE OBSERVATIONS
4537		NO REMARKABLE OBSERVATIONS
4538		NO REMARKABLE OBSERVATIONS
4539		NO REMARKABLE OBSERVATIONS
4540		NO REMARKABLE OBSERVATIONS
4541		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1 0 PPM

[illegible]

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APPENDIX I

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FEMALE REPRODUCTION DATA AND MEAN FETAL WEIGHTS (GRAMS)

GROUP 2 100 PPM

ANIMAL#	CORPORA LUTEA	%PREIMPL. LOSS	IMPLANT SITES	FETUSES			RESORPTIONS				SEX		AVERAGE FETAL BODY WEIGHT		
				LIVE	DEAD		EARLY	LATE	TOTAL		MALE	FEMALE	MALES	FEMALES	LITTER
				(n)	%				(n)	%					
2532	14	0.0	14	14	0	0.0	0	0	0	0.0	7	7	3.8	3.9	3.9
2533	15	6.7	14	14	0	0.0	0	0	0	0.0	6	8	4.2	4.0	4.1
2534	16	0.0	16	16	0	0.0	0	0	0	0.0	9	7	4.2	3.8	4.0
2535	NP														
2536	12	0.0	12	12	0	0.0	0	0	0	0.0	5	7	4.2	4.1	4.2
2537	18	16.7	15	15	0	0.0	0	0	0	0.0	7	8	3.9	3.7	3.8
2538	18	0.0	18	17	0	0.0	1	0	1	5.6	11	6	4.2	4.1	4.2
2539	12	0.0	12	12	0	0.0	0	0	0	0.0	6	6	4.5	4.4	4.5
2540	17	5.9	16	16	0	0.0	0	0	0	0.0	6	10	4.3	4.1	4.2
2541	11	18.2	9	9	0	0.0	0	0	0	0.0	5	4	4.6	4.3	4.4
MEAN	14.8	5.3	14.0	13.9	0.0	0.0	0.1	0.0	0.1	0.6	6.9	7.0	4.2	4.0	4.1
S.D.	2.68	7.40	2.69	2.52	0.00	0.00	0.33	0.00	0.33	1.85	1.96	1.66	0.24	0.23	0.23
N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

NP=NOT PREGNANT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 3 1000 PPM

[illegible]

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 4 10000 PPM

ANIMAL#	CORPORA LUTEA	%PREIMPL. LOSS	IMPLANT SITES	FETUSES			RESORPTIONS				SEX		AVERAGE FETAL BODY WEIGHT		
				LIVE	DEAD		EARLY	LATE	TOTAL		MALE	FEMALE	MALES	FEMALES	LITTER
					(n)	%			(n)	%					
4532	14	0.0	14	14	0	0.0	0	0	0	0.0	6	8	4.1	3.7	3.8
4533	15	0.0	15	14	0	0.0	1	0	1	6.7	9	5	4.4	4.0	4.3
4534	13	7.7	12	12	0	0.0	0	0	0	0.0	4	8	4.2	4.0	4.1
4535	13	0.0	13	13	0	0.0	0	0	0	0.0	8	5	4.0	3.7	3.9
4536	6	83.3	1	1	0	0.0	0	0	0	0.0	0	1	-	4.7	4.7
4537	16	6.3	15	14	0	0.0	1	0	1	6.7	13	1	4.1	3.7	4.1
4538	14	7.1	13	12	0	0.0	1	0	1	7.7	5	7	4.5	4.1	4.3
4539	15	0.0	15	15	0	0.0	0	0	0	0.0	9	6	4.4	4.1	4.3
4540	14	7.1	13	13	0	0.0	0	0	0	0.0	10	3	4.4	4.2	4.3
4541	17	5.9	16	15	0	0.0	1	0	1	6.3	8	7	4.5	4.3	4.4
MEAN	13.7	11.7	12.7	12.3	0.0	0.0	0.4	0.0	0.4	2.7	7.2	5.1	4.3	4.0	4.2
S.D.	2.98	25.39	4.30	4.11	0.00	0.00	0.52	0.00	0.52	3.54	3.61	2.64	0.20	0.31	0.25
N	10	10	10	10	10	10	10	10	10	10	10	10	9	10	10

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APPENDIX J

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 1 0 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
1532	85	345	65	150
1533	92	301	24	116
1534	88	315	32	120
1535	76	295	41	117
1536	97	282	33	129
1537	94	325	26	119
1538	57	343	70	127
1539	81	313	42	123
1540	91	325	42	133
1541	92	329	47	139
MEAN	85.	317.	42.	127.
S.D.	11.6	20.3	15.2	10.8
N	10	10	10	10

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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APPENDIX J

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 2 100 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
2532	84	313	42	126
2533	90	325	51	141
2534	97	313	29	127
2535x NP	2	276	35	37
2536	76	298	47	122
2537	89	325	31	119
2538	107	298	27	135
2539	81	322	50	132
2540	100	326	46	146
2541	62	338	50	113
MEAN	87.	318.	42.	129.
S.D.	13.6	13.4	9.7	10.6
N	9	9	9	9

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 3 1000 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
3532	75	311	52	127
3533	89	338	53	142
3534	101	352	56	157
3535	73	316	60	133
3536	88	305	40	128
3537	86	308	39	125
3538	83	303	41	124
3539	33	306	43	76
3540	91	353	60	151
3541	103	325	36	139
MEAN	82.	322.	48.	130.
S.D.	19.7	19.4	9.3	22.0
N	10	10	10	10

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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APPENDIX J

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 4 10000 PPM INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
4532	85	320	41	125
4533	94	332	45	138
4534	74	311	37	111
4535	79	271	22	101
4536	10	334	66	76
4537	89	309	43	132
4538	78	304	50	128
4539	99	320	42	142
4540	87	317	44	130
4541	100	334	46	147
MEAN	79.	315.	44.	123.
S.D.	25.9	18.9	10.9	21.4
N	10	10	10	10

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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APPENDIX K

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1		INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
0 PPM																				
FEMALE#	MEAN	FETUS#		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		1	2																	
1532	4.5	4.5	4.9	4.8	4.6/	4.8	4.6	4.5	4.2	4.6	4.5	4.2	4.1							
1533	3.8	3.4	3.8	3.3	4.0	4.1/	3.8	3.7	3.5	4.0	3.8	4.1	3.9	4.1	4.0	3.6	3.3			
1534	3.9	4.1	3.9	4.1	3.9	3.7	3.7/	4.1	4.1	3.8	3.9	4.0	4.0	3.6	3.9					
1535	3.8	3.8	3.9	4.1	3.9	3.8	3.6/	3.8	E	3.8	4.0	E	E	4.1	3.5	3.7				
1536	4.2	4.5	4.1	4.2	3.8	4.1	4.1	4.4	4.1	4.3	4.3/	4.6	4.2	4.0	4.1	4.2				
1537	3.5	3.3	3.4	3.7	3.5	3.5	3.5	3.5	3.3	3.8	3.4/	3.7	3.4	3.6	3.5	3.6	2.7	3.4		
1538	4.6	4.7	4.9	4.7/	4.4	4.5	4.6	4.4	4.1											
1539	4.3	4.2	4.3	4.6	4.3	4.2	4.0	4.2/	4.6	E	4.3	4.5	4.3	E	3.9					
1540	4.3	4.0	4.6	4.5	4.5	4.3	4.1	4.3/	3.9	4.8	4.5	4.2	4.1	4.3	4.2					
1541	4.3	4.2	4.5	4.5	4.7	4.3	3.7	4.4	4.3/	4.8	4.2	4.3	4.6	3.9	4.2					
MEAN	4.1																			
S.D.	0.36																			
N	10																			

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 2		100 PPM																		
		INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
FEMALE#	MEAN	FETUS#																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2532	3.9	3.6	3.9	3.9	3.9	3.8	4.1	3.7	3.9/	4.0	3.9	3.9	3.7	3.9	4.0					
2533	4.1	3.7	4.4	4.4	4.2	4.4	4.7/	4.6	3.9	4.0	4.0	3.6	4.0	4.2	3.3					
2534	4.0	4.2	4.4	4.0	4.3	3.9	3.8	4.3/	3.8	4.3	4.1	3.8	3.8	4.0	3.5	4.1	3.8			
2535	NP																			
2536	4.2	3.8	4.0	4.8	4.0	4.1/	4.2	4.0	4.3	4.5	3.9	4.0	4.3							
2537	3.8	3.5	4.0	3.7	3.8	3.7	3.9	3.7	3.7	3.7	3.9	3.9/	3.8	4.0	3.9	3.5				
2538	4.2	4.0	4.3	4.3	4.2	4.1	4.4	3.5	E	4.0	4.1	4.2/	4.5	4.6	4.0	4.2	4.2	4.2	4.2	
2539	4.5	4.5	4.6	4.5	4.1	4.5	4.5/	4.5	4.4	4.7	4.3	4.5	4.4							
2540	4.2	4.1	3.6	4.2	4.1	4.2	4.3	4.1/	4.4	4.2	4.4	4.1	4.1	4.1	4.2	4.2	4.1			
2541	4.4	4.4	4.4	4.0	4.4	4.6	4.7	4.6	4.5/	4.3										
MEAN	4.1																			
S.D.	0.23																			
N	9																			

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

NP=NOT PREGNANT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 3		1000 PPM																			
		INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																			
FEMALE#	MEAN	FETUS#																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
3532	4.2	4.3	4.0	4.1	4.2	4.2	4.5	3.9	4.3/	4.4	4.2	4.1	4.4								
3533	4.1	4.0	4.0	4.3	4.1	4.2	4.4	3.8	4.4	4.3/	3.8	4.0	E	4.1	4.1	3.6					
3534	4.0	3.8	3.8	3.9	4.3	3.8	4.1	4.0/	4.5	4.3	4.0	E	E	3.6	4.0	4.0	3.9	4.0	4.1		
3535	3.8	3.8	3.7	4.0	4.0	4.2/	3.8	3.8	4.2	3.9	3.5	3.7	3.7								
3536	4.3	4.1	4.2	4.3	4.4	4.3/	4.6	4.4	4.6	4.3	4.1	4.5	4.1	4.7							
3537	4.4	4.2	4.3	4.3	4.7	4.4	4.6/	4.7	4.1	4.2	4.3	4.5	4.1								
3538	3.8	3.9	3.8	4.0	3.7	3.5	3.8	3.7	3.4	4.0/	3.7	3.9	3.5	3.8	3.9						
3539	4.0	4.4	3.7	4.6	E	4.2	E	3.3/	E	E											
3540	4.3	4.0	4.4	4.4	4.4	4.1	4.3	3.9	4.2/	4.7	4.4	4.7	4.2	4.3	3.9						
3541	4.2	4.5	4.2	3.9	4.3	3.9	4.5	4.5/	4.2	4.0	4.0	4.2	4.2	4.2	4.2	4.5	4.1				
MEAN	4.1																				
S.D.	0.20																				
N	10																				

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 4		10000 PPM																		
FEMALE#	MEAN	FETUS#																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
4532	3.8	3.4	4.1	4.1	4.4	3.6	3.7/	4.0	3.7	4.0	4.0	4.0	2.9	3.8	4.0					
4533	4.3	4.6	4.1	4.4	4.6	4.4	4.0	4.6	4.3	4.0/	4.2	4.2	4.2	3.7	E	4.3				
4534	4.1	4.1	4.3	3.9	3.5	4.2	4.0	4.2	4.3/	4.0	4.2	4.4	3.7							
4535	3.9	3.7	3.7	3.9	4.0	3.9	4.0	3.8	3.7	4.3/	3.7	4.1	4.1	3.5						
4536	4.7 /	4.7																		
4537	4.1	3.9	4.2	4.1	E	4.0	4.3	3.7	4.0	4.2	4.1	4.0/	4.2	4.5	4.2	4.2				
4538	4.3	4.1	4.2	4.5	4.8	4.5	4.3	4.0	4.0	4.1	3.3/	4.6	4.6	E						
4539	4.3	4.4	4.1	4.3	4.1	4.2	4.5	4.4	4.4/	4.5	4.7	4.3	4.3	4.4	4.3	3.4				
4540	4.3	4.4	4.7	4.9	4.4/	4.7	4.1	4.2	4.2	4.3	4.1	4.4	3.7	4.2						
4541	4.4	4.4	5.0	E	4.4	4.1	4.5	4.1	4.5/	4.3	4.5	4.3	4.6	4.4	4.4	4.3	4.4			
MEAN	4.2																			
S.D.	0.25																			
N	10																			

A-Alive B-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1532	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
1533	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
1534	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1		0 PPM	
FEMALE#	PETUS#/SEX	ORGAN	CLASS OBSERVATION

1534	(CONTINUED)		
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1535	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
1536	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS			
GROUP 1	0 PPM		
FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1536	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
1537	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
1538	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
SEX CODES: M=Male, F=Female, U=Undetermined			
CLASS CODES: M=Malformation V=Variation I=Incidental			

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1539	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1540	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1541	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1541	(CONTINUED)		
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS

SEX CODES: M-Male, F-Female, U-Undetermined

CLASS CODES: M-Malformation V-Variation I-Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2: 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2532	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
2533	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
2534	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2534	(CONTINUED)		
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
2536	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2537	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2537	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
2538	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 M		WITHIN NORMAL LIMITS
	18 M		WITHIN NORMAL LIMITS
2539	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2539	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2540	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
2541	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3532	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
3533	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3534	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3534	(CONTINUED)		
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
	18 F		WITHIN NORMAL LIMITS
3535	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F E		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
3536	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

FETAL STATUS CODES: E=early resorption

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3536	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
3537	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3538	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3539	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F	GROSS EXAM	M EDEMATOUS; EXTREME WHOLE BODY
3540	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
3541	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3541	(CONTINUED)		
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4532	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4533	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4534	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
4534	(CONTINUED)			
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
4535	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
4536	1 F			WITHIN NORMAL LIMITS
4537	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4537	(CONTINUED)		
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4538	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
4539	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4540	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4541	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

	Equipment List	Appendix M
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Exposure Chamber

1000-Liter glass and stainless steel chamber (Wahmann).

Compound Generator

Liquified Petroleum Gas Cylinder (Chevron).

Flowmeters

Top Trak™ Mass Flow Meter, sizes 0-100 sccm, 0 – 1 and 0 – 20 Lpm,
Model 821-1 (Sierra Instruments).

Flowmeter, size 0 – 20 and 0 - 40 Lpm (Dwyer®).

Pressure/Vacuum Gauges

Matheson backpressure gauge, PN 63-3142.

Union Carbide vacuum gauge, Model SG-6310.

GAST vacuum gauge, Model NA.

Regulator

MG Industries, Series 325.

Valve

Metering Valve, Model 31RS4 and 316 (Whitey).

Tubing

Teflon® size 1/8" and 1/4".

Plastic, size 1/4" and 1/2" (Norton, Baxter).

Stainless steel, size 1/2".

Quick-disconnect with toggle valve (REGO®).

Copper tubing coil, size 1/8".

Vacuum Pump

Thomas Industries Inc., Model 707CM 50.

Air Analyzer

MIRAN® 1A-CVF Ambient Air Analyzer (Wilks) with a Cole Parmer Strip Chart Recorder, Model 201, and a Micronta® LCD Benchtop Digital Multimeter No. 22-195.

Balston® Microfibre™ Disposable Filter Unit, Grade DQ, was attached in-line.

	Equipment List	Appendix M
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Particle Sizer

TSI Aerodynamic Particle Sizer, Model 331001 and a DELL computer, Model 486P/25, equipped with an Epson LQ-570+ Dot matrix printer, Model P630B.

Environmental Monitoring

VWR Temperature and Humidity Gauge, tested prestudy with a Traceable Big Digit Hygrometer/Thermometer.

Oxygen/Gas Analyzer, Model 1214S (Gastech).

Digital Sound Level Meter, Model 840029 (SPER Scientific).

Photometer 1 Light Meter (Quantum Instruments).

Chamber Air Flow

Dwyer® Magnehelic® gauge, calibrated prestudy with Side Trak™ III, with Digital Meter, Model 831-N2 (Sierra Instruments Inc.) and on study with a Dry Gas Meter, Model 2M (Singer)

Chamber Static Pressure

Dwyer® Magnehelic® gauge (Dwyer® Instruments Inc.); calibrated prestudy with a Dwyer® Mark II Manometer, Model 25 (Dwyer® Instruments Inc.).

Miscellaneous

Water bath.

Thermomix 1420.

Precision thermometer, range 0-260°C (ERTCO).

Precision thermometer, range 0-150°C (USA).

Syringes, size 0 – 10 and 0 - 100 mL (Precision, Hamilton).

Groups 1-3	MIRAN® Calibration	Appendix N
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Methodology for Liquified Petroleum Gas

Miran No. 05 (Groups 1-3)

Settings: The instrument settings for the unit are summarized below:

Wavelength, microns	10.9
Pathlength, dial setting	14.00
Slit width, mm	1
Range, absorbance	1A
Response, seconds	1
Gain	High
Chart speed, cm/min	1
Chart volts	1

Calibrations: The MIRAN® was turned on and allowed to warm up for approximately 10 minutes. The cell was flushed with room air for approximately one minute. The loop was closed, the unit was zeroed and the calibration series was performed as shown below. The resultant data were plotted to obtain a calibration curve. Each observer used a separate syringe for calibration.

Injection Volume (µL)	Calculated Concentration ¹ (ppm)	Absorbance		
		Operator 1 (volts)	Operator 2 (volts)	Average (volts)
420	74.5	0.0192	0.0194	0.0193
560	99.3	0.0248	0.0264	0.0256
3000	532	0.1301	0.1299	0.1300
6000	1064	0.2603	0.2645	0.2624
7000	1241	0.297	0.305	0.3010

¹Calculated Conc. (ppm) = $\frac{\text{Volume injected (µL)}}{5.64\text{L}}$

where: 5.64L = volume of MIRAN® closed-loop

Groups 1-3	MIRAN® Calibration	Appendix N
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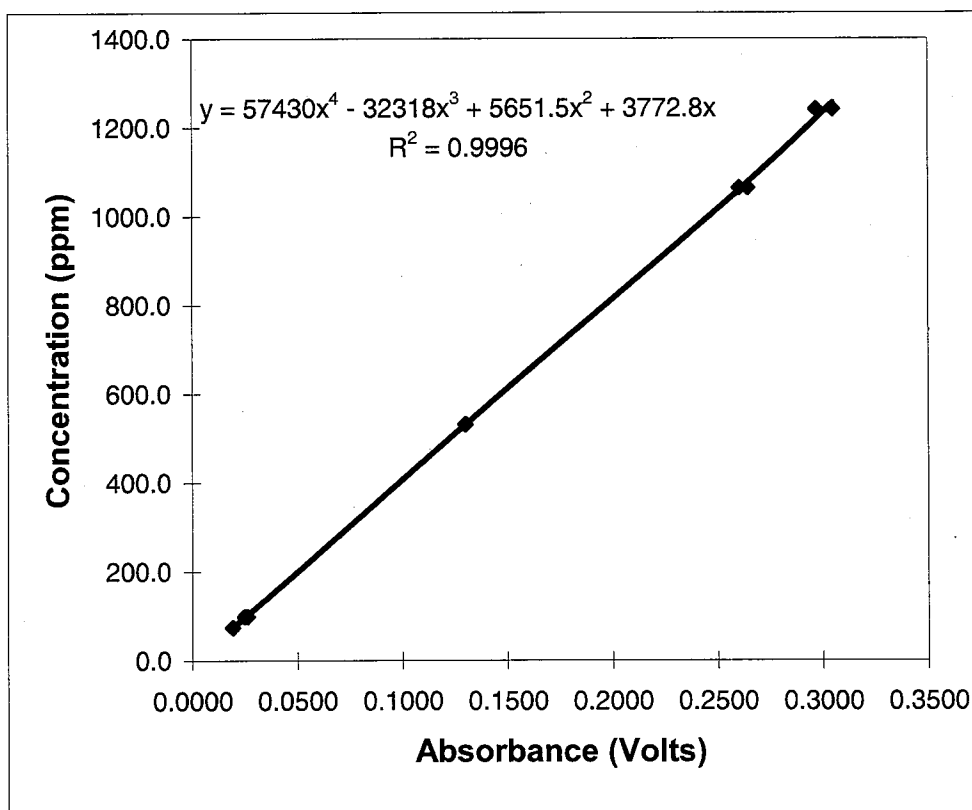
Calibration Checks: A two-point calibration check of the MIRAN® was performed prior to each exposure. The parameters are shown below:

Injection Volume (µL)	Calculated Concentration (ppm)	Expected Absorbance Reading (volts)	Acceptable Absorbance Range (volts)
560	99.3	0.0256	0.0218 – 0.0294
6000	1064	0.2624	0.2230 – 0.302

The absorbance was recorded after each injection. The absorbance was considered satisfactory if it was within 15% of the original calibration series. If the absorbance value fell outside the 15% range, the injection was rechecked as follows. The volume for the value that was out of range was reinjected twice. The closer pair of the three injections were averaged and the results were compared to the original curve. If the average of the pair was within the 15% range, the original was accepted. If the value of the average was outside the 15% range, the Study Director decided if a new graph was to be prepared.

Groups 1-3	MIRAN® Calibration	Appendix N
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Calibration Curve for Liquified Petroleum Gas



Group 4	MIRAN® Calibration	Appendix N
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Methodology for Liquified Petroleum Gas

Miran No. 2225 (Group 4)

Settings: The instrument settings for the unit are summarized below:

Wavelength, microns	10.9
Pathlength, dial setting	4.65
Slit width, mm	1
Range, absorbance	1A
Response, seconds	1
Gain	High
Chart speed, cm/min	1
Chart volts	1

Calibrations: The MIRAN® was turned on and allowed to warm up for approximately 10 minutes. The cell was flushed with room air for approximately one minute. The loop was closed, the unit was zeroed and the calibration series was performed as shown below. The resultant data were plotted to obtain a calibration curve. Each observer used a separate syringe for calibration.

Injection Volume (µL)	Calculated Concentration ¹ (ppm)	Absorbance		
		Operator 1 (volts)	Operator 2 (volts)	Average (volts)
28000	4965	0.350	0.353	0.352
45000	7979	0.544	0.535	0.540
56000	9929	0.646	0.651	0.649
68000	12057	0.770	0.779	0.775

$$^1\text{Calculated Conc. (ppm)} = \frac{\text{Volume injected (}\mu\text{L)}}{5.64\text{L}}$$

where: 5.64L = volume of MIRAN® closed-loop

Group 4	MIRAN [®] Calibration	Appendix N
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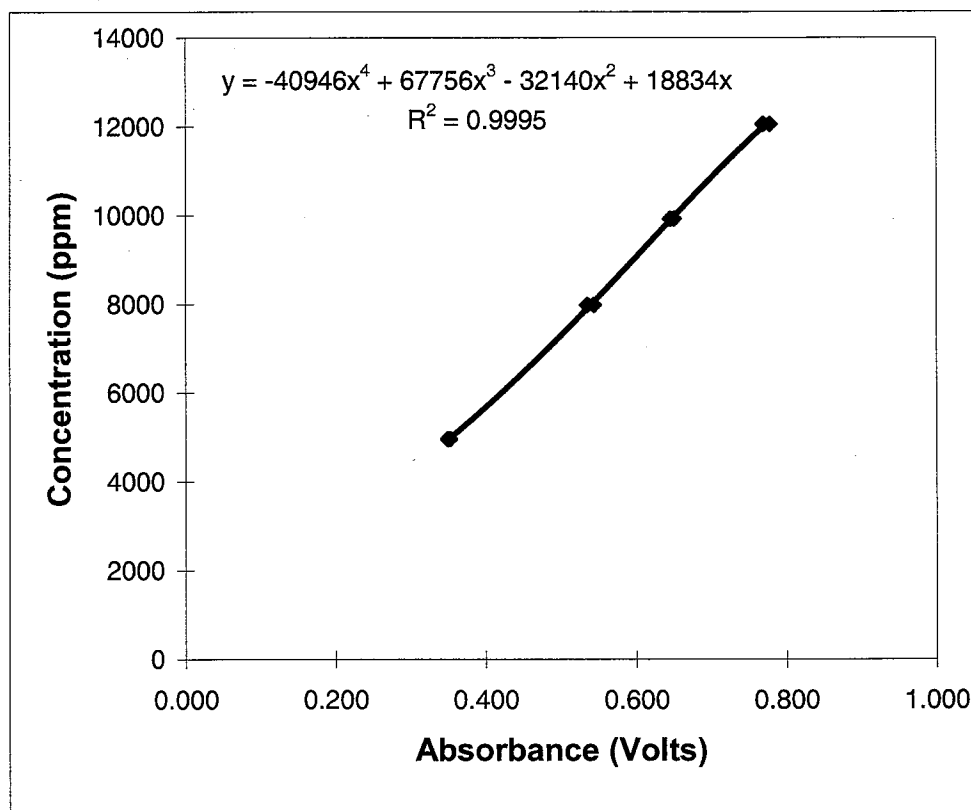
Calibration Checks: A one-point calibration check of the MIRAN[®] was performed prior to each exposure. The parameters are shown below:

Injection Volume (μ L)	Calculated Concentration (ppm)	Expected Absorbance Reading (volts)	Acceptable Absorbance Range (volts)
56,000	9929	0.649	0.552 – 0.746

The absorbance was recorded after each injection. The absorbance was considered satisfactory if it was within 15% of the original calibration series. If the absorbance value fell outside the 15% range, the injection was rechecked as follows. The volume for the value that was out of range was reinjected twice. The closer pair of the three injections were averaged and the results were compared to the original curve. If the average of the pair was within the 15% range, the original was accepted. If the value of the average was outside the 15% range, the Study Director decided if a new graph was to be prepared.

Group 4	MIRAN® Calibration	Appendix N
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Calibration Curve for Liquified Petroleum Gas



	Chamber Distribution Results (Pretest)	Appendix O
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<u>Group (target)</u>	<u>Date</u>	<u>Port</u>	<u>IR Conc (ppm)</u>	<u>Ratio to H-1</u>
2 (100 ppm)	18 Oct 2004	H-1	90	1.00
		H-2	85	0.94
		H-7	88	0.98
		H-1	95	1.00
		H-8	92	0.97
3 (1000 ppm)	18 Oct 2004	H-1	1100	1.00
		H-2	1100	1.00
		H-7	1200	1.09
		H-1	900	1.00
		H-8	960	1.07
4 (10000 ppm)	15 Oct 2004	H-1	8900	1.00
		H-2	9100	1.02
	18 Oct 2004	H-1	10000	1.00
		H-2	10000	1.00
		H-1	10000	1.00
		H-7	9800	0.98
		H-8	9800	0.98

	Chamber and Exposure Room Environmental Monitoring	Appendix P
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Interval	Location	Test Substance (ppm) ^a	Light (Ft Candles)	Noise (dB)	Oxygen (%)	Particle Sizing (mg/m ³) ^b
Pretest	Front Room	0	36	68.2	NM	NM
	Back Room	0	37	67.4	NM	NM
	Group 1	0	NM	NM	21	3.46 x 10 ⁻⁴
	Group 2	108	NM	NM	21	3.58 x 10 ⁻⁴
	Group 3	977	NM	NM	21	3.01 x 10 ⁻⁴
	Group 4	9830	NM	NM	21	1.04 x 10 ⁻³
Exposure 1	Front Room	0	35	67.6	NM	
	Back Room	0	35	64.0	NM	
	Group 1	0	NM	NM	21	
	Group 2	83.0	NM	NM	21	
	Group 3	1060	NM	NM	21	
	Group 4	10300	NM	NM	21	
Exposure 8	Front Room	0	33.4	66.3	NM	
	Back Room	0	34.6	62.8	NM	
	Group 1	0	NM	NM	21	
	Group 2	106	NM	NM	21	
	Group 3	938	NM	NM	21	
	Group 4	9780	NM	NM	21	
Exposure 13	Front Room	0	33.5	66.9	NM	
	Back Room	0	33.7	64.5	NM	
	Group 1	0	NM	NM	21	
	Group 2	103	NM	NM	21	
	Group 3	1120	NM	NM	21	
	Group 4	10000	NM	NM	21	

NM = Not measured

^aValues presented are the daily average for the chamber samples and a single time point for the room air samples.^bPretest results presented. For on-test results, see CMR (Appendix A).

	Analytical Report	Appendix Q
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STUDY TITLE

Analytical Report For:

**Liquified Petroleum Gas:
A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Whole-Body Exposure**

AUTHOR



REPORT DATE

9 February 2010

STUDY NUMBER

03-6140

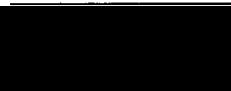
	Analytical Report	Appendix Q
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SIGNATURES

Written by:

09 Feb 10

Date



Formulation Chemistry Services

Reviewed by:

09 Feb 10

Date



Formulation Chemistry Services

Reviewed by:

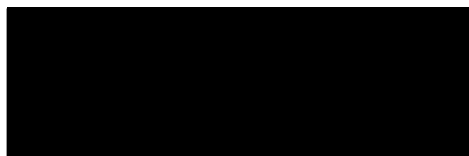
9 Feb 10

Date

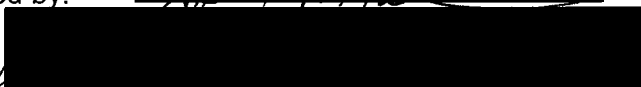


Formulation Chemistry Services

Approved by:

9 Feb 10

Date



Analytical Services

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1. Summary

The Liquified Petroleum Gas (LPG) chamber samples were analyzed to determine the purity and stability of the test substance by comparison to the Liquid Petroleum Gas (LPG) test substance. The analytical method (HLS-012-04) was validated at Huntingdon Life Sciences (HLS). The analytical method involved gas bag sampling of the test substance and quantification using Gas Chromatography with Flame Ionization Detection (FID).

2. Experimental Procedures

The analytical method (HLS-012-04) was validated by Formulation Chemistry at HLS. Details of the analytical method is maintained in this study file.

Gas bag sampling of the test substance and the analytical standard was performed in the Inhalation Department at HLS. The test substance and the analytical standard were analyzed using a Gas Chromatograph equipped with a HP Plot Q (30 m x 0.32 mm, 20 µm) column and Flame Ionization Detector (FID) to determine the purity of LPG test substance. An HP 3396A integrator was used for data collection and Excel was used for processing the data.

Date of sample analysis is listed as follows:

Interval	Date Analyzed
Pretest/Trials	19 Oct 04
Exposure 2	21 Oct 04
Exposure 9	28 Oct 04

3. Results and Discussion

The Liquified Petroleum Gas (LPG) chambers were analyzed prior to the initiation of the study and at two intervals during the study to determine the purity and stability of the test substance. The results of the characterization of the pretest/trials and exposures are presented in Table I and Tables II-A&B, respectively. Typical chromatograms of Liquified Petroleum Gas (LPG) chamber samples (Groups 1 to 4) are presented in Figures I-IV.

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Table I: LPG Characterization ("Pre-Study/Trial")

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.22	6.30	85.93	1.73	4.29	99.47
LPG-2	1.21	6.42	85.99	1.81	4.25	99.68
LPG-3	1.22	6.41	86.29	1.73	4.29	99.94
Group-1A	ND	ND	<LOQ	ND	ND	0.00
Group-1B	ND	ND	<LOQ	ND	ND	0.00
Group-2A	ND	6.79	92.31	ND	ND	99.10
Group-2B	0.82	6.27	85.70	1.90	5.21	99.90
Group-3A	0.89	7.21	87.61	ND	4.29	100.00
Group-3B	1.33	6.38	85.32	1.61	4.99	99.63
Group-4A	0.86	6.15	85.91	1.95	5.14	100.01
Group-4B	0.85	6.04	85.74	2.08	5.18	99.89

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

	Analytical Report	Appendix Q
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Table II-A: LPG Characterization (“Exposure 2”)

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.01	6.35	85.74	1.97	4.86	99.93
LPG-2	1.01	6.50	85.17	1.95	4.81	99.44
LPG-3	0.99	6.28	85.55	1.83	4.79	99.44
Group-1	ND	<LOQ	<LOQ	ND	ND	0.00
Group-2	2.29	6.52	91.20	ND	ND	100.01
Group-3	1.62	6.47	85.55	1.74	4.22	99.60
Group-4	0.83	6.35	85.35	1.94	5.09	99.56

LPG = Liquified Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

Table II-B: LPG Characterization (“Exposure 9”)

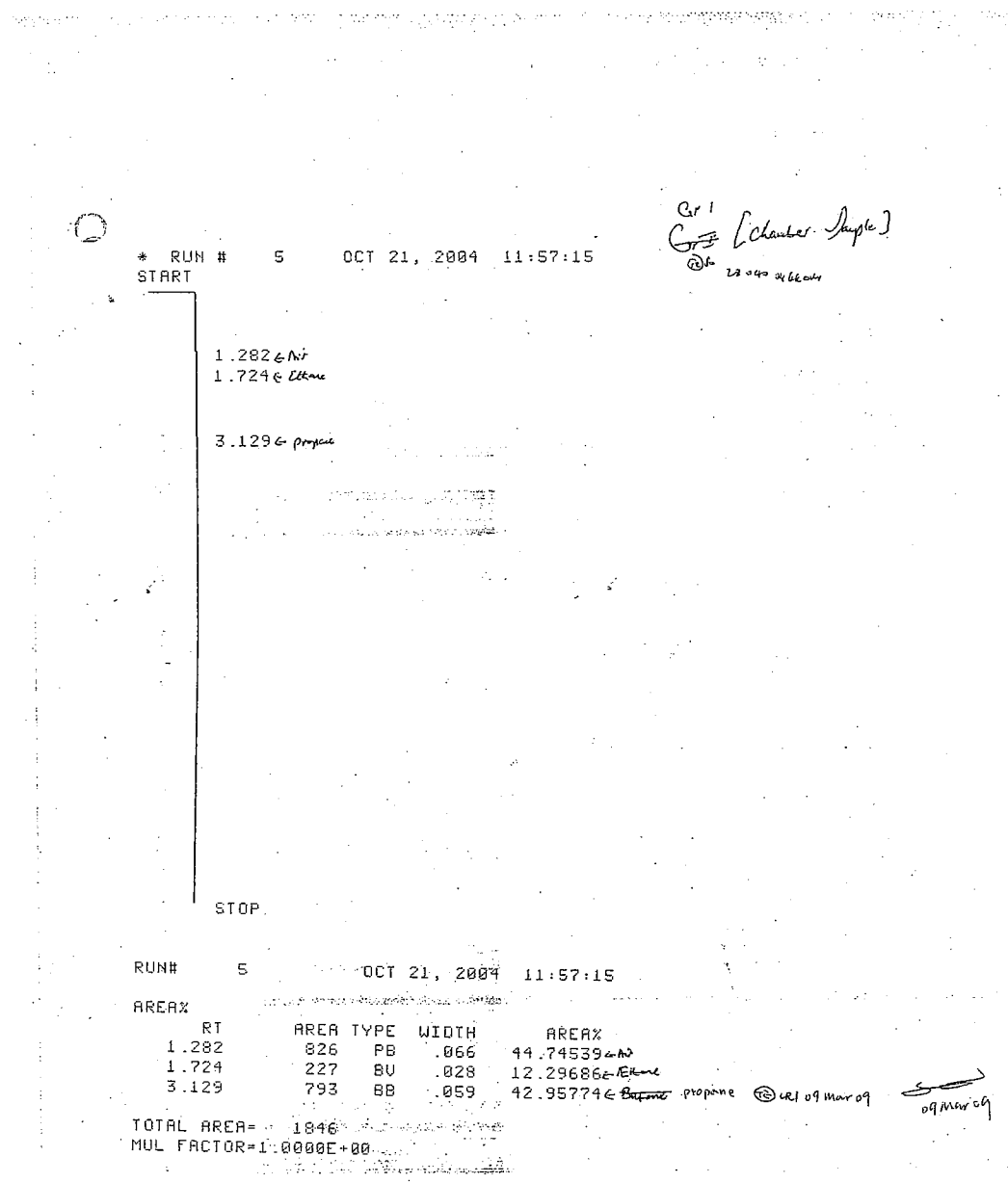
Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.40	6.63	85.86	1.68	4.36	99.93
LPG-2	1.41	6.30	85.88	1.68	4.38	99.65
LPG-3	1.41	6.12	86.17	1.81	4.40	99.91
Group-1	<LOQ	ND	<LOQ	ND	ND	0.00
Group-2	0.95	4.72	89.84	ND	ND	95.51
Group-3	1.40	4.83	89.01	ND	4.44	99.68
Group-4	1.03	6.82	87.99	1.31	2.83	99.98

LPG = Liquified Petroleum Gas

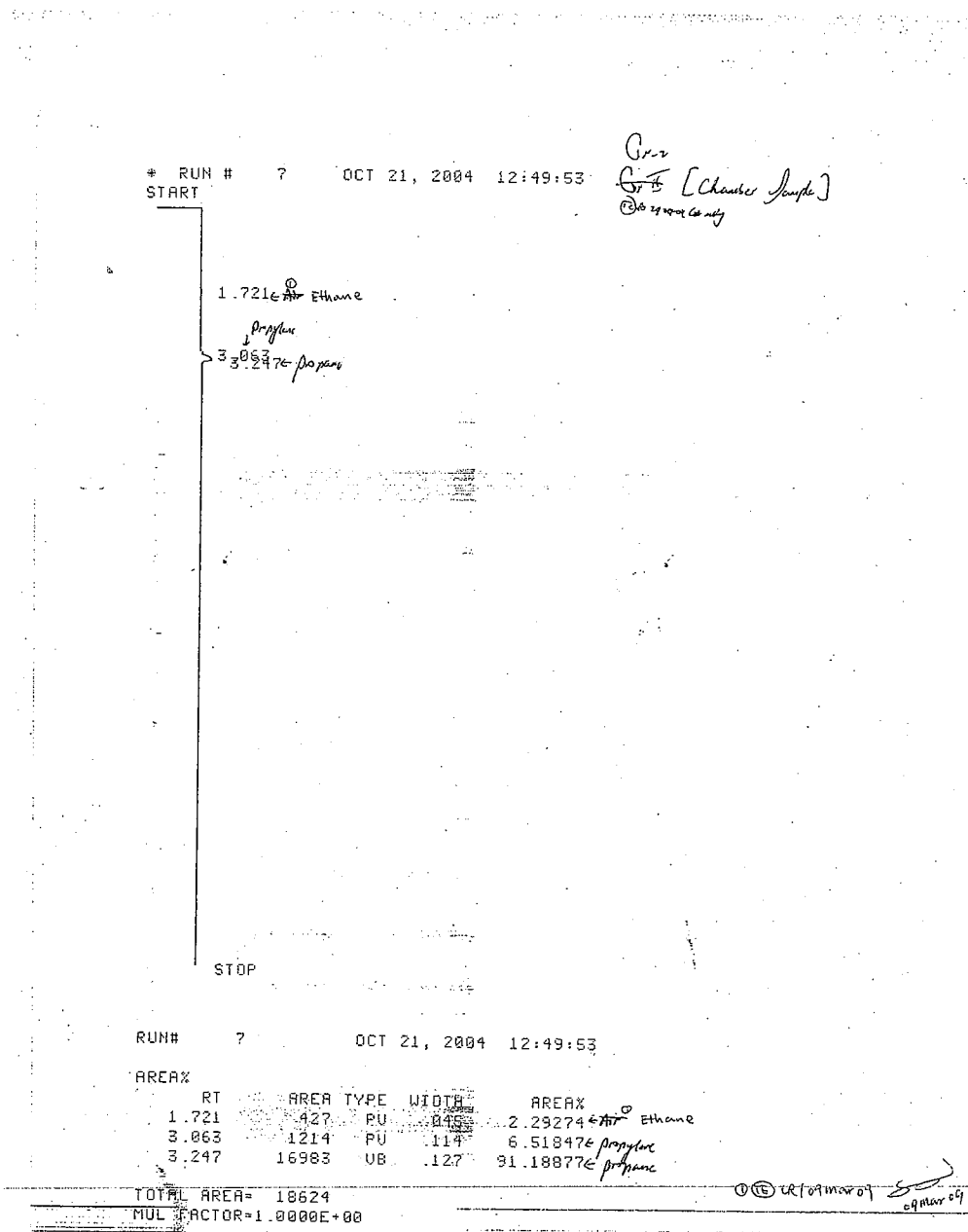
ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

	Analytical Report	Appendix Q
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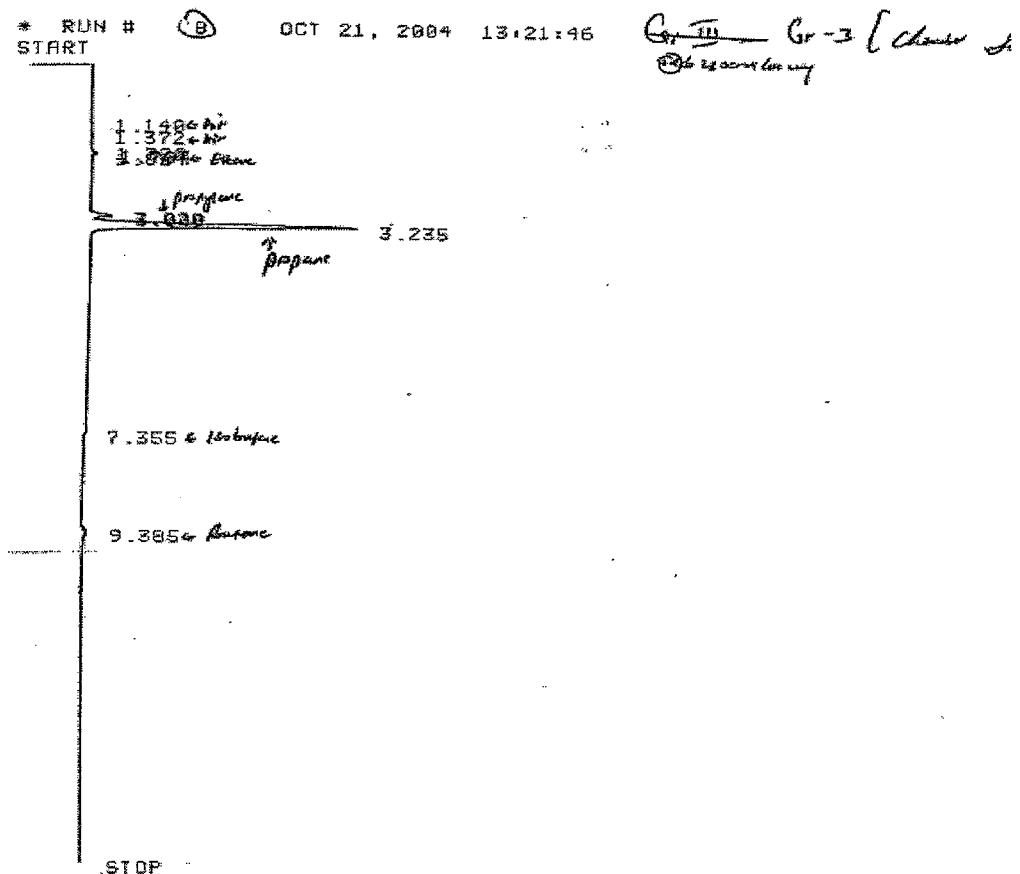
Figure I. A Typical Gas Chromatogram of Group 1 (Air Control) Chamber Sample**Response (mV) vs Time (minutes)**

	Analytical Report	Appendix Q
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Figure II. A Typical Gas Chromatogram of Group 2 (LPG) Chamber Sample**Response (mV) vs Time (minutes)**

	Analytical Report	Appendix Q
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Figure III. A Typical Gas Chromatogram of Group 3 (LPG) Chamber Sample



RUN# 8 OCT 21, 2004 13:21:46

AREA#

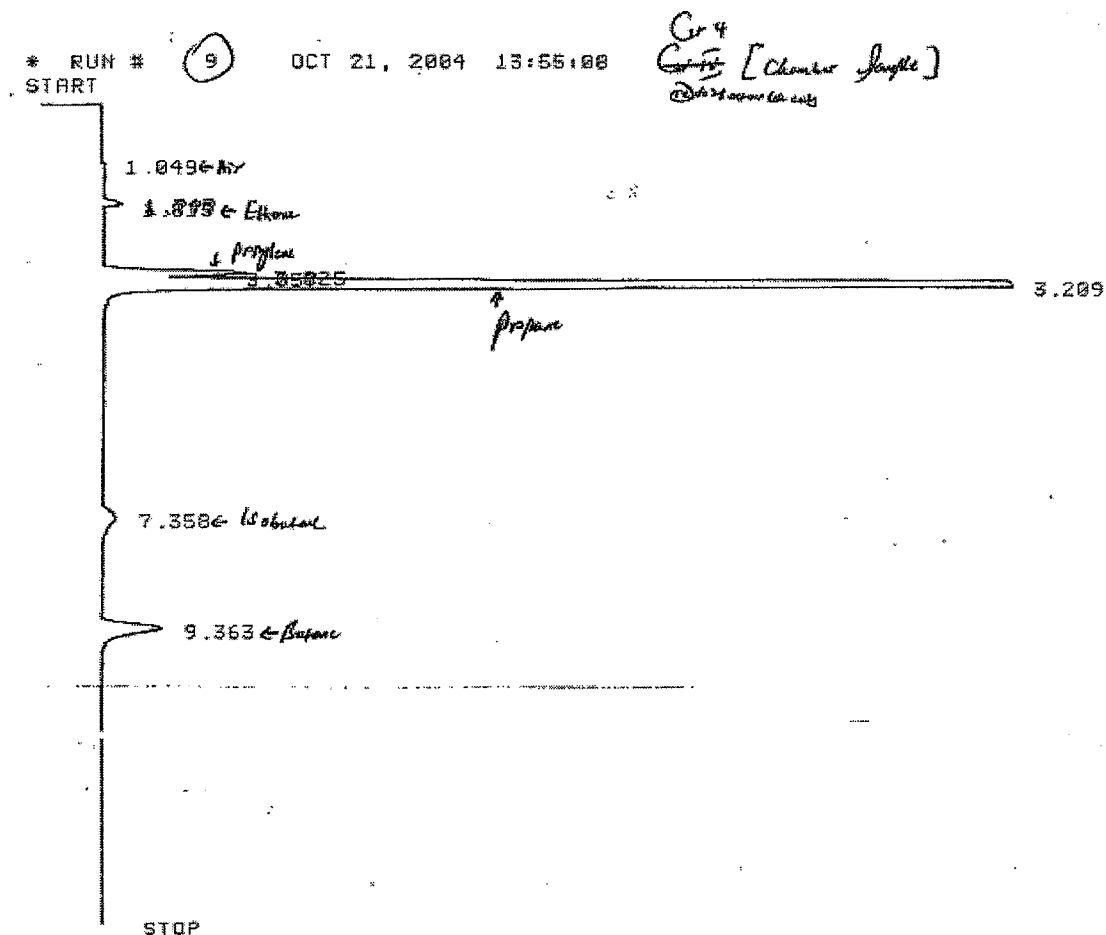
RT	AREA	TYPE	WIDTH	AREA%
1.140	166	PB	.016	.06858 <i>air</i>
1.372	792	PU	.103	.32718 <i>air</i>
1.720	842	PU	.036	.34784 <i>air</i>
1.767	1686	UU	.034	.69650 <i>air</i>
1.794	1107	UU	.021	.45731 <i>air</i>
1.824	278	UB	.018	.11484 <i>air</i>
3.020	8431	PU	.047	3.48291 <i>Propylene: 6.467</i>
3.040	7244	UU	.038	2.99255 <i>Propylene: 6.467</i>
3.235	207083	UB	.091	85.54746 <i>Isobutane</i>
7.355	4217	BU	.364	1.74207 <i>Butane</i>
9.385	10222	BB	.208	4.22278 <i>Butane</i>

TOTAL AREA= 242068
 MUL FACTOR=1.0000E+00

Response (mV) vs Time (minutes)

	Analytical Report	Appendix Q
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Figure IV. A Typical Gas Chromatogram of Group 4 (LPG) Chamber Sample



RUN# 9 OCT 21, 2004 13:55:08

AREA#	RT	AREA	TYPE	WIDTH	AREA#
1.049	194	BB	.018	.00876 Air	
1.745	8994	UU	.059	.40611 Ethane: 0.2	
1.777	6466	UU	.038	.29196 Propane: 6.55	
1.815	2798	UB	.020	.12634	
3.025	112362	PU	.091	5.07348	
3.057	28285	UU	.028	1.27715	
3.209	1890284	UB	.124	85.35210 Propane	
7.359	43014	PU	.355	1.94221 Isobutane	
9.363	112773	PB	.222	5.09204 Butane	
27.056	9520	UU	.840	.42986	

TOTAL AREA=2214690
MUL FACTOR=1.0000E+00

Response (mV) vs Time (minutes)

ChevronTexaco Energy Research
& Technology Company
Integrated Lab Technologies
100 Chevron Way
P.O.Box 1627
Richmond, CA 94802-0627
Tel 510-242-4993



July 23, 2003

ChevronTexaco


American Petroleum Institute
1220 L Street, Northwest
Washington, DC 20005-4070

Dear 

Enclosed are the analytical results for each of the five 100 gallon cylinders of liquefied petroleum gas that have been prepared for HPV light gases task group and are being stored at our facility. I have included individual analyses of each of the tanks plus two duplicates. Additionally since the five cylinders were filled from the same truck, should theoretically have the same composition, and in fact calculate to have very similar compositions, I summed the chromatographic signals of all seven analyses and calculated the average results for the LPG based on the summed signal. This technique reduces signal to noise and provides a more precise measurement of the smaller concentration constituents.

Liquid samples were injected at 100 psig using a liquid sampling loop. The coefficient of variation of the seven total sample areas was 12.8%, and the average total sample area had a 95% confidence limit of +/- 11.8 %, reflecting the difficulty of injecting truly repeatable amounts of such a volatile material.

Results were quantified by normalizing the total area counts to the average area counts for all seven analyses and then calculating the concentration of ethane, n-butane, isobutene, and isopentane by comparing peak areas with the average areas of a certified LPG master standard from Scott Specialty gases, run in triplicate. The concentrations of all other compounds heavier than propane were determined by applying weight response factors and ratioing adjusted peak areas to the n-butane adjusted peak area. The concentration of methane was treated similarly but ratioed to ethane. We were unfortunately unable to separate propane and propylene, given the high concentration of the propane. The two compounds were quantified by difference from 100.0 percent to account for detector overload, and were reported as a sum.

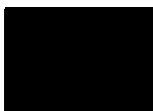
Neither benzene nor 1,3-butadiene were detected in any of the samples. The instrument detection limit for 1,3-butadiene was <10 ppm for all samples except LPG1 duplicate. In that sample the baseline was noisier than usual in the region where 1,3-butadiene elutes, necessitating an instrument detection limit of <20 ppm.

July 22, 2003
Page 2

ChevronTexaco

If you have any questions concerning this report please feel free to contact me.

Sincerely,

A solid black rectangular box used to redact a signature.A solid black rectangular box used to redact a signature.

Sample Name: LPG 1, tank V64452

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.015	0.025
ethane	2.048	1.947	2.262
propane + propylene	93.263	92.176	92.688
n-butane	2.857	3.607	3.167
n-pentane	0.068	0.079	0.061
isoparaffins			
isobutane	1.264	1.538	1.301
neopentane	0.003	0.004	0.003
isopentane	0.392	0.523	0.396
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.036	0.045	0.042
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.011	0.010
c-2-butene	0.009	0.010	0.010
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.011	0.012	0.010
2-methyl-1-butene	0.004	0.005	0.004
t-2-pentene	0.006	0.007	0.006
c-2-pentene	0.004	0.005	0.004
2-methyl-2-butene	0.010	0.011	0.009
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 1, tank V64452, duplicate injection

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.007	0.009	0.014
ethane	1.652	1.647	1.915
propane + propylene	93.647	92.178	92.778
n-butane	2.867	3.794	3.335
n-pentane	0.062	0.076	0.058
isoparaffins			
isobutane	1.262	1.610	1.363
neopentane	0.002	0.003	0.002
isopentane	0.393	0.549	0.416
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.040	0.051	0.048
1,3-butadiene	nd<0.002	nd<0.002	nd<0.002
t-2-butene	0.008	0.010	0.010
c-2-butene	0.009	0.011	0.011
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.019	0.023	0.018
2-methyl-1-butene	0.010	0.011	0.009
t-2-pentene	0.012	0.014	0.011
c-2-pentene	0.002	0.002	0.002
2-methyl-2-butene	0.006	0.007	0.006
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EOH 7/23/03

Sample Name: LPG 2, tank V641461

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.014	0.016	0.026
ethane	2.175	1.914	2.223
propane + propylene	92.887	92.362	92.856
n-butane	2.999	3.503	3.075
n-pentane	0.066	0.071	0.054
isoparaffins			
isobutane	1.358	1.529	1.293
neopentane	0.002	0.002	0.001
isopentane	0.404	0.499	0.377
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.042	0.047	0.044
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.008	0.008
c-2-butene	0.011	0.012	0.011
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.010	0.011	0.009
2-methyl-1-butene	0.006	0.007	0.005
t-2-pentene	0.005	0.005	0.004
c-2-pentene	0.003	0.003	0.003
2-methyl-2-butene	0.007	0.007	0.006
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

END 7/23/03

Sample Name: LPG 3, tank V641455

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.020	0.027	0.044
ethane	2.076	2.108	2.448
propane + propylene	93.650	92.169	92.625
n-butane	2.633	3.550	3.115
n-pentane	0.059	0.074	0.056
isoparaffins			
isobutane	1.123	1.458	1.233
neopentane	0.003	0.004	0.003
isopentane	0.351	0.501	0.378
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.036	0.047	0.044
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.009	0.009
c-2-butene	0.009	0.011	0.011
3-methyl-1-butene	nd<0.001	nd<0.001	nd<0.001
1-pentene	0.011	0.013	0.011
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.006	0.008	0.006
c-2-pentene	0.005	0.006	0.005
2-methyl-2-butene	0.004	0.005	0.004
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 3, tank V641455, duplicate injection

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.016	0.027
ethane	1.809	1.849	2.150
propane + propylene	93.517	91.854	92.436
n-butane	2.854	3.872	3.402
n-pentane	0.064	0.080	0.061
isoparaffins			
isobutane	1.246	1.629	1.380
neopentane	0.003	0.004	0.003
isopentane	0.404	0.579	0.438
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.038	0.050	0.047
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.012	0.011
c-2-butene	0.007	0.008	0.008
3-methyl-1-butene	0.004	0.004	0.003
1-pentene	0.014	0.017	0.014
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.005	0.006	0.005
c-2-pentene	0.004	0.005	0.004
2-methyl-2-butene	0.006	0.007	0.005
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 4, tank V641456

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.016	0.019	0.031
ethane	2.264	2.027	2.355
propane + propylene	92.619	91.935	92.455
n-butane	3.111	3.698	3.247
n-pentane	0.072	0.079	0.060
isoparaffins			
isobutane	1.357	1.554	1.315
neopentane	0.003	0.003	0.002
isopentane	0.443	0.557	0.421
2,3-dimethylbutane	0.008	0.008	0.005
cycloparaffins			
cyclopentane	0.003	0.003	0.003
olefins, dienes			
isobutene	0.042	0.048	0.045
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.010	0.011	0.011
c-2-butene	0.009	0.010	0.010
3-methyl-1-butene	0.003	0.004	0.003
1-pentene	0.015	0.017	0.013
2-methyl-1-butene	0.007	0.008	0.006
t-2-pentene	0.005	0.005	0.004
c-2-pentene	0.005	0.005	0.004
2-methyl-2-butene	0.009	0.009	0.007
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 5, tank V641437

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.014	0.022	0.036
ethane	1.816	2.100	2.439
propane + propylene	94.328	92.023	92.509
n-butane	2.332	3.581	3.143
n-pentane	0.057	0.080	0.061
isoparaffins			
isobutane	1.027	1.520	1.286
neopentane	0.004	0.006	0.004
isopentane	0.330	0.535	0.405
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.032	0.048	0.045
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.011	0.010
c-2-butene	0.008	0.012	0.012
3-methyl-1-butene	0.003	0.004	0.003
1-pentene	0.014	0.020	0.016
2-methyl-1-butene	0.010	0.014	0.011
t-2-pentene	0.005	0.007	0.006
c-2-pentene	0.005	0.007	0.006
2-methyl-2-butene	0.007	0.009	0.008
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EDX 7/23/03

Sample Name: Average Signal

Integration of the summed chromatographic signal of all samples and duplicates to gain improved signal to noise

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.016	0.027
ethane	1.809	1.849	2.150
propane + propylene	93.513	91.851	92.434
n-butane	2.854	3.872	3.402
n-pentane	0.064	0.080	0.061
isoparaffins			
isobutane	1.246	1.629	1.380
neopentane	0.003	0.004	0.003
isopentane	0.404	0.579	0.438
2,3-dimethylbutane	0.006	0.007	0.005
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.038	0.050	0.047
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.012	0.011
c-2-butene	0.007	0.008	0.008
3-methyl-1-butene	0.004	0.004	0.003
1-pentene	0.014	0.017	0.014
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.003	0.003	0.003
c-2-pentene	0.003	0.004	0.003
2-methyl-2-butene	0.005	0.006	0.005
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

API LPG Comparative Analysis -- August 23, 2004

Cylinder Serial Number	K634083	K634086	K634106	V641453	12/19/2001	
33# Cylinder Number				420#	Trap Target	
Filling Sequence	42	20	1	Cylinder 5	Wagon Spec's	
	wt %	wt %	wt %	wt %	wt %	vol %
methane	0.00	0.00	0.00	0.00	0.02	
ethylene	0.00	0.00	0.00	0.00		
ethane	0.56	1.10	1.14	1.32	2.48	
propylene	0.00	0.00	0.00	0.00		<10
propane	88.84	91.60	91.00	91.12	87.32	>85
isobutane	2.44	1.85	1.94	1.88	1.21	
1-butene + isobutene	0.09	0.06	0.07	0.06	0.04	<2
butane	6.52	4.52	4.82	4.65	2.75	<5
trans-2-butene	0.02	0.02	0.02	0.00	0.01	
2,2-dimethylpropane	0.02	0.01	0.01	0.02		
cis-2-butene	0.02	0.01	0.01	0.01	0.39	
3-methyl-1-butene	0.01	0.00	0.00	0.01		
isopentane	1.23	0.68	0.80	0.76		
1-pentene	0.04	0.02	0.02	0.03		
2-methyl-1-butene	0.01	0.01	0.01	0.01		
pentane	0.18	0.10	0.11	0.11		<0.5
isoprene	0.02	0.00	0.01	0.01		
trans-2-pentene	0.00	0.00	0.03	0.00		
cis-2-pentene	0.02	0.01	0.01	0.01		

August 23, 2004
file: P:API LPG

Sample ID: K634083, 33# Cyl, 3rd sample

	wt %
methane	0.00
ethylene	0.00
ethane	0.56
propylene	0.00
propane	88.84
isobutane	2.44
1-butene + isobutene	0.09
butane	6.52
trans-2-butene	0.02
2,2-dimethylpropane	0.02
cis-2-butene	0.02
3-methyl-1-butene	0.01
isopentane	1.23
1-pentene	0.04
2-methyl-1-butene	0.01
pentane	0.18
isoprene	0.02
trans-2-pentene	0.00
cis-2-pentene	0.02

K634086.AIA

	wt %
methane	0.00
ethylene	0.00
ethane	1.10
propylene	0.00
propane	91.60
isobutane	1.85
1-butene + isobutene	0.06
butane	4.52
trans-2-butene	0.02
2,2-dimethylpropane	0.01
cis-2-butene	0.01
3-methyl-1-butene	0.00
isopentane	0.68
1-pentene	0.02
2-methyl-1-butene	0.01
pentane	0.10
isoprene	0.00
trans-2-pentene	0.00
cis-2-pentene	0.01

K634106

	wt %	
methane	0.00	0
ethylene	0.00	0
ethane	1.14	1.14
propylene	0.00	0
propane	91.00	91
isobutane	1.94	1.94
1-butene + isobutene	0.07	0.07
butane	4.82	4.82
trans-2-butene	0.02	0.02
2,2-dimethylpropane	0.01	0.01
cis-2-butene	0.01	
3-methyl-1-butene	0.00	
isopentane	0.80	
1-pentene	0.02	
2-methyl-1-butene	0.01	
pentane	0.11	
isoprene	0.01	
trans-2-pentene	0.03	
cis-2-pentene	0.01	

V641453

	wt %
methane	0.00
ethylene	0.00
ethane	1.32
propylene	0.00
propane	91.12
isobutane	1.88
1-butene + isobutene	0.06
butane	4.65
trans-2-butene	0.00
2,2-dimethylpropane	0.02
cis-2-butene	0.01
3-methyl-1-butene	0.01
isopentane	0.76
1-pentene	0.03
2-methyl-1-butene	0.01
pentane	0.11
isoprene	0.01
trans-2-pentene	0.00
cis-2-pentene	0.01

Appendix S

PROTOCOL

LIQUIFIED PETROLEUM GAS

**A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY
IN THE RAT VIA WHOLE-BODY EXPOSURES**

CONFIDENTIAL

HLS Study No.:
Protocol No.:
Date:

03-6140
Final
5 October 2004

PROTOCOL SIGNATURES / PREFACE

(Confidential Information - to be distributed on a need-to-know basis)

Study Title: Liquified Petroleum Gas: A 2-Week Range-Finding
Inhalation Toxicity Study in the Rat via Whole-Body
Exposures

HLS Study No.: 03-6140

This is the Final Protocol. It has been reviewed and approved by:

[Redacted Signature]

Boetig
Date

Huntingdon Life Sciences (HLS)
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[Redacted Signature]

10/7/04
Date

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1. INTRODUCTION

HLS Study No.	03-6140
Protocol	Final
Study Title	Liquified Petroleum Gas: A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Whole-Body Exposures
Testing Facility	Huntingdon Life Sciences 100 Mettlers Road East Millstone, NJ 08875-2360
Purpose	This study is designed to provide a preliminary assessment of the toxicity of the test substance when administered via whole-body inhalation to rats for 2 weeks in order to determine appropriate exposure levels for a subsequent 13 Week Inhalation Study 03-6141 and a Developmental Inhalation Study 03-4253. The studies are intended to be used by the Petroleum HPV Testing Group in the EPA HPV Challenge Program.

2. STUDY PERSONNEL

Study Director	Gary M. Hoffman, B.A., DABT
Alternate Contact	Keith P. Hazelden, BSc, CBiol, MIBiol Director of Reproductive and Developmental Toxicology Tel.: 732-873-2550 x2590 Email: hazeldek@princeton.huntingdon.com

Additional personnel will be documented in the study file and presented in the final report.

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3. PROPOSED STUDY DATES

Study Initiation	Date Study Director signs protocol
Receipt of Test Animals	7 October 2004 (males) (Experimental Initiation)* 15&18 October 2004 (time-mated females)
First Day of Treatment	20 October 2004 (males) 20 October 2004 (females) (Experimental Initiation)**
Last Day of Treatment	3 November 2004 (males) 4 November 2004 (females)
Necropsy - Termination	3-4 November 2004 (males) 3-5 November 2004 (females)
Experimental Termination	5 November 2004 (Date of last data collection)
Submission of Audited Draft Report	13 January 2005
Study Completion	Date final report is signed by Study Director

*as per OECD GLPs; ** as per EPA GLPs

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4. EXPERIMENTAL DESIGN**4.1. STUDY SUMMARY**

Group	Test Substance	Exposure Level ^a	Number of Animals			
			Initial		Necropsy ^b	
		ppm	M	F	M	F
1	Air Control	0	10	10	10	10
2	Liquified Petroleum Gas	100	10	10	10	10
3	Liquified Petroleum Gas	1000	10	10	10	10
4	Liquified Petroleum Gas	10000	10	10	10	10

^aExposures will be 6 hours per day for 7 consecutive days per week for 2 weeks for a total of exactly 14 exposures. Exposure levels are expressed as ppm of test substance. The exposures will be conducted via whole-body exposure.

^bComplete postmortem evaluations will also be performed on animals which are found dead or euthanized in a moribund condition during the course of the study.

M = male; F = female (these animals will be timed-mated and will be exposed from Gestation Days 6-19).

The first day of exposures will be defined as Day 0 of the study.

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4.2. JUSTIFICATION FOR ROUTE, DURATION AND FREQUENCY

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of exposures are considered to be the minimum necessary for determining exposure levels for a subsequent 13-week inhalation study 03-6141 and a developmental inhalation study 03-4253.

4.3. JUSTIFICATION FOR TEST ANIMAL SELECTION

The rat is an animal model commonly utilized in toxicity studies as recommended in OECD and EPA guidelines and will be used in the subsequent subchronic toxicity study 03-6141. The female rats will be time-mated because this study will also serve as a range-find study for a developmental toxicity study 03-4253. In addition, a historical database is available for comparative evaluation.

4.4. JUSTIFICATION FOR NUMBER OF ANIMALS

The number of animals in the protocol is considered to be the minimum necessary for scientific and statistical reasons in order to evaluate the data with sufficient confidence levels.

4.5. JUSTIFICATION FOR EXPOSURE LEVEL SELECTION

The exposure levels were selected based on establishing (for safety reasons) the high exposure level as no more than 50% of the lower explosion limit (LEL = 2.1% = 21000 ppm) for the test substance.

5. TEST SUBSTANCE

5.1. TEST SUBSTANCE: LIQUIFIED PETROLEUM GAS

Test Substance Category: industrial gas

Description, lot number, storage, expiration date (if available) and handling procedures, as well as other pertinent information will be documented in the study data. The test substance will be stored (ambient conditions) in an outside solvent shed except when in use in the inhalation laboratory. The test substance will be handled as a flammable gas.

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5.2. IDENTIFICATION OF TEST SUBSTANCE

Unless otherwise noted, the identity, strength, purity, composition, stability and method of synthesis, fabrication and/or derivation of each batch of the test substance will be documented by the Sponsor before its use in the study. This documentation will be maintained by the Sponsor at the address indicated on the signature page of this protocol.

5.3. ARCHIVAL SAMPLES

Sponsor will arrange for storage of an archival sample at a contract archival facility (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA 20166).

5.4. ADMINISTRATION OF TEST SUBSTANCE

The test substance will be administered by whole-body inhalation exposure. The test substance will be administered as a gas (depending on the physical properties of the test substance) in the breathing air of the animals. The test atmosphere will be generated by an appropriate procedure determined during pre-study trials. The trials will be performed (at least two 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the target exposure levels. The method will be described in the raw data of the study and in the report.

The whole-body exposure chambers will each have a volume of approximately 1000 liters. Each chamber will be operated at a minimum flow rate of 200 liters per minute. The final airflow will be set to provide at least one air change in 5.0 minutes (12 air changes/hour) and a T_{99} equilibrium time of at most 23 minutes. This chamber size and air flowrate is considered adequate to maintain the animal-loading factor below 5% and the oxygen level at 19% or higher. At the end of the exposure, all animals will remain in the chamber for a minimum of the T_{99} equilibrium time. During this time, the chamber will be operated at approximately the same flow rate using clean air only.

5.5. EXPOSURE CONCENTRATION DETERMINATION

A nominal exposure concentration will be calculated daily, if possible. The flow of air through the chamber will be monitored using appropriate calibrated equipment. The test substance consumed during the exposure will be divided by the total volume of air passing through the chamber

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(volumetric flow rate times total exposure time) to give the nominal concentration.

During each exposure, measurements of airborne concentrations of test substance will be performed at least four times using an appropriate sampling procedure and infrared spectrophotometric analytical procedure. Also, one sample (gas tight syringe) per chamber per week will be analyzed by gas chromatography (GC) to characterize at least 5 major components (comprising at least 90% by weight of the test substance) to show test substance stability and comparison between the neat test substance and the test atmospheres.

If more than the normal amount of trial time is required because of test substance generation or monitoring problems (80 technician hours), the Sponsor will be consulted prior to additional trials (additional cost).

5.6. PARTICLE SIZE DISTRIBUTION ANALYSIS:

During each exposure, particle size determinations will be performed using a TSI Aerodynamic Particle Sizer to demonstrate the absence of any condensation aerosol.

5.7. CHAMBER AND EXPOSURE ROOM ENVIRONMENT:

Chamber temperature, humidity, airflow rate and static pressure will be monitored continuously and recorded every 30 minutes during exposure. Chamber temperature and relative humidity will be maintained, to the maximum extent possible, between 20 to 24°C and 40 to 60%, respectively. Chamber oxygen levels (maintained at least 19%) will be measured pretest and at the beginning, middle and end of the study.

Air samples will be taken in the vapor generation area pretest and at the beginning, middle and end of the study. Light (maintained approximately 30-40 foot-candles at 1.0 meter above the floor) and noise levels (maintained below 85 decibels) in the exposure room will be measured pretest and at the beginning, middle and end of the study.

5.8. SUMMARY OF CHAMBER ACTIVITY:

The minimum frequency of chamber activity is summarized below.

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Activity	Frequency/chamber
Measured Test Substance Concentration	4X/day
Particle Size	1X/day
Temperature	13X/day
Relative Humidity	13X/day
Airflow Rate	13X/day
Nominal Test Substance Concentration	1X/day
Rotation Pattern of Exposure Cages	1X/day
Loading/Unloading Verification	1X/day

5.9. FREQUENCY AND DURATION OF ADMINISTRATION

The test substance will be administered for 6 hours per day for 7 consecutive days per week for 2 weeks for a total of exactly 14 exposures. Test substance administration will continue through the day prior to necropsy.

5.10. UNUSED TEST SUBSTANCE

Following completion of the final report for the final study with this test substance, the Testing Facility will inform the Sponsor of the volume of remaining test substance as well as the number of test substance containers. The Sponsor will then instruct the Testing Facility whether to dispose of the remaining test substance and containers or to ship the test substance and containers to another location.

6. TEST ANIMALS

6.1. SPECIES

Albino Rats (Outbred) Vaf/Plus®
Sprague-Dawley - derived (CD®)
Crl: CD (SD) IGS BR

6.2. SUPPLIER

Charles River Laboratories

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Documentation of the specific breeding facility will be maintained in the study file.

6.3. ANIMAL REQUIREMENTS/SPECIFICATIONS

6.3.1. NUMBER OF ANIMALS ON STUDY

<u>Total</u>	<u>Males</u>	<u>Females</u>
80	40	40

6.3.2. AGE

Young adult male animals (approximately 6 weeks at receipt; approximately 8 weeks (and no more than 9 weeks) at initiation of exposures. Female animals will be mature, timed-mated, approximately 75 to 85 days in age at receipt and at gestation day 6 at initiation of exposures.

6.3.3. WEIGHT

Approximately 200 to 300 grams at first exposure of male animals. Female animals will weigh approximately 210 to 270 grams on Day 0 of gestation, based on the Supplier's documentation (non-GLP). Animals outside of this range may be used at the discretion of the Study Director.

6.4. ACCLIMATION PERIOD

Approximately 2 weeks for male animals. Female animals will be received on Days 0, 1, 2 or 3 of gestation and will be quarantined until start of exposures on Gestation Day 6. All animals will be checked for viability twice daily. Prior to assignment to study, all animals will be examined to ascertain suitability for study.

6.5. ANIMAL CARE AND HUSBANDRY

6.5.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

Currently acceptable practices of good animal husbandry will be followed, e.g., *Guide for the Care and Use of Laboratory Animals*; National Academy Press, 1996. Huntingdon Life Sciences Inc. is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC).

6.5.2. VETERINARY CARE

Animals will be monitored by the technical staff for any conditions requiring possible veterinary care. If any such conditions are identified, a staff veterinarian will be notified for an examination and evaluation. Animals will be treated as outlined in the Animal Welfare Act Compliance section of this protocol.

6.5.3. ENVIRONMENTAL CONDITIONS

Light/Dark Cycle

Twelve hour light/dark cycle provided via automatic timer.

Temperature

Temperature will be monitored in accordance with Testing Facility SOPs to ensure that the desired range of 18 to 26°C is maintained to the maximum extent possible.

Humidity

Humidity will be monitored in accordance with Testing Facility SOPs to ensure that the desired range of 30 to 70% is maintained to the maximum extent possible.

6.5.4. HOUSING

Male animals will be individually housed in suspended, stainless steel wire mesh cages during the acclimation and during the remainder of the study. Female animals will be individually housed in suspended, stainless steel wire mesh cages during the acclimation and during the remainder of the study.

6.5.5. FEED

Certified Rodent Diet, No. 5002; (Meal) (PMI Nutrition International, St. Louis, MO) *ad libitum*.

6.5.6. WATER

Elizabethtown Water Company, Westfield, NJ; *ad libitum*, via automated watering system.

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6.5.7. FEED ANALYSIS

Analytical certification of batches of feed provided by the manufacturer will be maintained on file by the Testing Facility. There are no known contaminants in the feed which are expected to interfere with the objectives of this study.

6.5.8. WATER ANALYSIS

Water analyses are conducted by Elizabethtown Water Company to assure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR Part 141). Water analysis, provided by the supplier, will be maintained on file at the Testing Facility. In addition, chemical and microbiological analyses are conducted biannually (by a Subcontractor) on water samples collected from representative rooms in this facility. Results are maintained on file. There are no known contaminants which are expected to interfere with the objectives of this study.

6.5.9. ANIMAL ASSIGNMENT

More male animals than required for the study will be purchased and acclimated. Male animals considered suitable for study on the basis of pretest physical examinations, body weight data and any other pretest evaluations, will be randomly assigned to control or treated groups in an attempt to equalize mean group body weights. Female animals considered suitable for study on the basis of pretest physical examinations will be randomized into groups on the day of receipt using a method that ranks the Gestation Day 4 body weights and randomly assigns each female animal within the block into groups. Female animals may be replaced based on physical examinations and/or body weight change up to Gestation Day 6, as necessary. Individual weights of animals placed on test shall be within $\pm 20\%$ of the mean weight for each sex. Disposition of all animals not utilized in the study will be maintained in the study file.

6.5.10. IDENTIFICATION

Each animal will be assigned a temporary identification number upon receipt. After selection for study, each animal will be ear-tagged with a number assigned by the Testing Facility. This

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number plus the study number will comprise the unique animal number for each animal. If the tag is lost, it will be replaced. Each cage will be provided with a cage card which will be color coded for exposure level identification and will contain the study number and animal number.

6.5.11. ANIMAL HUSBANDRY/EXPOSURE

Housing:	Individually in cages.
Food:	None.
Water:	None.

7. IN-LIFE EVALUATIONS

7.1. CLINICAL OBSERVATIONS

7.1.1. VIABILITY CHECKS (CAGE-SIDE)

Observations for mortality and general condition will be made at least twice daily (once in the morning and once in the afternoon). Animals in poor health or in a possible moribund condition will be identified for further monitoring and possible euthanasia.

7.1.2. PHYSICAL EXAMINATIONS

In-Chamber: All animals will be observed as a group at least once during each exposure.

Out-of-Chamber: Each animal will be removed from its cage and examined at least once pretest and during each week of the study period. Examinations will include observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of clonic or tonic movements, stereotypy (e.g., excessive grooming, repetitive circling) or bizarre behavior (e.g., self-mutilation, walking backward) will be recorded.

7.2. BODY WEIGHTS

Non-fasted body weights for animals will be recorded at least once pretest (on GD 4 for the females) and once per week (on GD 6, 13, 20 for

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the females) during the study period. Fasted weights will be obtained prior to necropsy (males only).

7.3. FEED CONSUMPTION

Feed consumption will be measured (weighed) during the week prior to treatment initiation and once per week during the study period. Feed will be available without restriction 7 days/week except during exposures. Animals will be presented with weighed feeders at the scheduled intervals. After at least 2 days (pre-test) or 5 days (on-test), the feeders will be reweighed and the resulting weight subtracted from the initial feeder weight to obtain the grams of feed consumed per animal per day. The grams consumed per kilogram of body weight per day will then be calculated for each animal.

8. POSTMORTEM EVALUATIONS

8.1. MACROSCOPIC PATHOLOGY

A complete macroscopic examination will be performed on all animals, including animals euthanized in a moribund condition or for humane reasons or found dead; all abnormal observations will be recorded. The necropsy will consist of an external examination, including identification of all clinically recorded lesions, as well as a detailed internal examination.

8.1.1. MORIBUND ANIMALS

Animals showing signs of severe debility, particularly if death appears imminent, will be euthanized to prevent loss of tissues through autolysis.

8.1.2. TERMINAL NECROPSY

Necropsy will be performed on all surviving animals after 14 days of exposure. Necropsy schedules will be established in order to assure that approximately equal numbers of males and females from each group will be examined at similar times of the day of necropsy.

8.2. METHOD OF EUTHANASIA

All adults will be euthanized by an overdose of carbon dioxide inhalation. All live fetuses will be euthanized by an intraperitoneal overdose of sodium pentobarbital.

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8.3. ORGAN WEIGHTS

Organs indicated below will be taken from all survivors at the scheduled necropsies, weighed, recorded and organ/body and organ/brain weight ratios calculated. Organs will not be weighed for animals found dead or euthanized in a moribund condition during the course of the study. Prior to weighing, all organs will be carefully dissected and properly trimmed to remove fat and other contiguous tissues in a uniform manner. Organs will be weighed as soon as possible after dissection to avoid drying. Paired organs will be weighed together.

adrenals	kidneys	seminal vesicles
brain	liver	spleen
epididymides	lungs	testes
heart	pituitary	thymus

8.4. TISSUE PRESERVATION

Tissues listed in Appendix A will be obtained at necropsy and preserved for all male animals. The female animals will only have the adrenals, brain, heart, kidneys, liver, lungs, pituitary, spleen, thymus, gross lesions and target organs (as designated by the Study Director, Pathologist and/or Sponsor based on experimental findings) as well as the uterus with ovaries (but without placenta) preserved.

Eyes and testes and epididymides – modified Davidson's solution initially and then 10% neutral buffered formalin

All other tissues - 10% neutral buffered formalin

Note: Lungs (gravity method) and urinary bladder will be infused with formalin to ensure fixation.

8.5. EVALUATION OF DAMS AND PUPS

A macroscopic postmortem examination will be performed on all the dams, including those dying spontaneously or euthanized in either a moribund condition or after prematurely delivering a litter. Females that are not pregnant or found dead or sacrificed prior to schedule termination will have implantation data (*ie* number of fetuses and early/late embryo-fetal deaths) determined at necropsy (Salewski's test). Corpora lutea will not be counted for these animals.

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Dams showing signs of premature delivery will be euthanized on the day such evidence is observed. Reproductive tracts will be examined for implantation data (implantation sites, live/dead fetuses and early/late embryo-fetal deaths). Fetuses obtained earlier than Gestation Day (GD) 20 will be evaluated for external malformations, euthanized and discarded.

Any dams initiating delivery on GD 20 will be immediately euthanized and the fetuses processed with the other GD 20 fetuses. Dams surviving on GD 20 will have the following examinations of their pregnancies:

The intact uteri (ovaries attached) will be removed from the abdominal cavity and weighed intact. Corpora lutea will be counted (without dissection) and the number per ovary recorded. The number of the following will be recorded:

- live fetuses
- dead fetuses (no significant degeneration)
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- early embryonic deaths (evidence of implantation but no recognizable fetus)

The maternal carcass will then be discarded.

All live fetuses will be weighed as a litter (males and females separately). Each (live and dead) fetus will be given a macroscopic external examination for defects including observation of the palate. The sex will be determined by external examination only. Fetuses with obvious external malformations will be preserved (10% neutral buffered formalin) for possible future examination. All other fetuses, and intra-uterine deaths, will be discarded.

8.6. MICROSCOPIC PATHOLOGY EVALUATIONS

No examinations are required. Authorization will be obtained from the Sponsor prior to performing any examinations.

9. ARCHIVING OF RECORDS AND SPECIMENS

All data documenting experimental details and study procedures and observations will be recorded and maintained as raw data. At the completion of the study, all reports, raw data and retained samples will be maintained in the Testing Facility's Archives for a period of 1 year after submission of the signed final report.

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The Sponsor will be contacted in order to determine the final disposition of these materials. The Sponsor is responsible for all cost associated with the storage of these materials beyond one year from the issuance of the final report and for any costs associated with the shipment of these materials to the Sponsor or to any other facility designated by the Sponsor.

10. STATISTICAL ANALYSIS

10.1. ITEMS TO BE ANALYZED

The following will be compared for control and test substance-treated groups.

- mean body weight values
- mean feed consumption values
- mean terminal organ weights, organ/body and organ/brain weight ratios
- Number of implantation sites and corpora lutea
- Pre- and post-implantation loss
- Number of pups per litter
- Number of male and female pups per litter
- Average pup weight per litter as a composite for both sexes
- Total litter weight

10.2. PROCEDURES

Evaluation of equality of group means will be made by the appropriate statistical method, followed by a multiple comparison test if needed. Bartlett's test (Bartlett, 1937; Sokal and Rohlf, 1995; Snedecor and Cochran, 1967) will be performed to determine if groups have equal variances. For all parameters except organ weights, if the variances are equal, parametric procedures will be used; if not, nonparametric procedures will be used. Organ weight data will be analyzed only by parametric methods. The parametric method will be the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Dunlap and Duffy, 1975). If significant differences among the means are indicated, additional tests will be used to determine which means are significantly different from the control: Dunnett's (Dunlap et al., 1981; Dunnett, 1955, 1964) or Cochran and Cox's modified t-test (Cochran and Cox, 1959). The nonparametric method will be the Kruskal-Wallis test (Kruskal and Wallis, 1952, 1953) and if differences are indicated or Pairwise Comparison with Bonferroni Correction (Games and Howell, 1976) will be used to determine which means differ from control. Bartlett's test for equality of variance will be conducted at the 1% significance level; all other statistical tests will be conducted at the 5% and 1% significance levels.

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References for these procedures are:

Bartlett, M.S. 1937. Properties of sufficiency and statistical tests. *Proceedings of the Royal Society, Series A*, 160: 268-282; Cochran, W.G. and Cox, G.M. 1959. *Experimental Designs*, New York: John Wiley, pp. 100-102; Dunlap, W.P. and Duffy, J.A. 1975. Fortran IV Functions for Calculating Exact Probabilities Associated with Z, Chi-Square, T and F Values. *Behav. Res. Methods and Instrumentations* 7:59-60; Dunlap, W.P., Marx, M.S. and Agamy, G.G. 1981. Fortran IV functions for calculating probabilities associated with Dunnett's test. *Behav. Res. Methods and Instrumentation* 13: 363-366; Dunnett, C.W. 1955. A multiple comparison procedure for comparing several treatments with a control. *Journal of the American Statistical Association* 50: 1096-1121; Dunnett, C.W. 1964. New tables for multiple comparisons with a control. *Biometrics* 20-3: 482-491; Games, P.A. and Howell, J.F. 1976. Pairwise multiple comparison procedures with unequal n's and/or variances: a monte-carlo study. *Journal of Educational Statistics* 1: 113-125; Kruskal, W.H. and Wallis, W.A. 1952. Use of Ranks in one-criterion variance analysis. *Journal of the American Statistical Association* 47: 583-621; Kruskal, W.H. and Wallis, W.A. 1953. Errata for Kruskal-Wallis (1952) *Journal of the American Statistical Association* 48: 907-911; Snedecor, G.W. and Cochran, W.G. 1967. *Statistical Methods*. 6th edition. Ames: Iowa State University Press; Sokal, R.R. and Rohlf, F.J. 1995. *Biometry*. 3rd Edition. San Francisco: W.H. Freeman pp. 369-371.

11. REPORTING

11.1. STATUS REPORTS

Periodic written (weekly) updates on study progress will be provided by the Study Director.

11.2. FINAL REPORT

One unbound hard copy and one electronic copy of an audited draft report will be submitted following termination of the study. After receipt and review of the Sponsor's comments, appropriate changes will be made and two hard copies and one electronic copy of a signed, final report will be issued. (Additional copies will be provided at additional cost). The report will minimally include:

Compliance Statement (including Sponsor signature line)
Quality Assurance Statement
Summary

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Introduction
Experimental Design
Materials and Methods
Discussion of Study Results
Conclusion (including NOAEL statement, if applicable)
Tables of Exposure Data
Mortality Data
Individual animal termination history
Summary of daily animal observations (as appropriate)
Summary of weekly physical examination data
Tables of mean and individual body weights
Tables of mean and individual feed consumption
Tables of mean and individual organ weights, organ/brain
and organ/body weight ratios
Individual and summary tables of macroscopic pathology findings
Individual and summary tables of number of implantation sites
Individual and summary tables of number of corpora lutea
Individual and summary tables of pre- and post-implantation loss
Individual and summary tables of number of pups per litter
Individual and summary tables of number of male and female pups
Individual and summary tables of litter mean pup weight
Appendix of analytical results
References for experimental methodology
Senior personnel participating in the study
Copy of study protocol and associated amendments

12. REGULATORY REFERENCES

12.1. TESTING GUIDELINES

This study is not designed to meet regulatory requirements. It is designed to assess the toxicity of the test substance in order to determine appropriate exposure levels for a subsequent 13-Week Inhalation Study 03-6141 and a Developmental Inhalation Study 03-4253. The studies are intended to be used by the Petroleum HPV Testing Group in the EPA HPV Challenge Program.

12.2. GOOD LABORATORY PRACTICES

This study will be conducted in compliance with Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

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12.3. ANIMAL WELFARE ACT COMPLIANCE

This study will comply with all appropriate parts of the Animal Welfare Act Regulations: 9 CFR Parts 1 and 2 Final Rules, Federal Register, Volume 54, No. 168, August 31, 1989, pp. 36112-36163 effective October 30, 1989 and 9 CFR Part 3 Animal Welfare Standards; Final Rule, Federal Register, Volume 56, No. 32, February 15, 1991, pp. 6426-6505 effective March 18, 1991. The Sponsor should make particular note of the following:

1. The Sponsor's signature on this protocol documents that, for the study described, there are no generally accepted non-animal alternatives and the study does not unnecessarily duplicate previous experiments in regard to species, test substance, route of administration or duration of treatment.
2. All procedures used in this study have been designed to avoid discomfort, distress and pain to the animals. All methods are described in this study protocol or written laboratory standard operating procedures.
3. Any procedures outlined in this study which cause more than momentary or slight pain or distress to the animals will be performed with appropriate sedatives, analgesics or anesthetics unless the withholding of these agents is justified for scientific reasons, in writing by the Sponsor and the Study Director, in which case the procedure will continue for the minimum time necessary. Documentation of the justification for withholding treatment for pain or distress and IACUC approval of the procedures will be made prior to study initiation on the IACUC Protocol Review Form.
4. Animals experiencing more than momentary or slight pain or distress due to test substance or injury or illness will be treated by the Testing Facility's veterinary staff with approved analgesics or agents to relieve pain after consultation with the Study Director and Sponsor. However, in emergency situations, the veterinary staff is authorized to administer emergency treatment as necessary. Any subsequent treatment or euthanasia will be administered after consultation with the Study Director. The Sponsor will be advised by the Study Director of all emergency situations in as timely a manner as possible.
5. Methods of euthanasia used during this study are in conformance with the above-referenced regulations.

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12.4. INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

The IACUC Protocol Review Subcommittee has reviewed this protocol and found it to be in compliance with all appropriate regulations.

13. QUALITY ASSURANCE MONITORING

The Huntingdon Life Sciences Quality Assurance Unit will monitor the facilities, equipment, personnel, methods, practices, records and controls used in this study to assure that they are in conformance with this protocol, company SOPs, and the appropriate Good Laboratory Practice requirements.

14. ALTERATION IN STUDY DESIGN

Alterations of this protocol may be made as the study progresses. No changes in the protocol will be made without the consent of the Sponsor. In the event that the Sponsor authorizes a protocol change verbally, such changes will be honored by the Testing Facility and will be followed by a written verification. All protocol modifications will be signed by the Study Director and a Sponsor representative. Any modifications potentially affecting animal welfare will also be signed by 2 members of the Institutional Animal Care and Use Committee prior to the modification's implementation.

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APPENDIX A

Tissues Preserved for Males

Tissue	Preserved
adrenal gland	X
aorta (thoracic)	X
bone (sternum/femur)	X
bone marrow (rib) ^a	X
brain (medulla/pons, cerebrum and cerebellum)	X
epididymides	X
esophagus	X
eyes (with optic nerves)	X
heart	X
kidneys	X
large intestine (cecum, colon, and rectum)	X
lacrimal gland	X
larynx	X
liver	X
lungs (with mainstem bronchi)	X
lymph nodes (mediastinal and mesenteric)	X
mammary gland	X
muscle (biceps femoris)	X
nasopharyngeal tissue	X
nerve (sciatic)	X
pancreas	X
pituitary	X

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Tissue	Preserved
prostate	X
salivary gland with submandibular lymph node	X
seminal vesicles	X
skin	X
small intestine (duodenum, jejunum, ileum)	X
spinal cord (cervical, thoracic, lumbar)	X
spleen	X
stomach	X
testes	X
thymic region	X
thyroid (with parathyroids)	X
trachea	X
uninary bladder	X
Zymbal's gland	X
gross lesions	X
target organs ^b	X

^aBone marrow smears will be prepared. They will only be evaluated (Sponsor approval, additional cost) if needed.

^bTarget organs will be designated by the Study Director, Pathologist and/or Sponsor based on experimental findings.

Protocol Amendment No. 1

Study Title: Liquified Petroleum Gas: A 2-Week Range-Finding Inhalation
Toxicity Study in the Rat via Whole-Body Exposures

Changes

1. Study Summary, page 3:

Revise: The first day of exposures will be defined as Day 0 of the study (**males**). **The first day of gestation will be defined as Day 0 of the study (females).**

2. Administration of Test Substance, page 5:

Revise:The test substance will be administered as a gas/**vapor** (depending on the physical properties of the test substance) in the breathing air of the animals.....

3. Administration of Test Substance, page 5:

Revise:Each chamber will be operated at a minimum flow rate of **180** ~~200~~ liters per minute. The final airflow will be set to provide at least one air change in **5.6** ~~5-9~~ minutes (**11** ~~12~~ air changes/hour) and a T₉₉ equilibrium time of at most **26** ~~23~~ minutes.....

4. Exposure Concentration Determination, page 6:

Revise:Also, one sample (gas tight syringe) per chamber per week (**and pretest**) will be analyzed by gas chromatography (GC) to characterize at least 5 major components (comprising at least 90% by weight of the test substance) to show test substance stability and comparison between the neat test substance and the test atmospheres.

5. Animal Assignment, page 10:

Revise: Female animals considered suitable for study on the basis of pretest physical examinations will be randomized into groups **on Gestation Day 4** ~~on the day of receipt~~ using a method that ranks the Gestation Day 4 body weights and randomly assigns each female animal within the block into groups.....

6. Evaluation of Dams and Pups, page 14:

Revise: All live fetuses will be weighed as a litter (males and females **individually** ~~separately~~).....

Reasons for Changes

1. Clarification of the procedure for scheduling the males and the females on test.
2. Clarification of the physical property of the test substance.

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Protocol Amendment No. 1

3. Clarification of the chamber operating conditions to reflect the recalibration of the airflows during the study.
4. Clarification that a GC assay was also conduct pretest.
5. Clarification of the day of randomization of the test animals.
6. Clarification that the individual pups were weighed.

Amendment approved by:

[Redacted Signature]

[Redacted Signature]

[Redacted Signature]

[Redacted Signature]

8/2/09
Date

9/2/2009
Date

	Testing Facility Personnel	Appendix T
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TITLE/DEPARTMENT	NAME/DEGREE
SENIOR VICE PRESIDENT, SAFETY ASSESSMENT	
DIRECTOR REPRODUCTIVE AND DEVELOPMENTAL TOXICOLOGY	
DIRECTOR, ANALYTICAL SERVICES	
DIRECTOR, TOXICOLOGY OPERATIONS	
DIRECTOR, QUALITY ASSURANCE	
STUDY DIRECTOR	
STUDY MONITOR	
VETERINARIAN	
MANAGER/SUPERVISOR	
Rodent and Reproductive Toxicology Inhalation Toxicology Pharmacy Analytical Services Necropsy and Fetal Pathology	

	Report Amendments	Appendix U
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There are no amendments for this report at this time.

	Testing Facility Personnel	Appendix CC
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TITLE/DEPARTMENT	NAME/DEGREE
SENIOR VICE PRESIDENT, SAFETY ASSESSMENT	
DIRECTOR, REPRODUCTIVE AND DEVELOPMENTAL TOXICOLOGY	
DIRECTOR, ANALYTICAL SERVICES	
DIRECTOR, TOXICOLOGY OPERATIONS	
DIRECTOR, QUALITY ASSURANCE	
STUDY DIRECTOR	
PATHOLOGIST	
STUDY MONITORS	
VETERINARIAN	
MANAGER/SUPERVISOR	
Reproductive Toxicology Inhalation Toxicology Pharmacy Analytical Services Clinical Pathology	
Necropsy and Fetal Pathology Post In-Life Division	
SUBCONTRACTORS	
OPHTHALMOLOGY	

	Report Amendments	Appendix DD
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There are no amendments for this report at this time.