### **Data Requirement**

EPA OPPTS 870.3650 OECD 422

STUDY NO. 03-4242

BUTANE: COMBINED REPEATED-EXPOSURE TOXICITY WITH

### REPRODUCTION/DEVELOPMENTAL TOXICITY AND

### NEUROTOXICITY SCREENING IN RATS VIA

### WHOLE-BODY INHALATION EXPOSURES

### **Amended Final Report**

VOLUME II of III

Performed by: Huntingdon Life Sciences (HLS)

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1220 L Street, Northwest

Washington, D.C. 20005-4070

Date:

15 August 2008

Amended Date:

14 May 2010

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Individual Animal Gross and	
Microscopic Observations	
Main Study	
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### Key to Abbreviations

LN

= Lymph Node

=

Oviducts/Fallop

Oviducts/Fallopian Tubes

SC

Spinal Cord

### Corresponding exposure levels for each group were as follows:

Group 1 - 0 ppm Group 2 - 900 ppm Group 3 - 3000 ppm Group 4 - 9000 ppm

#### **Notes**

- 1. Unless otherwise specified in a histopathology note, the organ/tissue examined was the required (routine) section. (This note is always presented)
- 2. The dimensions of gross lesions are presented as a general range based on the actual dimensions noted during macroscopic examinations. The actual dimensions of gross lesions can be found in the raw data.

PHASE DAY OF DEATH		SEX: Male PHASE: Dosing phase	ANIMAL: 1030 GROUP: 1
Tissue		Microscopic Observations/Comments	
	No gross observations on tissue.	SUBCHONDRAL/SUBFIBROUS BONE: FIBROUS (FOcal, Moderate.	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		PERIPORTAL MONONUCLEAR CELL AGGREGATES Multifocal, Minimal.	3,
Mesenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Slight	÷.
		SINUS HISTIOCYTES, Moderate.	
		RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Slight.	1
Mediastinal LN .	No gross observations on tissue.	HEMORRHAGE, Focal, Moderate.	
		FOLLICULAR LYMPHOID ACTIVITY, Minimal	
		PARACORTICAL LYMPHOID ACTIVITY, Modera	ite.
		SINUS HISTIOCYTES, Moderate.	
Lungs	No gross observations on tissue.	ARTERIAL MEDIAL HYPERTROPHY, Multifoca	11,
		PERIVASCULAR/SUBPLEURAL MICROGRANULOMA Multifocal, Minimal.	Δ,

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

PHASE DAY OF D	ATUS: Final phase sacrifice EATH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1030 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Lungs . ;		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	
Thymus	No gross observations on tissue.	HEMORRHAGE, Minimal.	
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Slight.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Cecum	Colon	Duodenum
Epididymides	Heart	Ileum	Jejunum	Kidneys
Mammary-protocol	Tibial Nerve	Prostate	Parathyroid	Rectum/Low Colon
Cervical SC	Thoracic SC	Lumbar SC	Skin-protocol	Spleen
Stomach	Seminal vesicles	Testes	Thyroid	Urinary bladder

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1031 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comment	s
Adrenal Glands No gross observations on tissu		
Brain No gross observations on tissu	e.  HEMORRHAGE, Focal, Minimal.	
Tibia No gross observations on tissu	e. Tissue is unremarkable (with co	mment).
	- ONLY FRAGMENT OF TIBIA PRESEN	T.
Ileum No gross observations on tissu	e. Tissue is missing.	•
	- Tissue was trimmed in histolo not found on microscopic slide. improvement.	<b></b>
Kidneys No gross observations on tissu	e. INTERSTITIAL MONONUCLEAR CELL A BILATERAL, Multifocal, Minimal.	GGREGATES,
Liver No gross observations on tissu	e. PERIPORTAL MONONUCLEAR CELL AGG Multifocal, Minimal.	REGATES,
	- SINGLE MODERATE FOCUS OF SUBACUTE/CHRONIC INFLAMMATORY C INFILTRATE	ELL .
Mesenteric LN No gross observations on tissu	e. FOLLICULAR LYMPHOID ACTIVITY, M	inimal.
	PARACORTICAL LYMPHOID ACTIVITY,	Minimal.
	SINUS HISTIOCYTES, Moderate.	•

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Male ANIMAL: 1031 PHASE: Dosing phase GROUP: 1		
issue Gross Observations/Comments	Microscopic Observations/Comments		
lesenteric LN	RETICULOENDOTHELIAL CELL: GOLDEN- PIGMENT, Minimal.		
	FREE ERYTHROCYTES/ERYTRHOPHAGOCYT Multifocal, Minimal.	osis,	
ediastinal LN No gross observations on tissue.			
	HEMORRHAGE, Focal, Moderate.		
	FOLLICULAR LYMPHOID ACTIVITY, Sli	ght.	
	PARACORTICAL LYMPHOID ACTIVITY, S	light.	
	SINUS HISTIOCYTES, Moderate.		
	FREE ERYTHROCYTES/ERYTHROPHAGOCYTMULtifocal, Minimal.	osis,	
	SINUS EDEMA, Minimal.		
ungs No gross observations on tissue.			
	HEMORRHAGE/CONGESTION/EDEMA, Mult Slight.	ifocal,	
	ARTERIAL MEDIAL HYPERTROPHY, Mult. Minimal.	ifocal,	
	PERIVASCULAR/SUBPLEURAL MICROGRAN Multifocal, Minimal.	ULOMA,	
	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal.	s/golden	
	VASCULAR MINERALIZATION, Multifoca	al,	

# Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATE	US: Final phase sacrifice TH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1031 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Parathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.	
Stomach	No gross observations on tissue.	DILATED GLANDS, Multifocal, Minimal.	
Testes	No gross observations on tissue.	TUBULAR CELLULAR DEGENERATION/NECROS BILATERAL, Multifocal, Slight.	IS,
Thyroid	No gross observations on tissue.	One-of-pair missing. HEMORRHAGE/CONGESTION, Minimal.	
Thymus	No gross observations on tissue.	HEMORRHAGE, Minimal.	
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifocal, Mo	derate.
		SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMA CELL INFILTRATE, Multifocal, Minimal	
		SUBMUCOSAL FIBROUS/CART EMBOLUS, Foc Minimal.	al,

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Sternal Marrow Femoral Marrow Tibial Marrow Sternum Femur

٠,

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

\_\_\_\_\_\_

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1031 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 1

Tissue Gross Observations/Comments Microscopic Observations/Comments

1188de Gloss Observacions/comments .Firetoscopic Observacions/comments

Cecum Colon Duodenum Epididymides Heart
Jejunum Mammary-protocol Tibial Nerve Prostate Rectum/Low Colon

Jejunum Mammary-protocol Tibial Nerve Prostate Rectum/Low C Cervical SC Thoracic SC Lumbar SC Skin-protocol Spleen

Seminal vesicles Urinary bladder

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Male ANIMAL: 1032 PHASE: Dosing phase GROUP: 1		
Tissue	Gross Observations/Comments	Microscopic Observations/Comments		
Tibia	No gross observations on tissue.	SUBCHONDRAL/SUBFIBROUS BONE: FIB		
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATERA Multifocal, Minimal.	<b>ऑ</b> .,	
iver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CE FOCUS/FOCI, Multifocal, Minimal.		
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, MU Minimal.	ultifocal,	
		PERIPORTAL MONONUCLEAR CELL AGGR Multifocal, Minimal.	REGATES,	
esenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, SI	light.	
		PARACORTICAL LYMPHOID ACTIVITY,	Marked.	
		SINUS HISTIOCYTES, Multifocal, S	Flight.	
		SINUS EDEMA, Multifocal, Minimal	· ·	
•		FREE ERYTHROCYTES/ERYTRHOPHAGOCY Focal, Minimal.	TOSIS,	
		MEDULLARY PLASMACYTOSIS, Slight.		

25-Apr-06; 14:06

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

\_\_\_\_\_\_ STATUS: Final phase sacrifice SEX: Male ANIMAL: 1032 PHASE: Dosing phase PHASE DAY OF DEATH: 30 GROUP: 1 Gross Observations/Comments Microscopic Observations/Comments

Mediastinal LN . . . . No gross observations on tissue.

FOLLICULAR LYMPHOID ACTIVITY, Minimal.

PARACORTICAL LYMPHOID ACTIVITY, Marked.

FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight.

SINUS EDEMA, Multifocal, Minimal.

MEDULLARY PLASMACYTOSIS, Slight.

Multifocal, Minimal.

Discolored, All lobes, Red, Foci, </= 0.1

Examined; 3 correlations found: HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Slight. SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI,

ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Slight.

PERIVASCULAR/SUBPLEURAL MICROGRANULOMA, Multifocal, Minimal.

ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES. Multifocal, Minimal.

PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: PHASE DAY OF DEATH:	Final phase sacrifice 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1032 GROUP: 1
	Gross Observations/Comments	Microscopic Observations/Comments	
Lungs		VASCULAR MINERALIZATION, Multifocal, Minimal	
Parathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.	
Spleen	. No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Multifoca	1,
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifocal, Sligh	ε.
,		SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATOR CELL INFLITRATE, Multifocal, Minimal.	r
Urinary bladder	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- SEMINAL FLUID MATERIAL PRESENT.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Cecum	Colon	Duodenum
Epididymides	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Prostate	Rectum/Low Colon	Cervical SC	Thoracic SC

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1032

PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 1

Tissue Gross Observations/Comments Microscopic Observations/Comments

Lumbar SC Skin-protocol Stomach Seminal vesicles Testes

Thyroid Thymus

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

	ATUS: Final phase sacrifice	SEX: Male PHASE: Dosing phase	ANIMAL: 1033 GROUP: 1
	Gross Observations/Comments		
	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifo Minimal.	ocal,
Mesenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Marked.	
		PARACORTICAL LYMPHOID ACTIVITY, Moder	rate.
		SINUS HISTIOCYTES, Multifocal, Slight	: <b>.</b>
		SINUS EDEMA, Multifocal, Slight.	
		FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS Multifocal, Moderate.	<b>;</b> ,
,		MEDULLARY PLASMACYTOSIS, Minimal.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal	Ļ
		PARACORTICAL LYMPHOID ACTIVITY, Sligh	nt.
		SINUS HISTIOCYTES, Slight.	
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS Multifocal, Slight.	
iungs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, Multifoo	cal,

Slight.

25-Apr-06; 14:06

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Main Study Animals

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1033 GROUP: 1
Fissue Gross Observations/Comments		nts
ungs	ARTERIAL MEDIAL HYPERTROPHY, : Moderate.	Multifocal,
	PERIVASCULAR/PERIALVEOLAR SUBINFLAMMATORY CELL FOCI, MultiMinimal.	
	PERIVASCULAR/SUBPLEURAL MICRO Multifocal, Minimal.	GRANULOMA,
	ALVEOLAR/INTRAALVEOLAR MACROP BROWN PIGMENT-LADEN MACROPHAG Multifocal, Minimal.	
	PERIBRONCHIAL/PERIVASCULAR LY AGGREGATES, Multifocal, Sligh	
	VASCULAR MINERALIZATION, Mult Minimal.	ifocal,
ammary-protocol No gross observations on tiss	ue. PROMINENT LUMINAL EOSINOPHILI SECRETIONS, Present.	C/BASOPHILIC
	ACINAR EPITHELIAL VACUOLAR CH Moderate.	ANGE,
ancreas No gross observations on tiss	ue. ISLETS: MONONUCLEAR CELL INFL INFILTRATE, Focal, Slight.	AMMATORY
rostate No gross observations on tiss	ue. LUMINAL CELLULAR DEBRIS, Mult Minimal.	ifocal,
	INTERSTITIAL SUBACUTE/CHRONIC CELL INFILTRATE, Multifocal,	

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

SEX: Male ANIMAL: 1033 STATUS: Final phase sacrifice PHASE: Dosing phase PHASE DAY OF DEATH: 30 Gross Observations/Comments Microscopic Observations/Comments Tissue is unremarkable; one-of-pair Parathyroid . . . . . No gross observations on tissue. missing. Spleen . . . . . . . No gross observations on tissue. GOLDEN-BROWN PIGMENT, Minimal. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal. CAPSULE FIBROSIS, Multifocal, Slight. Stomach . . . . . . . No gross observations on tissue. DILATED GLANDS, Focal, Minimal. Thyroid . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION, Minimal. Trachea . . . . . . . . No gross observations on tissue. GLANDULAR DILATATION, Slight.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum ·	Colon
Duodenum	Epididymides	Heart	Ileum	Jejunum
Kidneys	Tibial Nerve	Rectum/Low Colon	Cervical SC	Thoracic SC

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1033

PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 1

Tissue Gross Observations/Comments Microscopic Observations/Comments

Lumbar SC Skin-protocol Seminal vesicles Testes Thymus

Urinary bladder

PHASE DAY OF DE		SEX: Male ANIMAL: 103 PHASE: Dosing phase GROUP: 1	34	
Tissue	Gross Observations/Comments	Microscopic Observations/Comments		
Tibia No gross observations on tissue.		SUBCHONDRAL/SUBFIBROUS BONE: FIBROUS CYST, Multifocal, Moderate.		
		- ONLY FRAGMENT OF TIBLA PRESENT.		
iver	No gross observations on tissue.	HEPATOCELLULAR NECROSIS/HEMORRHAGE, Multifocal, Slight.		
		SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Slight.		
		PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.		
		SUBCAPSULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Slight.		
esenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.		
		PARACORTICAL LYMPHOID ACTIVITY, Moderate.		
		SINUS HISTIOCYTES, Multifocal, Slight.		
	•	SINUS EDEMA, Multifocal, Slight.		
		MEDULLARY PLASMACYTOSIS, Slight.		
ediastinal LN	No gross observations on tissue.	HEMORRHAGE, Moderate.		
·		FOLLICULAR LYMPHOID ACTIVITY, Minimal.		
		PARACORTICAL LYMPHOID ACTIVITY, Slight.		

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

ANIMAL: 10

PHASE DAY OF DEATH: 30

PHASE: Dosing phase

GROUP: 1

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Mediastinal LN . . . .

SINUS HISTIOCYTES, Multifocal, Slight.

FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Moderate.

SINUS EDEMA, Multifocal, Slight.

MEDULLARY PLASMACYTOSIS, Slight.

Lungs .

Discolored, All lobes, Red, Foci, 0.2 - 0.5

cm, Moderate

Examined; 2 correlations found:
HEMORRHAGE/CONGESTION/EDEMA, Multifocal,
Moderate.
PERIVASCULAR/PERIALVEOLAR
SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI,
Multifocal, Slight.

SUBPLEURAL HEMORRHAGE/SUBACUTE .
INFLAMMATION/FIBROSIS, Multifocal,
Minimal.

ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Slight.

ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Moderate.

PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.

VASCULAR MINERALIZATION, Multifocal, Minimal.

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Male PHASE: Dosing phase	ANIMAL: 1034 GROUP: 1
Tissue _	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/BA SECRETIONS, Multifocal, Present.	SOPHILIC
Prostate	No gross observations on tissue.	INTERSTITIAL SUBACUTE/CHRONIC INF	
Parathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pa missing.	ir
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Mul	tifocal,
Thymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Slight.	
Frachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifocal,	Slight.
		SUBMUCOSAL SUBACUTE/CHRONIC INFLA	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain

Urinary bladder

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 30 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Sternum Femur Cecum Colon Duodenum Heart Epididymides Ileum Jejunum Kidneys Tibial Nerve Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Seminal vesicles Testes Thyroid

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Male PHASE: Dosing phase	ANIMAL: 1035 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	PROMINENT LARGE SUBCHONDRAL ARTERIES Multifocal, Marked.	,
Kidneys	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL AGGREGAUNILATERAL, Focal, Slight.	ATES,
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifo	ocal,
		PERIPORTAL MONONUCLEAR CELL AGGREGATI Multifocal, Minimal.	es,
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight	
	•	PARACORTICAL LYMPHOID ACTIVITY, Modes	rate.
•		SINUS HISTIOCYTES, Minimal.	
		SINUS EDEMA, Multifocal, Slight.	
		MEDULLARY PLASMACYTOSIS, Minimal.	
Mediastinal LN	No gross observations on tissue.	HEMORRHAGE, Slight.	
		FOLLICULAR LYMPHOID ACTIVITY, Minimal	ι.
		PARACORTICAL LYMPHOID ACTIVITY, Marke	ed.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations			
PHASE DAY OF DEA	US: Final phase sacrifice UTH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1035 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Mediastinal LN		SINUS HISTIOCYTES, Minimal.	
		SINUS EDEMA, Multifocal, Minimal.	
		MEDULLARY PLASMACYTOSIS, Moderate.	•
Lungs			
	Discolored, All lobes, Red, Foci, = 0.1 cm, Moderate</td <td>Examined; 2 correlations found: HEMORRHAGE/CONGESTION/EDEMA, Multifoca Slight. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOO Multifocal, Minimal.</td> <td></td>	Examined; 2 correlations found: HEMORRHAGE/CONGESTION/EDEMA, Multifoca Slight. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOO Multifocal, Minimal.	
		SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.	
		ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Slight.	
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDE BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	EN
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.	
		VASCULAR MINERALIZATION, Multifocal, Minimal.	
Prostate	No gross observations on tissue.	INTERSTITIAL SUBACUTE/CHRONIC INFLAMMATO CELL INFILTRATE, Multifocal, Slight.	DRY

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 1035 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comment	ts
Spleen No gross observations on tissue.	. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.	
Testes No gross observations on tissue.	Tissue is unremarkable (with co	omment).
	- BILATERAL ARTIFACTUAL RUPTUR	E OF TUNICA.
Trachea No gross observations on tissue.	GLANDULAR DILATATION, Multifoca	al, Slight.
	SUBMUCOSAL SUBACUTE/CHRONIC IN CELL INFILTRATE, Multifocal, M:	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Cecum	Colon	Duodenum
Epididymides	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Parathyroid	Rectum/Low Colon	Cervical SC	Thoracic SC
Lumbar SC	Skin-protocol	Stomach	Seminal vesicles	Thyroid
Thymus	Urinary bladder			•

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

\_ STATUS: Final phase sacrifice SEX: Male ANIMAL: 1036 PHASE: Dosing phase PHASE DAY OF DEATH: 31 GROUP: 1 Gross Observations/Comments Microscopic Observations/Comments Kidneys . . . . . . . No gross observations on tissue. CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATERAL, Minimal. Liver . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. PERIPORTAL MICROGRANULOMA, Focal, Moderate. Mesenteric LN . . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Moderate. PARACORTICAL LYMPHOID ACTIVITY, Slight. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Slight. Mediastinal LN . . . . No gross observations on tissue. HEMORRHAGE, Slight. FOLLICULAR LYMPHOID ACTIVITY, Minimal.

PARACORTICAL LYMPHOID ACTIVITY, Minimal.

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Main Study Animals

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1036 GROUP: 1
	Gross Observations/Comments	Microscopic Observations/Comment	s
		SINUS HISTIOCYTES, Multifocal, I	Minimal.
		FREE ERYTHROCYTES/ERYTHROPHAGOC Multifocal, Slight.	YTOSIS,
		SINUS EDEMA, Multifocal, Slight	
		MEDULLARY PLASMACYTOSIS, Minima	1.
lungs	No gross observations on tissue.	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifoc	al, Slight.
		ARTERIAL MEDIAL HYPERTROPHY, Mu. Minimal.	ltifocal,
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES Multifocal, Minimal.	
		PERIBRONCHIAL/PERIVASCULAR LYMPI AGGREGATES, Multifocal, Slight.	
	·	VASCULAR MINERALIZATION, Multiforminal.	ocal,
ammary-protoco	ol No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/	BASOPHILIC
pleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, M	ultifocal,

Duodenum

Testes

Tibial Nerve

Thoracic SC

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1036 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Thyroid . . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION, Multifocal, Minimal. Trachea . . . . . . . No gross observations on tissue. GLANDULAR DILATATION, Multifocal, Moderate. SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY

Tibial Marrow

Cecum

Ileum

Stomach

Tissues without comment under Gross Observations were within normal limits at necropsy.

The following tissues were unremarkable microscopically: Adrenal Glands Sternal Marrow Femoral Marrow Sternum Femur Tibia

> Epididymides Heart Prostate Parathyroid Lumbar SC Thymus.

Skin-protocol Urinary bladder

Jejunum Rectum/Low Colon Cervical SC

Brain

Colon

Seminal vesicles

CELL INFILTRATE, Multifocal, Minimal.

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1037 GROUP: 1	
	Gross Observations/Comments	Microscopic Observations/Comments		
	No gross observations on tissue.	CONGESTION/HEMORRHAGE, Minimal:		
Colon	No gross observations on tissue.	CONGESTION/HEMORRHAGE, Minimal.		
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR BPITHELIUM-BASOPHILIC, UNILATERAL, Multifocal, Minimal.		
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.		
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal Minimal.	.,	
		PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.		
•		PERIPORTAL MICROGRANULOMA, Focal, Slight	:.	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.		
		PARACORTICAL LYMPHOID ACTIVITY, Marked.		
		SINUS HISTIOCYTES, Multifocal, Slight.		
		MEDULLARY PLASMACYTOSIS, Minimal.		
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal.		

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1037 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Commen	
Mediastinal LN		PARACORTICAL LYMPHOID ACTIVITY	, Marked.
		SINUS HISTIOCYTES, Multifocal,	Minimal.
		FREE ERYTHROCYTES/ERYTHROPHAGO Multifocal, Minimal.	CYTOSIS,
		SINUS EDEMA, Focal, Slight.	
		MEDULLARY PLASMACYTOSIS, Sligh	ıt.
	Discolored, All lobes, Red, Foci, </td <td>= 0.1 Examined; 2 correlations found HEMORRHAGE/CONGESTION/EDEMA, Slight. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATOR Multifocal, Minimal.</td> <td>Multifocal,</td>	= 0.1 Examined; 2 correlations found HEMORRHAGE/CONGESTION/EDEMA, Slight. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATOR Multifocal, Minimal.	Multifocal,
•	•	ARTERIAL MEDIAL HYPERTROPHY, Minimal.	ultifocal,
		ALVEOLAR/INTRAALVEOLAR MACROPE BROWN PIGMENT-LADEN MACROPHAGE Multifocal, Minimal.	•
		PERIBRONCHIAL/PERIVASCULAR LYM AGGREGATES, Multifocal, Minima	
		VASCULAR MINERALIZATION, Multi	focal,

- EXTRA-PLEURAL TISSUE: HEMORRHAGE WITH

DEGENERATION/NECROSIS.

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1037 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Mammary-protoco	l No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC SECRETIONS, Present.	
Prostate	No gross observations on tissue.	INTERSTITIAL SUBACUTE/CHRONIC INFLAMM CELL INFILTRATE, Multifocal, Slight.	ATORY
Rectum/Low Colo	on No gross observations on tissue.	CONGESTION/HEMORRHAGE, Minimal.	
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, Min	imal.
		EXTRAMEDULLARY HEMATOPOIESIS, Multiforminal.	cal,
Testes	No gross observations on tissue.	TUBULAR CELLULAR DEGENERATION/NECROSIS, UNILATERAL, Focal, Slight.	
Trachea	No gross observations on tissue.	SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATO	DRY

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1037 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Sternum Femur Tibia Duodenum Epididymides Extremity Heart Ileum Jejunum Tibial Nerve Thoracic SC Skin-protocol Parathyroid Cervical SC Lumbar SC Stomach Seminal vesicles Thyroid Thymus Urinary bladder

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1038 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Liver . . . . . . . . . No gross observations on tissue, CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. FIBROUS TAGS, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Moderate. PARACORTICAL LYMPHOID ACTIVITY, Moderate. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Minimal. Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Slight. PARACORTICAL LYMPHOID ACTIVITY, Slight. SINUS HISTIOCYTES, Multifocal, Slight. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Focal, Slight. MEDULLARY PLASMACYTOSIS, Multifocal,

Slight.

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1038 GROUP: 1
<b>Tissue</b>	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifoca Minimal.	
		ARTERIAL MEDIAL HYPERTROPHY, Mu. Minimal.	tifocal,
•	· .	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, MULTIFOCAL, MINIMAL.	
		PERIBRONCHIAL/PERIVASCULAR LYMPRAGGREGATES, Multifocal, Minimal	
ammary-protoco	ol No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/I SECRETIONS, Multifocal, Present	
arathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pmissing.	pair
pleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.	
Cestes	No gross observations on tissue.	Tissue is unremarkable (with con	nment).
		- SEVERAL TUBULES ARE SLIGHTLY AUTOLYTIC/AGONAL CHANGE.	
rachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifocal	, Minimal.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1038

PHASE DAY OF DEATH: 31 PHASE: Dosing phase 

Gross Observations/Comments Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Tibia Cecum Colon Duodenum Epididymides Heart Ileum Jejunum Kidneys Tibial Nerve Prostate Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Seminal vesicles

Thyroid Thymus Urinary bladder

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Kidneys . . . . . . . No gross observations on tissue. CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATERAL, Multifocal, Minimal. INTERSTITIAL MONONUCLEAR CELL AGGREGATES. UNILATERAL, Multifocal, Minimal. Liver . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Minimal. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Moderate. Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Minimal. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Multifocal, Slight.

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Mammary-protocol . . . No gross observations on tissue.

Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS. Multifocal, Minimal. SINUS EDEMA, Multifocal, Minimal. MEDULLARY PLASMACYTOSIS, Slight. Lungs . . . . . . . . . No gross observations on tissue. SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal. PERIVASCULAR/SUBPLEURAL MICROGRANULOMA, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES. Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Moderate. VASCULAR MINERALIZATION, Multifocal, Minimal.

PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC

SECRETIONS, Present.

Thyroid

Thymus

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

PHASE DAY (	STATUS: Final OF DEATH: 31	phase sacrifice		SEX: Male PHASE: Dosing	g phase	ANIMAL: 1039 GROUP: 1
Cissue	Gro	oss Observations/C	omments	Microscopio	C Observations/Comments	
?arathyroid	1 No	gross observatio	ns on tissue.	Tissue is missing.	unremarkable; one-of-pa	air
Spleen	No	gross observatio	ns on tissue.	EXTRAMEDUI Minimal.	LLARY HEMATOPOIESIS, Mul	ltifocal,
Frachea .	No	o gross observatio	ns on tissue.	GLANDULAR	DILATATION, Multifocal,	, Moderate.
			tions were within n	normal limits at ne	ecropsy.	
		e unremarkable mic				
		Sternal Marrow		Tibial Marrow	Brain	
	cernum	Femur	Tibia	Cecum	Colon	
	ıodenum İbial Nerve	- <u>r</u>		Ileum	Jejunum	
	iblai Nerve imbar SC	Prostate Skin-protocol	•	Cervical SC		
Τí	INDAL DC	PYTII-DIOCOCOT	Scomacn	Seminal vesicles	restes	

Urinary bladder

# Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1040 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Commer	nts
	No gross observations on tissue.		comment),
		- ILEUM IS VOID OF PEYER'S PAT	THCHES.
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATE Minimal.	BRAL, Focal,
		INTERSTITIAL MONONUCLEAR CELL BILATERAL, Minimal.	AGGREGATES,
		- CORTICAL TUBULAR NECROSIS/AUTOLYSIS/AGONAL CHAN	NGE
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Multifocal, Minima	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Minimal.	
		PERIPORTAL MONONUCLEAR CELL AG Multifocal, Minimal.	egregates,
		SUBCAPSULAR SUBACUTE/CHRONIC I CELL INFILTRATE, Multifocal, M	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Marked.
		PARACORTICAL LYMPHOID ACTIVITY	/, Moderate.
		SINUS HISTIOCYTES, Multifocal,	Moderate.

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1040 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Mesenteric LN . . . . SINUS EDEMA, Focal, Slight. FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS, Minimal. MEDULLARY PLASMACYTOSIS, Minimal. Mediastinal LN . . . . No gross observations on tissue. HEMORRHAGE, Focal, Moderate. FOLLICULAR LYMPHOID ACTIVITY, Minimal. PARACORTICAL LYMPHOID ACTIVITY, Minimal. SINUS HISTIOCYTES, Multifocal, Slight. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Slight. Lungs . . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Minimal. SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal,

Minimal.

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		PHASE: Dosing phase	ANIMAL: 1040 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Lungs		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOI BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.	
		VASCULAR MINERALIZATION, Multifocal, Minimal.	
Mammary-protoco	l No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/BASOPHI SECRETIONS, Present.	LIC
Prostate No gross observations on tissue.		INTERSTITIAL SUBACUTE/CHRONIC INFLAMMACELL INFILTRATE, Multifocal, Minimal.	ATORY
Parathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.	
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Minimal.	
		CAPSULE FIBROSIS, Focal, Slight.	
Frachea	No gross observations on tissue.	GLANDULAR DILATATION, Slight.	
Jrinary bladder	No gross observations on tissue.	MINERAL DEPOSIT, Focal, Minimal.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 1040
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 1
Tissue Gross Observations/Comments Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Tibia Cecum Colon Duodenum Epididymides Heart Jejunum Tibial Nerve Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Seminal vesicles Testes Thyroid Thymus

# Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1041 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Ileum		Tissue is unremarkable.	·
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CEL FOCUS/FOCI, Multifocal, Minimal.	L
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Mul Minimal.	tifocal,
		PERIPORTAL MONONUCLEAR CELL AGGRE Multifocal, Minimal.	gates,
Mesenteric LN .	No gross observations on tissue.		
		FOLLICULAR LYMPHOID ACTIVITY, Mod	
		SINUS HISTIOCYTES, Multifocal, Sl	ight.
		FREE ERYTHROCYTES/ERYTRHOPHAGOCYT	osis,
		MEDULLARY PLASMACYTOSIS, Multifoc Slight.	al,
Mediastinal LN	No gross observations on tissue.		
		FOLLICULAR LYMPHOID ACTIVITY, Min	imal.
		PARACORTICAL LYMPHOID ACTIVITY, M	inimal.
		SINUS HISTIOCYTES, Multifocal, Sl	ight.
		FREE ERYTHROCYTES/ERYTHROPHAGOCYT	osis,

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . MEDULLARY PLASMACYTOSIS, Multifocal, Slight. Lungs . . . . . . . . No gross observations on tissue. SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES. Multifocal, Slight. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal. VASCULAR MINERALIZATION, Multifocal, Minimal. Parathyroid . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Skin-protocol . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Focal, Minimal. Spleen . . . . . . . No gross observations on tissue. GOLDEN-BROWN PIGMENT, Multifocal, Minimal. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

. Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 1041 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Testes	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- SEVERAL TUBULES ARE SLIGHTLY AUTOLYTIC/AGONAL CHANGE.	
Thymus	No gross observations on tissue.	HEMORRHAGE, Focal, Minimal.	
Trachea	No gross observations on tissue.	SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal.	•
Urinary bladder	No gross observations on tissue.	LUMENAL DISTENSION, Marked.	
		- MUCOSAL EPITHELIUM IS PARTIALLY MARKED ATTENUATED FROM LUMENAL DISTENSION.	LY

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Epididymides	Heart	Jejunum	Kidneys
Mammary-protocol	Tibial Nerve	Prostate	Rectum/Low Colon	Cervical SC
Thoracic SC	Lumbar SC	Stomach	Seminal vesicles	Thyroid

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 2031
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 2
Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE DAY OF DEATH: 30

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, 0.2 - 0.5

cm, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male
PHASE DAY OF DEATH: 30

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, </= 0.1
cm, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

\_\_\_\_\_

STATUS: Final phase sacrifice SEX: Male ANIMAL: 2034
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 2035

PHASE DAY OF DEATH: 30 PHASE: Dosing phase

Gross Observations/Comments Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, </= 0.1 cm, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male
PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, 0.2 - 0.5
cm, Slight

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

No tissues examined.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 2
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, 0.2 - 0.5 cm, Slight

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

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STATUS: Final phase sacrifice SEX: Male ANIMAL: 2040
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

Fracture, Shaft, Severe

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male
PHASE DAY OF DEATH: 30
PHASE: Dosing phase

GROUP: 3

Tissue
Gross Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, 0.2 - 0.5 cm, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male
PHASE DAY OF DEATH: 30
PHASE: Dosing phase
GROUP: 3

Tissue
Gross Observations/Comments
Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, </= 0.1 cm, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 3032

PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male
PHASE DAY OF DEATH: 30
PHASE: Dosing phase
GROUP: 3

Tissue
Gross Observations/Comments
Microscopic Observations/Comments

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

Discolored, All lobes, Red, Foci, </= 0.1 cm, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 3035
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

. Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 3036
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

SEX: Male

STATUS: Final phase sacrifice

ANIMAL: 3037

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

Tissue

Gross Observations/Comments

Microscopic Observations/Comments \_\_\_\_\_\_

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 3

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, 0.2 - 0.5

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

No tissues examined.

cm, Slight

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 3039
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 3040
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 3

Fissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 3

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Foci, </= 0.1 cm, Slight

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 30 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Femur . . . . . . . . No gross observations on tissue, EPIPHYSEAL CARTILAGINOUS ISLAND(S), Focal, Slight. Liver . . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Slight. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Slight. FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS, Multifocal, Minimal. MEDULLARY PLASMACYTOSIS, Moderate. Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Minimal.

PARACORTICAL LYMPHOID ACTIVITY, Moderate.

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	PHASE: Dosing phase GROU	L: 4030 JP: 4
Tissue Gross Observations/Comments	Microscopic Observations/Comments	
Mediastinal LN	SINUS HISTIOCYTES, Multifocal, Minimal.	
	FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal.	
	SINUS EDEMA, Multifocal, Slight.	
Lungs No gross observations on tissue.		
	ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Slight.	
	PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal.	
•	ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	
	PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal.	
	VASCULAR MINERALIZATION, Multifocal, Minimal.	
Mammary-protocol No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC SECRETIONS, Present.	
Prostate No gross observations on tissue.	INTERSTITIAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Moderate.	
Spleen No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.	

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4030
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4

Tissue Gross Observations/Comments Microscopic Observations/Comments

Trachea . . . . . . . No gross observations on tissue.

GLANDULAR DILATATION, Multifocal, Moderate.

- TRACHEAL EPITHELIUM: LARGE PALE EOSINOPHILIC INCLUSION BODIES.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Tibia Cecum · Colon Duodenum Epididymides Heart Ileum Jejunum Kidneys Parathyroid Rectum/Low Colon Cervical SC Tibial Nerve Thoracic SC Lumbar SC Skin-protocol Stomach Seminal vesicles Testes Thyroid Thymus Urinary bladder

# Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Male PHASE: Dosing phase	ANIMAL: 4031 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Femoral Marrow	No gross observations on tissue.	Tissue is missing.	
Tibial Marrow .	No gross observations on tissue.	Tissue is missing.	
Femur	No gross observations on tissue.	Tissue is missing.	
Fibia	No gross observations on tissue.	Tissue is missing.	
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, BILATERAL, FO Minimal.	cal,
		INTERSTITIAL MONONUCLEAR CELL AGGREG BILATERAL, Multifocal, Minimal.	ATES,
liver	No gross observations on tissue.	FIBROUS TAGS, Multifocal, Minimal.	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight	
		PARACORTICAL LYMPHOID ACTIVITY, Mode	rate.
		SINUS HISTIOCYTES, Multifocal, Sligh	t.
		SINUS EDEMA, Multifocal, Slight.	
		MEDULLARY PLASMACYTOSIS, Slight.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minima	1.
		PARACORTICAL LYMPHOID ACTIVITY, Mode	rate.
		SINUS HISTIOCYTES, Multifocal, Sligh	t.

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

•		SEX: Male PHASE: Dosing phase	ANIMAL: 4031 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	~~~~~~~~~~~~
Mediastinal LN		FREE ERYTHROCYTES/ERYTHROPHAGOCYT	osis,
Lungs	Discolored, All lobes, Red, Foci, = 0.1 cm, Moderate</td <td>Examined; 2 correlations found: PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY C Multifocal, Minimal. PERIVASCULAR/SUBPLEURAL MICROGR Multifocal, Minimal.</td> <td></td>	Examined; 2 correlations found: PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY C Multifocal, Minimal. PERIVASCULAR/SUBPLEURAL MICROGR Multifocal, Minimal.	
		ARTERIAL MEDIAL HYPERTROPHY, Mult Minimal.	ifocal,
. ·		ALVEOLAR/INTRAALVEOLAR MACROPHAGE BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	s/golden
		PERIBRONCHIAL/PERIVASCULAR LYMPHO AGGREGATES, Multifocal, Slight.	ID
		VASCULAR MINERALIZATION, Multifoc Minimal.	al,
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Mul	tifocal,
Thyroid	No gross observations on tissue.	LYMPHOID NODULE, UNILATERAL, Foca	l, Slight.
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Focal, Slig	ht.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4031
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUF: 4

Tissue Gross Observations/Comments Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Brain Sternum Cecum Colon Duodenum Epididymides Heart Ileum Jejunum Mammary-protocol Tibial Nerve Prostate Parathyroid Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Seminal vesicles Testes Stomach Thymus Urinary bladder

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4032 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4 Gross Observations/Comments Microscopic Observations/Comments Liver . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Marked. PARACORTICAL LYMPHOID ACTIVITY, Moderate. SINUS HISTIOCYTES, Multifocal, Minimal. SINUS EDEMA, Multifocal, Slight. FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS, Multifocal, Minimal. MEDULLARY PLASMACYTOSIS, Multifocal, Slight. Mediastinal LN . . . . No gross observations on tissue. HEMORRHAGE, Moderate. FOLLICULAR LYMPHOID ACTIVITY, Slight. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Multifocal, Minimal. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Moderate. MEDULLARY PLASMACYTOSIS, Multifocal,

Slight.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4032
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4

Tissue Gross Observations/Comments Microscopic Observations/Comments

Tibble Global Vacional Commences Actions Commences

Lungs , . . . . . . . No gross observations on tissue.

HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Minimal.

ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Slight.

PERIVASCULAR/SUBPLEURAL MICROGRANULOMA, Multifocal, Minimal.

PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.

VASCULAR MINERALIZATION, Multifocal, Minimal.

- OCCASSIONAL ARTERIES WITH MEDIAL HYPERTROPHY/HYPERPLASIA

Parathyroid . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair

missing.

Thymus . . . . . . . No gross observations on tissue.

HEMORRHAGE, Multifocal, Minimal.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4032 PHASE: Dosing phase PHASE DAY OF DEATH: 30 GROUP: 4

Gross Observations/Comments Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Sternum Femur Tibia Cecum Colon Duodenum Epididymides Heart Ileum Jejunum Kidneys Mammary-protocol Tibial Nerve Prostate Rectum/Low Colon

Cervical SC Thoracic SC Lumbar SC Skin-protocol Spleen

Seminal vesicles Testes Stomach Thyroid Trachea

Urinary bladder

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Main Study Animals

STATUS: Final phase sacrifice TASE DAY OF DEATH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 4033 GROUP: 4
ssue Gross Observations/Comments	Microscopic Observations/Comments	
ididymides No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL AG BILATERAL, Multifocal, Minimal.	
art No gross observations on tissue.	INFLAMMATORY CELL FOCI, Multifoc	al,
ver No gross observations on tissue.	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Mu Minimal.	ltifocal,
	PERIPORTAL MONONUCLEAR CELL AGGR Multifocal, Minimal.	EGATES,
senteric LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, SI	ight.
	PARACORTICAL LYMPHOID ACTIVITY,	Minimal.
	SINUS HISTIOCYTES, Multifocal, M	oderate,
	RETICULOENDOTHELIAL CELL: GOLDEN PIGMENT, Minimal.	-BROWN
	MEDULLARY PLASMACYTOSIS, Multifo Slight.	cal,
diastinal LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, sl	ight.
	PARACORTICAL LYMPHOID ACTIVITY,	Minimal.
	SINUS HISTIOCYTES, Multifocal, M	inimal.

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations STATUS: Final phase sacrifice SEX: Male ANIMAL: 4033 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4 Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS. Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Moderate. Lungs . . . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION/EDEMA. Multifocal. Minimal. SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Focal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight. VASCULAR MINERALIZATION, Multifocal, Minimal. Spleen . . . . . . . No gross observations on tissue. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE: Dosing phase

GROUP: 4

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Microscopic Observations/Comments

Microscopic Observations/Comments

Mononuclear Cell Aggregates, Focal, Minimal.

Trachea . . . . . No gross observations on tissue.

SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Tibia Cecum Colon Duodenum Ileum Jejunum Kidneys Mammary-protocol Tibial Nerve Prostate Rectum/Low Colon Cervical SC Parathyroid Skin-protocol Seminal vesicles Thoracic SC Lumbar SC Stomach Testes Thymus Urinary bladder

	COO.	and microscopic observations	
PHASE DAY OF DEAT	US: Final phase sacrifice TH: 30	SEX: Male PHASE: Dosing phase	ANIMAL: 4034 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	~
	No gross observations on tissue.	Tissue is unremarkable (with comm	ent).
		- ONLY PROXIMAL TIBIAL FRAGMENT P	RESENT.
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATERAL Minimal.	, Focal,
		INTERSTITIAL MONONUCLEAR CELL AGG BILATERAL, Multifocal, Minimal.	REGATES,
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CEL FOCUS/FOCI, Multifocal, Minimal.	<b>L</b>
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Mul Minimal.	tifocal,
		PERIPORTAL MONONUCLEAR CELL AGGRE Multifocal, Minimal.	GATES,
Mesenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Min	imal.
		PARACORTICAL LYMPHOID ACTIVITY, M	oderate.
		SINUS HISTIOCYTES, Multifocal, Mi	nimal.
		SINUS EDEMA, Multifocal, Slight.	
		RETICULOENDOTHELIAL CELL: GOLDEN- PIGMENT, Minimal.	BROWN
		MEDULLARY PLASMACYTOSIS, Multifoc Minimal.	al,

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4034 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4 Tissue Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Slight. PARACORTICAL LYMPHOID ACTIVITY, Minimal. SINUS HISTIOCYTES, Multifocal, Slight. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Multifocal, Minimal. Discolored, All lobes, Red, Foci, </= 0.1 Examined; 3 correlations found: cm, Moderate SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Focal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI. Multifocal, Minimal. PERIVASCULAR/SUBPLEURAL MICROGRANULOMA, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Moderate. VASCULAR MINERALIZATION, Multifocal,

Minimal.

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4034 PHASE: Dosing phase PHASE DAY OF DEATH: 30 GROUP: 4 Gross Observations/Comments Microscopic Observations/Comments Mammary-protocol . . . No gross observations on tissue. PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC SECRETIONS, Present. Parathyroid . . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Spleen . . . . . . . No gross observations on tissue. GOLDEN-BROWN PIGMENT, Multifocal, Minimal. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal. Stomach . . . . . . . . No gross observations on tissue. DILATED GLANDS, Multifocal, Minimal. Thymus . . . . . . . No gross observations on tissue. HEMORRHAGE, Focal, Minimal.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Cecum Colon Duodenum Epididymides Heart Ileum Jejunum Tibial Nerve Prostate Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Seminal vesicles Testes Thyroid Trachea

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4034
PHASE DAY OF DEATH: 30 FHASE: Dosing phase GROUP: 4

Tissue Gross Observations/Comments Microscopic Observations/Comments

Urinary bladder

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Male PHASE: Dosing phase	ANIMAL: 4035 GROUP: 4
	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, BILATERAL, Multifocal, Minimal. EOSINOPHILIC TUBULAR CASTS, UNILATERAL, Focal, Minimal.	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.  CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal Minimal.	ι,
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.  PARACORTICAL LYMPHOID ACTIVITY, Marked.	
		SINUS HISTIOCYTES, Multifocal, Moderate	
		RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Slight.	
		FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS, Multifocal, Minimal.	
		- NO DEFINITIVE GERMINAL CENTER	
Mediastinal LN	No gross observations on tissue.	Tissue is missing.	•
Lungs	No gross observations on tissue.	ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal.	

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Male PHASE: Dosing phase	ANIMAL: 4035 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comme	ents
Lungs		PERIVASCULAR/PERIALVEOLAR SUB INFLAMMATORY CELL FOCI, Multi Minimal.	BACUTE/CHRONIC
		ALVEOLAR/INTRAALVEOLAR MACROP BROWN PIGMENT-LADEN MACROPHAG Multifocal, Minimal.	• • • •
		PERIBRONCHIAL/PERIVASCULAR LY AGGREGATES, Multifocal, Minim	
		VASCULAR MINERALIZATION, Mult Minimal.	ifocal,
Prostate	No gross observations on tissue.	LUMINAL CELLULAR DEBRIS, Mult Slight.	ifocal,
		INTERSTITIAL SUBACUTE/CHRONIC CELL INFILTRATE, Multifocal,	
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS,	Minimal.
Thymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Minim	mal.
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Slight.	
		SUBMUCOSAL SUBACUTE/CHRONIC I CELL INFILTRATE, Minimal.	NFLAMMATORY

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4035

PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4

Tissue Gross Observations/Comments Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.

The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Tibia Cecum Colon Duodenum Epididymides Heart Ileum Jejunum Mammary-protocol Tibial Nerve Parathyroid Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Seminal vesicles

Testes Thyroid Urinary bladder

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 Tissue Gross Observations/Comments Microscopic Observations/Comments Kidneys . . . . . . . No gross observations on tissue. INTERSTITIAL MONONUCLEAR CELL AGGREGATES, UNILATERAL, Multifocal, Minimal. EOSINOPHILIC TUBULAR CASTS, UNILATERAL, Focal, Minimal. Liver . . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES. Multifocal, Minimal. SUBCAPSULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Focal, Minimal. FIBROUS TAGS, Focal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Minimal. PARACORTICAL LYMPHOID ACTIVITY, Moderate. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Moderate. RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Slight. FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS,

Multifocal, Minimal.

PHASE DAY OF DE	TUS: Final phase sacrifice ATH: 31	SEX: Male PHASE: Dosing phase	ANIMAL: 4036 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Commen	
Mesenteric LN .		MEDULLARY PLASMACYTOSIS, Minima	al.
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, I	Minimal.
•	,	PARACORTICAL LYMPHOID ACTIVITY	, Moderate.
		SINUS HISTIOCYTES, Multifocal,	Minimal.
	•	FREE ERYTHROCYTES/ERYTHROPHAGOOM Multifocal, Minimal.	CYTOSIS,
		SINUS EDEMA, Multifocal, Slight	t.
•		MEDULLARY PLASMACYTOSIS, Modera	ate.
Lungs	No gross observations on tissue.	ARTERIAL MEDIAL HYPERTROPHY, MI Minimal.	ultifocal,
		PERIVASCULAR/PERIALVEOLAR SUBAGE INFLAMMATORY CELL FOCI, Multiforminal.	· · · · - · · · · · · · · · · · ·
		ALVEOLAR/INTRAALVEOLAR MACROPHI BROWN PIGMENT-LADEN MACROPHAGES Multifocal, Minimal.	
		PERIBRONCHIAL/PERIVASCULAR LYMI AGGREGATES, Multifocal, Slight	
		VASCULAR MINERALIZATION, Multip Minimal.	focal,

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Male PHASE: Dosing phase	ANIMAL: 4036 GROUP: 4
Tissue Gross Observations/Comments	Microscopic Observations/Comment	s
Mammary-protocol No gross observations on tissue.	PROMINENT LUMINAL EOSINOPHILIC/ SECRETIONS, Present.	/BASOPHILIC
Parathyroid No gross observations on tissue.	Tissue is unremarkable; one-of-missing.	-pair
Spleen No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifoca	,
	Minimal.	Altitiour,
Trachea No gross observations on tissue.	GLANDULAR DILATATION, Multifoca	al, Moderate.
	SUBMUCOSAL SUBACUTE/CHRONIC INF CELL INFILTRATE, Multifocal, Mc	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Epididymides	Heart	Ileum	Jejunum
Tibial Nerve	Prostate	Rectum/Low Colon	Cervical SC	Thoracic SC
Lumbar SC	Skin-protocol	Stomach	Seminal vesicles	Testes

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Male

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 4

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Thyroid

Thymus

Urinary bladder

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4037 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Adrenal Glands . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Kidneys . . . . . . . . No gross observations on tissue. INTERSTITIAL MONONUCLEAR CELL AGGREGATES. UNILATERAL, Multifocal, Slight. EOSINOPHILIC TUBULAR CASTS, UNILATERAL, Focal, Minimal. Liver . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Slight. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. PERIPORTAL MICROGRANULOMA, Focal, Slight. FIBROUS TAGS, Focal, Minimal. Mesenteric LN . . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Minimal. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Minimal. SINUS EDEMA, Multifocal, Slight.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4037 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Tissue Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Slight. PARACORTICAL LYMPHOID ACTIVITY, Moderate. SINUS HISTIOCYTES, Multifocal, Minimal. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal. MEDULLARY PLASMACYTOSIS, Multifocal, Slight. Discolored, All lobes, Red, Foci, 0.2 - 0.5 Examined; 1 correlation found: cm, Slight SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES. Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal. Mammary-protocol . . . No gross observations on tissue. PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC SECRETIONS, Present. ACINAR EPITHELIAL VACUOLAR CHANGE, Minimal.

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 4037 GROUP: 4
rissue	Gross Observations/Comments	Microscopic Observations/Comments	
Prostate	No gross observations on tissue.	INTERSTITIAL SUBACUTE/CHRONIC CELL INFILTRATE, Multifocal, N	
Parathyroid	. No gross observations on tissue.	. Tissue is unremarkable; one-of-pair missing.	
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifoo	cal, Minimal.
		EXTRAMEDULLARY HEMATOPOIESIS, Minimal.	Multifocal,
Thyroid	No gross observations on tissue.	Tissue is unremarkable; one-of missing.	-pair
Phymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Slight	· ·•
Frachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifoo	al, Moderate.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Sternal Marrow Femoral Marrow Tibial Marrow Femur

Brain Tibia Cecum Colon

Sternum Duodenum

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4037 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 Gross Observations/Comments Microscopic Observations/Comments

Epididymides Ileum Heart

Jejunum Tibial Nerve Lumbar SC Skin-protocol

Rectum/Low Colon Cervical SC Thoracic SC Stomach Seminal vesicles Testes

Urinary bladder

STAT		SEX: Male PHASE: Dosing phase	ANIMAL: 4038 GROUP: 4
	Gross Observations/Comments		
	No gross observations on tissue.	PROMINENT CORTICAL HAVERSIAN SYSTEM Present.	
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATERAL, Multifocal, Minimal.	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multi Minimal.	focal,
		PERIPORTAL MONONUCLEAR CELL AGGREGA Multifocal, Minimal.	TES,
		PERIPORTAL MICROGRANULOMA, Focal, M	oderate.
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Sligh	t.
		PARACORTICAL LYMPHOID ACTIVITY, Mod	erate.
		SINUS HISTIOCYTES, Multifocal, Mini	mal.
		SINUS EDEMA, Multifocal, Slight.	
		RETICULOENDOTHELIAL CELL: GOLDEN-BR PIGMENT, Minimal.	OWN

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

<del>-</del>		SEX: Male PHASE: Dosing phase	ANIMAL: 4038 GROUP: 4
	Gross Observations/Comments		
Mediastinal LN No gross observations on tissue.		FOLLICULAR LYMPHOID ACTIVITY, MODERATE PARACORTICAL LYMPHOID ACTIVITY, MODERATE SINUS HISTIOCYTES, Minimal.	derate.
		FREE ERYTHROCYTES/ERYTHROPHAGOCYT Multifocal, Minimal. SINUS EDEMA, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Focal, S	
Lungs	Discolored, All lobes, Red, Foci, O.cm, Moderate	HEMORRHAGE/CONGESTION/EDEMA, Fo Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY O Multifocal, Minimal.	CELL FOCI,
		ALVEOLAR/INTRAALVEOLAR MACROPHAGE BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHO AGGREGATES, Multifocal, Moderate.	DID
		VASCULAR MINERALIZATION, Multifoc	cal,
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Min	uimal.

25-Apr-06; 14:06

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 4038 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Stomach	No gross observations on tissue.	DILATED GLANDS, Multifocal, Minimal	i.
Thyroid	No gross observations on tissue.	HEMORRHAGE/CONGESTION, Multifocal,	Minimal.
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifocal, S	Blight.
		SUBMUCOSAL SUBACUTE/CHRONIC INFLAMM	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

		. oboopioarij.		
Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Femur	Tibia	Cecum	Colon	Duodenum
Epididymides	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Prostate	Parathyroid	Rectum/Low Colon	Cervical SC
Thoracic SC	Lumbar SC	Skin-protocol	Seminal vesicles	Testes
Thymus	Urinary bladder	_		•

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 4039 GROUP: 4
Tissue	Gross Observations/Comments	Migroscopic Observations/Commo	mta
Kidneys	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL UNILATERAL, Multifocal, Minim	AGGREGATES,
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Multifocal, Minim	CELL
		CENTRILOBULAR SUBACUTE/CHRONI INFLAMMATORY CELL INFILTRATE, Minimal.	
		PERIPORTAL MONONUCLEAR CELL AM Multifocal, Minimal.	GGREGATES,
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Minimal.
	•	PARACORTICAL LYMPHOID ACTIVIT	Y, Marked.
		SINUS HISTIOCYTES, Multifocal	, Slight.
		SINUS EDEMA, Multifocal, Sligh	ht.
ediastinal LN	No gross observations on tissue.	PARACORTICAL LYMPHOID ACTIVITY	Y, Moderate.
		SINUS HISTIOCYTES, Multifocal	, Minimal.
		FREE ERYTHROCYTES/ERYTHROPHAGO Multifocal, Slight.	OCYTOSIS,
		SINUS EDEMA, Multifocal, Minim	mal.
		LYMPHOID DEPLETION, Multifocal	l, Moderate.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

\_ STATUS: Final phase sacrifice SEX: Male ANIMAL: 4039 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Tissue Gross Observations/Comments Microscopic Observations/Comments Discolored, All lobes, Red, Foci, </= 0.1 Examined; 1 correlation found: cm, Slight PERIVASCULAR/SUBPLEURAL MICROGRANULOMA. Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Slight. VASCULAR MINERALIZATION, Multifocal, Minimal. Mammary-protocol . . . No gross observations on tissue. PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC SECRETIONS, Present. ACINAR EPITHELIAL VACUOLAR CHANGE, Multifocal, Slight. MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. Parathyroid . . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Spleen . . . . . . . No gross observations on tissue. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 Tissue Gross Observations/Comments Microscopic Observations/Comments Thymus . . . . . . . . No gross observations on tissue. HEMORRHAGE, Multifocal, Minimal. Trachea . . . . . . . . No gross observations on tissue. MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Minimal. GLANDULAR DILATATION, Moderate.

SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Slight.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Tibia Cecum Colon Duodenum Epididymides Heart Ileum Jejunum Tibial Nerve Prostate Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Seminal vesicles Testes Urinary bladder Thyroid

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Male PHASE: Dosing phase	ANIMAL: 4040 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comme	ents
	No gross observations on tissue.	SUBCHONDRAL/SUBFIBROUS BONE: Focal, Minimal.	
Kidneys	No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILAT Minimal.	FERAL, Focal,
		INTERSTITIAL MONONUCLEAR CELIBILATERAL, Multifocal, Minima	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Multifocal, Minim	
		CENTRILOBULAR SUBACUTE/CHRONI INFLAMMATORY CELL INFILTRATE, Minimal.	
esenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY	, Minimal.
		PARACORTICAL LYMPHOID ACTIVIT	ΓΥ, Marked.
		SINUS HISTIOCYTES, Multifocal	l, slight.
		SINUS EDEMA, Multifocal, Slig	ght.
		RETICULOENDOTHELIAL CELL: GOI PIGMENT, Multifocal, Slight.	LDEN-BROWN
		FREE ERYTHROCYTES/ERYTRHOPHAG	GOCYTOSIS,

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

------STATUS: Final phase sacrifice SEX: Male ANIMAL: 4040 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Tissue Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Slight. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Multifocal, Slight. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal. SINUS EDEMA, Minimal. MEDULLARY PLASMACYTOSIS, Moderate. Lungs . . . . . . . . No gross observations on tissue. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES. Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight. VASCULAR MINERALIZATION, Multifocal, Minimal. Mammary-protocol . . . No gross observations on tissue. PROMINENT LUMINAL EOSINOPHILIC/BASOPHILIC SECRETIONS, Present. Parathyroid . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing.

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase

Tissue Gross Observations/Comments Microscopic Observations/Comments

Spleen . . . . . . . No gross observations on tissue.

EXTRAMEDULLARY HEMATOPOIESIS, Multifocal,

Minimal.

Testes . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment).

> - SEVERAL TUBULES ARE SLIGHTLY AUTOLYTIC/AGONAL CHANGE.

Thymus . . . . . . . No gross observations on tissue.

HEMORRHAGE, Minimal.

Trachea . . . . . . . . No gross observations on tissue.

MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Multifocal, Minimal.

SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Slight.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Cecum Colon Duodenum Epididvmides Heart Ileum Jejunum Tibial Nerve Prostate Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Male ANIMAL: 4040
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4

Fissue Gross Observations/Comments Microscopic Observations/Comments

Skin-protocol Stomach Seminal vesicles Thyroid Urinary bladder

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Male PHASE: Dosing phase	ANIMAL: 4041 GROUP: 4		
Tissue Gross Observations/Comments	Microscopic Observations/Comments			
Femur No gross observations on tissue.	METAPHYSEAL CARTILAGINOUS ISLAND(S), Multifocal, Slight.			
Tibia No gross observations on tissue.	SUBCHONDRAL/SUBFIBROUS BONE: FIBROUS CYS Multifocal, Marked.	T,		
Ileum No gross observations on tissue.	Tissue is unremarkable (with comment).			
	- INTESTINAL TISSUE LACKS PEYER'S PATCHE	s.		
Kidneys No gross observations on tissue.	CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, BILATERAL, Focal, Minimal.			
Liver No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.			
Mesenteric LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Moderate.			
	PARACORTICAL LYMPHOID ACTIVITY, Minimal.			
	SINUS HISTIOCYTES, Multifocal, Moderate.			
Mediastinal LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Moderate.			
	PARACORTICAL LYMPHOID ACTIVITY, Moderate			
	SINUS HISTIOCYTES, Multifocal, Moderate.			
	FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal.			

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

-STATUS: Final phase sacrifice SEX: Male PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 ~ \_ Gross Observations/Comments Microscopic Observations/Comments Discolored, All lobes, Red, Foci, </= 0.1 Examined; 2 correlations found: cm, Slight HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI. Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight. VASCULAR MINERALIZATION, Multifocal, Minimal. Prostate . . . . . . No gross observations on tissue. LUMINAL CELLULAR DEBRIS, Minimal. INTERSTITIAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Moderate. Parathyroid . . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Spleen . . . . . . . . No gross observations on tissue. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal. Stomach . . . . . . . No gross observations on tissue. DILATED GLANDS, Minimal.

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

\_ STATUS: Final phase sacrifice SEX: Male ANIMAL: 4041 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 . . . Tissue Gross Observations/Comments Microscopic Observations/Comments Thymus . . . . . . . No gross observations on tissue. HEMORRHAGE, Focal, Minimal. Trachea . . . . . . . No gross observations on tissue. GLANDULAR DILATATION, Slight.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Sternum Cecum Heart Jejunum Cervical SC Thoracic SC

Femoral Marrow Colon

Tibial Marrow Duodenum Mammary-protocol Tibial Nerve Skin-protocol

Epididymides Rectum/Low Colon Seminal vesicles

Brain

Lumbar SC Testes Thyroid Urinary bladder

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 1530 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comments	
Duodenum No gross observations on tissue.		
	- PANCREATIC TISSUE INCLUDED; SLIGHT, FOCAL PERIVASCULAR MONONUCLEAR CELL AGGREGATES.	
Heart No gross observations on tissue.	INFLAMMATORY CELL FOCI, Focal, Minimal.	)
Liver No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifoca Minimal.	1,
	PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.	
Mesenteric LN No gross observations on tissue.	FOLLTON AD AMERICAN ACCURATION OF THE PARTY	
	FOLLICULAR LYMPHOID ACTIVITY, Slight.	
	PARACORTICAL LYMPHOID ACTIVITY, Marked.	
	SINUS HISTIOCYTES, Multifocal, Slight.	
	SINUS EDEMA, Multifocal, Slight.	
·	MEDULLARY PLASMACYTOSIS, Minimal.	
Mediastinal LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal.	
	PARACORTICAL LYMPHOID ACTIVITY, Moderat	е.

		Individual Animal Gross and Microscopic Observations				
PHASE DAY OF D	ATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1530			
Tissue	Gross Observations/Comments	Microscopic Observations/Comment	ts			
Mediastinal LN		SINUS HISTIOCYTES, Minimal.				
		SINUS EDEMA, Multifocal, Slight	·,			
		MEDULLARY PLASMACYTOSIS, Slight	£.			
Lungs	No gross observations on tissue.					
	•	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifoom Minimal.	cal,			
•		ARTERIAL MEDIAL HYPERTROPHY, Mu Minimal.	ıltifocal,			
		PERIVASCULAR/PERIALVEOLAR SUBAC INFLAMMATORY CELL FOCI, Multifo Minimal.				
		ALVEOLAR/INTRAALVEOLAR MACROPHA BROWN PIGMENT-LADEN MACROPHAGES Multifocal, Minimal.				
		PERIBRONCHIAL/PERIVASCULAR LYMF AGGREGATES, Multifocal, Slight.				
Parathyroid .	No gross observations on tissue.	Tissue is unremarkable; one-of-missing.	pair			
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifoca	al, Minimal.			
		EXTRAMEDULLARY HEMATOPOIESIS, M Minimal.	Multifocal,			

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

PHASE DAY OF	TATUS: Final phase sacrifice DEATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 1530 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Ileum	Jejunum	Kidneys	Mammary-protocol	Tibial Nerve
Oviducts/Fallop	Ovaries	Rectum/Low Colon	Cervical SC	Thoracic SC
Lumbar SC	Skin-protocol	Stomach	Thyroid	Thymus
Trachea	Urinary bladder	500	111,2024	1117 mas

STATUS: Final phase sacrifice	(DV1
PHASE DAY OF DEATH: 30	SEX: Female ANIMAL: 1531 PHASE: Dosing phase GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comments
Duodenum No gross observations on tissue.	Tissue is unremarkable (with comment).
	- PANCREATIC TISSUE INCLUDED: FOCAL, MINIMAL MONONUCLEAR CELL AGGREGATES.
Liver No gross observations on tissue.	
	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.
	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal.
	PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.
desenteric LN No gross observations on tissue.	
	FOLLICULAR LYMPHOID ACTIVITY, Slight.
	PARACORTICAL LYMPHOID ACTIVITY, Marked.
	SINUS HISTIOCYTES, Multifocal, Minimal.
	SINUS EDEMA, Multifocal, Slight.
dediastinal LN No gross observations on tissue.	
	FOLLICULAR LYMPHOID ACTIVITY, Slight.
	PARACORTICAL LYMPHOID ACTIVITY, Marked.
	SINUS HISTIOCYTES, Multifocal, Minimal.
	FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal.

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Female PHASE: Dosing phase		1531 1
Fissue Gross Observations/Comments	Microscopic Observations/Comments		
ungs No gross observations on tissue.	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.  ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal.  PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal.  ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.  PERIBRONCHIAL/PERIVASCULAR LYMPHOID		
	VASCULAR MINERALIZATION, Multifocal, Minimal.		
Parathyroid No gross observations on tissue.	Tissue is missing.		
pleen No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, Minim	al.	
	EXTRAMEDULLARY HEMATOPOIESIS, Multifoca Minimal.	1,	
rachea No gross observations on tissue.	GLANDULAR DILATATION, Multifocal, Sligh	t.	
	SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATOR CELL INFILTRATE, Multifocal, Minimal.	Y	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

ST PHASE DAY OF D	ATUS: Final phase sacrifice EATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 1531 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Uterus	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Heart	Ileum	Jejunum	Kidnevs	Mammary-protocol
Tibial Nerve	Oviducts/Fallop	Ovaries	Rectum/Low Colon	Cervical SC
Thoracic SC	Lumbar SC	Skin-protocol	Stomach	Thyroid
Thumus	Ilrinary bladdor	¥		

PHASE DAY OF DE	TUS: Final phase sacrifice	SEX: Female PHASE: Dosing phase	ANIMAL: 1532 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- Recut: no improvement	
Kidneys	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL AGGREGATE UNILATERAL, Minimal.	ss,
Liver	No gross observations on tissue.	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifoca Slight.	1,
		PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Marked.	
		SINUS HISTIOCYTES, Slight.	
		SINUS EDEMA, Multifocal, Slight.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Moderate.	
		PARACORTICAL LYMPHOID ACTIVITY, Minimal	•
		SINUS HISTIOCYTES, Multifocal, Slight.	
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight.	
		RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Slight.	

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Female ANIMAL: 1532 PHASE: Dosing phase GROUP: 1		
Tissue	Gross Observations/Comments	Microscopic Observations/Comment	s	
Mediastinal LN		SINUS EDEMA, Focal, Slight.		
Lungs	No gross observations on tissue.			
		ARTERIAL MEDIAL HYPERTROPHY, Mu Slight.	ltifocal,	
		PERIVASCULAR/PERIALVEOLAR SUBAC INFLAMMATORY CELL FOCI, Multifo Minimal.		
		PERIVASCULAR/SUBPLEURAL MICROGR Multifocal, Minimal.	ANULOMA,	
		ALVEOLAR/INTRAALVEOLAR MACROPHA BROWN PIGMENT-LADEN MACROPHAGES Multifocal, Minimal.	GES/GOLDEN ,	
		PERIBRONCHIAL/PERIVASCULAR LYMP AGGREGATES, Multifocal, Moderat		
		VASCULAR MINERALIZATION, Multifight.	ocal,	
Parathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-	pair	
Spleen	No gross observations on tissue.			
		GOLDEN-BROWN PIGMENT, Multifocal	l, Minimal.	
		EXTRAMEDULLARY HEMATOPOIESIS, MIMINIMAL.	ultifocal,	
Thymus	No gross observations on tissue.			
	· ·	HEMORRHAGE, Multifocal, Minimal	•	

Oviducts/Fallop Ovaries

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

PHASE DAY OF I	TATUS: Final phase sacrific DEATH: 30		SEX: Female PHASE: Dosine		ANIMAL: 1532 GROUP: 1
Tissue	Gross Observation	s/Comments	Microscopio	c Observations/Comments	
Frachea	No gross observa	tions on tissue.			
				PITHELIAL EOSINOPHILIC	
			DROPLETS/	INCLUSION BODIES, Focal, 1	Minimal.
	,		GLANDULAR	DILATATION, Multifocal,	Slight.
			SUBMUCOSAI CELL INFII	L SUBACUTE/CHRONIC INFLAM LTRATE, Multifocal, Minima	MATORY al.
terus	No gross observa	tions on tissue.			
			LUMENAL DI	ISTENSION, BILATERAL, Marl	ced.
			- NORMAL I ESTRUS CYC	PHYSIOLOGIC MORPHOLOGY OF CLE.	THE
agina	No gross observat	cions on tissue.	Tissue is	unremarkable (with commer	nt).
			- NORMAL E ESTRUS CYC	PHYSIOLOGIC MORPHOLOGY OF CLE.	THE
issues withou	t comment under Gross Obser	vations were within	normal limits at no	agrongy	
ne rollowing	tissues were unremarkable m	icroscopically:	TIMILES OF HE	ctopay.	
Stern	al Marrow Femoral Marrow	Tibial Marrow	Brain	Sternum	
Femur Heart		Cecum	Colon	Duodenum	
неагс	Ileum	Jejunum	Mammary-protocol	Tibial Nerve	

Thoracic SC

Rectum/Low Colon Cervical SC

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30				Female Dosing phase	ANIMAL: 1532 GROUP: 1	
Tissue		Fross Observations/C	omments	Micro	oscopic Observations/Comments	
	Lumbar SC	Skin-protocol	Stomach	Thyroid	Urinary bladder	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

PHASE DAY OF DE	TUS: Final phase sacrifice ATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 1533 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comme	ents
	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELI UNILATERAL, Multifocal, Minim	AGGREGATES,
iver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Multifocal, Minim	
		CENTRILOBULAR SUBACUTE/CHRONI INFLAMMATORY CELL INFILTRATE, Minimal.	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	, Minimal.
		PARACORTICAL LYMPHOID ACTIVIT	TY, Minimal.
•		SINUS HISTIOCYTES, Multifocal	l, Slight.
		SINUS EDEMA, Multifocal, Slig	ght.
		RETICULOENDOTHELIAL CELL: GOI PIGMENT, Multifocal, Minimal.	
ediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Moderate.
		PARACORTICAL LYMPHOID ACTIVIT	TY, Moderate.
		SINUS HISTIOCYTES, Minimal.	
		FREE ERYTHROCYTES/ERYTHROPHAG	GOCYTOSIS,
		RETICULOENDOTHELIAL CELL: GOI	LDEN-BROWN

PIGMENT, Multifocal, Slight.

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Female ANIM PHASE: Dosing phase GRO	
issue	Gross Observations/Comments	Microscopic Observations/Commer	nts
	No gross observations on tissue.	ARTERIAL MEDIAL HYPERTROPHY, N	
		PERIVASCULAR/PERIALVEOLAR SUBA INFLAMMATORY CELL FOCI, Multii Minimal.	
		ALVEOLAR/INTRAALVEOLAR MACROPH BROWN PIGMENT-LADEN MACROPHAGE Multifocal, Minimal.	
	•	PERIBRONCHIAL/PERIVASCULAR LYN AGGREGATES, Multifocal, Slight	
		VASCULAR MINERALIZATION, Multimal.	ifocal,
varies	No gross observations on tissue.	CONGESTION, UNILATERAL, Slight	t.
oleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Minimal.	Multifocal,
rachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifoo	cal, Slight.
terus	No gross observations on tissue.	Tissue is unremarkable (with o	comment).
		- NORMAL PHYSIOLOGIC MORPHOLOG ESTRUS CYCLE.	GY OF THE
gina	No gross observations on tissue.	Tissue is unremarkable (with o	comment).

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 1533
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 1

Tissue Gross Observations/Comments Microscopic Observations/Comments

Vagina

- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Tibia Cecum Colon Duodenum Heart Ileum Jejunum Mammary-protocol Tibial Nerve Oviducts/Fallop Rectum/Low Colon Cervical SC Parathyroid Thoracic SC Lumbar SC Skin-protocol Stomach Thyroid Thymus Urinary bladder

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Female PHASE: Dosing phase	ANIMAL: 1534 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Adrenal Glands	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- Recut: no improvement	
Brain	No gross observations on tissue.	HEMORRHAGE/HEMATOCYST WITH FIBROUS ORGANIZATION, Focal, Moderate.	
Kidneys	No gross observations on tissue.	MEDULLA: MINERAL DEPOSIT(S), UNILATERA Multifocal, Minimal.	L,
		CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, UNILATERAL, Foo Minimal.	al,
Liver	No gross observations on tissue.		
		SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifoc Minimal.	al,
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Minima	1.
		SINUS HISTIOCYTES, Multifocal, Slight.	
		SINUS EDEMA, Multifocal, Slight.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal.	

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

SEX: Female STATUS: Final phase sacrifice ANIMAL: 1534 PHASE DAY OF DEATH: 30 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . PARACORTICAL LYMPHOID ACTIVITY, Minimal. SINUS HISTIOCYTES, Minimal. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight. MEDULLARY PLASMACYTOSIS, Slight. Lungs . . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Focal, Moderate. PERIVASCULAR/SUBPLEURAL MICROGRANULOMA, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal. VASCULAR MINERALIZATION, Multifocal, Minimal. Spleen . . . . . . . No gross observations on tissue. GOLDEN-BROWN PIGMENT, Multifocal, Minimal. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 1534 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comments	
Trachea No gross observations on tissue.	MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Minimal.	<del></del>
	GLANDULAR DILATATION, Multifocal, S	light.
Uterus No gross observations on tissue.	Tissue is unremarkable (with commen	t).
	- NORMAL PHYSIOLOGIC MORPHOLOGY OF ESTRUS CYCLE.	THE
Vagina No gross observations on tissue.	Tissue is unremarkable (with commer	t).
	- NORMAL PHYSIOLOGIC MORPHOLOGY OF ESTRUS CYCLE.	THE

Tissues without comment under Gross Observations were within normal limits at necropsy.

The following tissues were unremarkable microscopically:

Sternal Marrow Femoral Marrow Tibial Marrow Sternum Femoral

Scernar Marrow	remoral Marrow	Tiblal Marrow	sternum	Femur
Tibia	Cecum	Colon	Duodenum	Heart
Ileum	Jejunum	Mammary-protocol	Tibial Nerve	Oviducts/Fallop
Ovaries	Parathyroid	Rectum/Low Colon	Cervical SC	Thoracic SC
Lumbar SC	Skin-protocol	Stomach	Thyroid	Thymus
Urinary bladder	*		•	

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 1535 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Commer	nts
Kidneys No gross observations on tissue.	CORTEX/CORTICO-MEDULLARY JUNC DEPOSIT(S), UNILATERAL, Multi: Minimal.	
Liver No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Multifocal, Minima	
	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Minimal.	
Mesenteric LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Minimal.
	PARACORTICAL LYMPHOID ACTIVITY	Y, Minimal.
	SINUS HISTIOCYTES, Multifocal	, Slight.
	SINUS EDEMA, Multifocal, Sligh	ht.
Mediastinal LN No gross observations on tissue.	HEMORRHAGE, Moderate.	
	FOLLICULAR LYMPHOID ACTIVITY,	Minimal.
	PARACORTICAL LYMPHOID ACTIVITY	Y, Minimal.
	SINUS HISTIOCYTES, Multifocal	, Slight.
	FREE ERYTHROCYTES/ERYTHROPHAGO Multifocal, Moderate.	ocytosis,
	RETICULOENDOTHELIAL CELL: GOLD PIGMENT, Multifocal, Slight.	DEN-BROWN

	STATUS: Final phase sacrifice SEX: Female ANIMAL: 1535				
PHASE DAY OF DEATH: 30 PH		HASE: Dosing phase	GROUP: 1		
lissue	Gross Observations/Comments	Microscopic Observations/Comments			
Hediastinal LN .	· · · · · · · · · · · · · · · · · · ·	SINUS EDEMA, Multifocal, Slight.	• • • • • • • • • • • • • • • • • • • •		
		MEDULLARY PLASMACYTOSIS, Multifocal, Minimal.			
oungs	Discolored, All lobes, Red, Foci, 0.2 - 0.5 cm, Slight	Examined; 1 correlation found:  PERIVASCULAR/PERIALVEOLAR  SUBACUTE/CHRONIC INFLAMMATORY CELL FOOM Multifocal, Minimal.	21,		
		ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal.	,		
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDE BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	EN		
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.			
		VASCULAR MINERALIZATION, Multifocal, Minimal.			
arathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.			
pleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, Minima	ıl.		
		EXTRAMEDULLARY HEMATOPOIESIS, Multifocal Minimal.	L,		
hymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Minimal.			

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Obser-

		Indi	vidual Animal Gros	ss and Microscopic (	Observations	
STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30				SEX: Female PHASE: Dosing	phase	ANIMAL: 1535 GROUP: 1
		ss Observations/Co	omments	Microscopio	Observations/Comment	
Trachea	No	gross observation			DILATATION, Multifoca	
					L SUBACUTE/CHRONIC INF LTRATE, Multifocal, Mi	
Uterus	No	gross observation	ns on tissue.	GLANDULAR	DILATATION, Multifoca	al, Slight.
		<i>:</i>		- NORMAL I ESTRUS CYC	PHYSIOLOGIC MORPHOLOGY	OF THE
Vagina	No	gross observation	ns on tissue.	Tissue is	unremarkable (with co	omment).
				- NORMAL I ESTRUS CYC	PHYSIOLOGIC MORPHOLOGY CLE.	OF THE
The following t Adrena Sternu Duoden Tibial Thorac	issues were 1 Glands m um	unremarkable micr Sternal Marrow Femur Heart	roscopically: Femoral Marrow Tibia Ileum Ovaries	normal limits at ne Tibial Marrow Cecum Jejunum Rectum/Low Colon Stomach	Brain Colon Mammary-protocol	

PHASE DAY OF DEATH:	Final phase sacrifice 31	SEX: Female PHASE: Dosing phase	ANIMAL: 1536 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	***
	No gross observations on tissue.	Tissue is missing.	
Tibial Marrow	No gross observations on tissue.	Tissue is missing.	
Femur	No gross observations on tissue.	Tissue is missing.	
Tibia	No gross observations on tissue.	Tissue is missing.	
Extremity	hair thin/absent, Both forepaws, Moderate	Examined; 1 correlation found: FOLLICULAR HYPERKERATOSIS/HAIR SHAFT ABSENT/DECREASED IN SIZE, Multifocal, Slight.	
Ileum	Abnormal Contents, Red, Thin fluid, Moderate	Tissue is unremarkable. Examined; no correlation found	
Kidneys	Dilated Pelvis, Right, Slight	Examined; 1 correlation found: DILATED PELVIS, UNILATERAL, Present.	
		MEDULLA: MINERAL DEPOSIT(S), UNILATERAL Focal, Minimal.	,
		- OCCASIONAL TUBULES APPEAR AUTOLYTIC/NECROTIC/AGONAL CHANGE.	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifoca Minimal.	1,

PHASE DAY OF DE		SEX: Female ANIMAL: 1536 PHASE: Dosing phase GROUP: 1	5
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Liver		PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.	
		SUBCAPSULAR HEMORRHAGE, Multifocal, Slight.	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Moderate.	
		PARACORTICAL LYMPHOID ACTIVITY, Moderate.	
		SINUS HISTIOCYTES, Multifocal, Moderate.	
		SINUS EDEMA, Minimal.	
ediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Moderate.	
		PARACORTICAL LYMPHOID ACTIVITY, Marked.	
		SINUS HISTIOCYTES, Minimal.	
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight.	
		MEDULLARY PLASMACYTOSIS, Moderate.	
ungs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Slight.	
		SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.	
		ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Moderate.	

PHASE DAY OF D	ATUS: Final phase sacrifice EATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 1536 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comment	ts
Lungs		PERIVASCULAR/PERIALVEOLAR SUBA INFLAMMATORY CELL FOCI, Multifo Minimal.	CUTE/CHRONIC
		PERIVASCULAR/SUBPLEURAL MICROGI Multifocal, Minimal.	RANULOMA,
		ALVEOLAR/INTRAALVEOLAR MACROPHI BROWN PIGMENT-LADEN MACROPHAGES Multifocal, Minimal.	
		PERIBRONCHIAL/PERIVASCULAR LYMI AGGREGATES, Multifocal, Slight	
Tibial Nerve	No gross observations on tissue.	Tissue is unremarkable (with co	omment).
		- PROMINENT PERIVASCULAR MONONT AGGREGATES.	UCLEAR CELL
Parathyroid .	No gross observations on tissue.	Tissue is unremarkable; one-of-missing.	-pair
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Minimal.	
		EXTRAMEDULLARY HEMATOPOIESIS, Minimal.	Multifocal,
Thymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Minima	L.
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifoca	al, Slight.
		SUBMUCOSAL SUBACUTE/CHRONIC INICELL INFILTRATE, Multifocal, M.	

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Female PHASE: Dosing phase	ANIMAL: 1536 GROUP: 1
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Uterus	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Brain	Sternum	Cecum
Colon	Duodenum	Heart	Jejunum	Mammary-protocol
Oviducts/Fallop	Ovaries	Rectum/Low Colon	Cervical SC	Thoracic SC
Lumbar SC	Skin-protocol	Stomach	Thyroid	Urinary bladder

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 1537 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 1 Tissue Gross Observations/Comments Microscopic Observations/Comments Kidneys . . . . . . . No gross observations on tissue. CORTEX/CORTICO-MEDULLARY JUNCTION: MINERAL DEPOSIT(S), BILATERAL, Multifocal, Slight. CORTEX: CONVOLUTED TUBULAR EPITHELIUM-BASOPHILIC, BILATERAL, Multifocal, Minimal. INTERSTITIAL MONONUCLEAR CELL AGGREGATES, BILATERAL, Multifocal, Minimal. Liver . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Moderate. PARACORTICAL LYMPHOID ACTIVITY, Moderate. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Moderate. MEDULLARY PLASMACYTOSIS, Moderate. Mediastinal LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Minimal.

Individual Animal Gross and Microscopic Observations				
	Final phase sacrifice	SEX: Female	ANIMAL: 1537	
Tissue		Microscopic Observations/Commen		
Mediastinal LN		PARACORTICAL LYMPHOID ACTIVITY	, Moderate.	
		SINUS HISTIOCYTES, Multifocal,	Minimal.	
		FREE BRYTHROCYTES/ERYTHROPHAGO Multifocal, Minimal.	CYTOSIS,	
		MEDULLARY PLASMACYTOSIS, Sligh	t.	
Lungs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, For Moderate.	ocal,	
		ARTERIAL MEDIAL HYPERTROPHY, Minimal.	ultifocal,	
		PERIVASCULAR/PERIALVEOLAR SUBAINFLAMMATORY CELL FOCI, Multifeminal.	•	
		ALVEOLAR/INTRAALVEOLAR MACROPH BROWN PIGMENT-LADEN MACROPHAGE: Multifocal, Minimal.	•	
		PERIBRONCHIAL/PERIVASCULAR LYM AGGREGATES, Multifocal, Minima		
		VASCULAR MINERALIZATION, Multi- Minimal.	focal,	
Parathyroid	No gross observations on tissue.	Tissue is missing.		
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifoca	al, Minimal.	
		EXTRAMEDULLARY HEMATOPOIESIS, Minimal.	Multifocal,	

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 1537 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Tissue Gross Observations/Comments Microscopic Observations/Comments Thyroid . . . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Thymus . . . . . . . No gross observations on tissue. HEMORRHAGE, Multifocal, Minimal. Trachea . . . . . . . No gross observations on tissue. GLANDULAR DILATATION, Multifocal, Moderate. SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Slight. Uterus . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE. Vagina . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain
Sternum Femur Tibia Cecum Colon

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

		Indi	via Whole-Bo	ity Screening in dy Inhalation Exp ss and Microscopi	osures	
PHASE DA	STATUS: Find AY OF DEATH: 31	al phase sacrifice		SEX: Fem. PHASE: Dos		ANIMAL: 1537 GROUP: 1
Tissue	(	Gross Observations/Co	omments	Microsco	pic Observations/Comments	
	Duodenum Tibial Nerve Thoracic SC	Heart Oviducts/Fallop Lumbar SC	Ileum Ovaries Skin-protocol	Jejunum Rectum/Low Col Stomach	Mammary-protocol on Cervical SC Urinary bladder	

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 1538 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comments	
Femur No gross observations on tissue.	Tissue is unremarkable (with comment)	
	- ONLY ONE MENISCUS PRESENT.	
Tibia No gross observations on tissue.	SUBCHONDRAL/SUBFIBROUS BONE: FIBROUS Focal, Moderate.	CYST,
Extremity hair thin/absent, Both forepaws, Moderate	Examined; 1 correlation found: EMPTY HAIR FOLLICLES/HAIR SHAFT ABS Focal, Slight.	SENT,
Kidneys No gross observations on tissue.	MEDULLA: MINERAL DEPOSIT(S), UNILATER Focal, Minimal.	RAL,
	INTERSTITIAL MONONUCLEAR CELL AGGREGA BILATERAL, Multifocal, Minimal.	ATES,
Liver No gross observations on tissue.	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifo Minimal.	ocal,
Mesenteric LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal	1.
	PARACORTICAL LYMPHOID ACTIVITY, Market	ed.
	SINUS HISTIOCYTES, Multifocal, Slight	· ·
Mediastinal LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight	
	PARACORTICAL LYMPHOID ACTIVITY, Moder	rate.

PHASE DAY OF DE	TUS: Final phase sacrifice ATH: 31	PHASE: Dosing phase	ANIMAL: GROUP:	
Tissue	Gross Observations/Comments	Microscopic Observations/Comments		
Mediastinal LN		SINUS HISTIOCYTES, Minimal.		
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight.		
		RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Slight.		
		SINUS EDEMA, Focal, Slight.		
Lungs	No gross observations on tissue.	ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal.		
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDE BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	in	
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.		
varies	No gross observations on tissue.	CONGESTION, UNILATERAL, Slight.		
Skin-protocol .	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Minimal.		
Skin (other) .	Hair Thin/Absent, Cervical, Moderate	Examined; 1 correlation found: EMPTY HAIR FOLLICLE, Focal, Slight.		
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, Minima	1.	

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 1538 GROUP: 1
Tissue Gross Observations/Comments	Microscopic Observations/Comments	
Trachea No gross observations on tissue.	GLANDULAR DILATATION, Slight.	
Urinary bladder No gross observations on tissue.	Tissue is missing.	
Uterus No gross observations on tissue.	Tissue is unremarkable (with comme	nt).
	- NORMAL PHYSIOLOGIC MORPHOLOGY OF ESTRUS CYCLE.	THE
Vagina No gross observations on tissue.	Tissue is unremarkable (with comme	nt).
	- NORMAL PHYSIOLOGIC MORPHOLOGY OF ESTRUS CYCLE.	THE

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

rowand cropace were	ant character meet	obcopically.		
Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Cecum	Colon	Duodenum	Heart
Ileum	Jejunum	Mammary-protocol	Tibial Nerve	Oviducts/Fallop
Parathyroid	Rectum/Low Colon	Cervical SC	Thoracic SC	Lumbar SC
Stomach	Thyroid	Thymus		

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Female PHASE: Dosing phase	ANIMAL: 1539 GROUP: 1
Tissue		Microscopic Observations/Comments	· · · · · · · · · · · · · · · · · · ·
Adrenal Glands	No gross observations on tissue.	Tissue is unremarkable (with comment)	
		- Recut: no improvement	
Brain	No gross observations on tissue.	HEMORRHAGE, Multifocal, Minimal.	
Ileum	No gross observations on tissue.	Tissue is unremarkable (with comment)	
		- TISSUE IS VOID OF PEYER'S PATHCHES.	
Kidneys	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL AGGREGA BILATERAL, Minimal.	res,
Liver	No gross observations on tissue.	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifominimal.	cal,
esenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Marke	d.
		SINUS HISTIOCYTES, Slight.	
		SINUS EDEMA, Moderate.	
Mediastinal LN	No gross observations on tissue.	HEMORRHAGE, Minimal.	
		FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Moder	ate.

STA	STATUS: Final phase sacrifice SEX: Female ANIMAL: 1539					
PHASE DAY OF DEATH: 31		PHASE: Dosing phase	ANIMAL: 1539 GROUP: 1			
<u> </u>	Gross Observations/Comments	Microscopic Observations/Comm				
Mediastinal LN		SINUS HISTIOCYTES, Multifoca	l, Minimal.			
		FREE ERYTHROCYTES/ERYTHROPHAM Multifocal, Slight.	GOCYTOSIS,			
		SINUS EDEMA, Slight.				
Jungs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, Minimal.	Multifocal,			
		ALVEOLAR/INTRAALVEOLAR MACRO BROWN PIGMENT-LADEN MACROPHA Multifocal, Minimal.				
·		PERIBRONCHIAL/PERIVASCULAR L'AGGREGATES, Multifocal, Sligi				
varies	No gross observations on tissue.	CONGESTION, Slight.				
arathyroid	No gross observations on tissue.	Tissue is missing.				
horacic SC	No gross observations on tissue.	HEMORRHAGE, Focal, Minimal.				
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS	, Minimal.			
rachea	No gross observations on tissue.	GLANDULAR DILATATION, Moderat	te.			
		SUBMUCOSAL SUBACUTE/CHRONIC : CELL INFILTRATE, Multifocal,				

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

individual Animal Gloss and Microscopic Observations				
STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 1539 GROUP: 1		
Tissue Gross Observations/Comments	Microscopic Observations/Comments			
Uterus No gross observations on tissue.	Tissue is unremarkable (with comment).			
Vagina No gross observations on tissue.	Tissue is unremarkable (with comment) NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.			

Tissues without comment under Gross Observations were within normal limits at necropsy. The foll

lowing	tissues	were	unremark	cable	microscopic	ally:
Stern	nal Marr	ow .	Femoral	Marro	ow Tibial	Marro

Femoral Marrow Tibial Marrow Sternum Femur Duodenum Cecum Colon

Tibia Heart Jejunum Mammary-protocol Tibial Nerve Oviducts/Fallop Rectum/Low Colon Cervical SC Lumbar SC Skin-protocol Stomach Thyroid

Thymus Urinary bladder

PHASE DAY OF DE	TUS: Final phase sacrifice ATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 1540 GROUP: 1	
Ticane	Gross Observations/Comments	Migraggoria Observations/Comments		
Ileum	No gross observations on tissue.	Tissue is unremarkable (with comment)		
		- ILEUM IS VOID OF PEYER'S PATCHES.		
Kidneys	No gross observations on tissue.	MEDULLA: MINERAL DEPOSIT(S), UNILATER Minimal.	AL,	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.		
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.		
		PARACORTICAL LYMPHOID ACTIVITY, Marke	d.	
		SINUS HISTIOCYTES, Slight.		
		SINUS EDEMA, Focal, Slight.		
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.		
		PARACORTICAL LYMPHOID ACTIVITY, Moder	ate.	
		SINUS HISTIOCYTES, Minimal.		
Lungs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, Multifoc Minimal.	al,	
		ARTERIAL MEDIAL HYPERTROPHY, Multifoc Minimal.	al,	
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GO BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	LDEN	

## Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STAT		SEX: Female PHASE: Dosing phase	ANIMAL: 1540 GROUP: 1
Tissue		Microscopic Observations/Comments	
Lungs		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.	
Parathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.	
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Minimal.	
Thyroid	No gross observations on tissue.	MONONUCLEAR CELL AGGREGATES, UNILATERAN	<b></b>
Prachea	No gross observations on tissue.	GLANDULAR DILATATION, Slight.	
Jterus	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
/agina	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 1540

PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 1

Gross Observations/Comments

Microscopic Observations/Comments 

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Sternum Femur Tibia

Cecum Colon Duodenum Heart Jeiunum Mammary-protocol Tibial Nerve Oviducts/Fallop Ovaries Rectum/Low Colon Cervical SC

Thoracic SC Lumbar SC Skin-protocol Stomach Thymus Urinary bladder

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 1541 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 1 Tissue Gross Observations/Comments Microscopic Observations/Comments Tibia . . . . . . . . No gross observations on tissue. SUBCHONDRAL/SUBFIBROUS BONE: FIBROUS CYST. Multifocal, Moderate. Cecum . . . . . . . . No gross observations on tissue. DILATED GLAND WITH CELLULAR DEBRIS, Focal, Minimal. Ileum . . . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - ILEUM IS VOID OF PEYER'S PATCHES. Liver . . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Marked. PARACORTICAL LYMPHOID ACTIVITY, Marked. SINUS HISTIOCYTES, Multifocal, Moderate. SINUS EDEMA, Multifocal, Minimal. FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS.

Focal, Minimal.

MEDULLARY PLASMACYTOSIS, Minimal.

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations \_\_\_\_\_\_ STATUS: Final phase sacrifice SEX: Female ANIMAL: 1541 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 1 Gross Observations/Comments Microscopic Observations/Comments \_\_\_\_\_\_ Mediastinal LN . . . . No gross observations on tissue. Tissue is missing. Lungs . . . . . . . . No gross observations on tissue. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC

ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.

PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal.

INFLAMMATORY CELL FOCI, Multifocal,

VASCULAR MINERALIZATION, Multifocal, Minimal.

Ovaries . . . . . . . . No gross observations on tissue.

CONGESTION, BILATERAL, Slight.

Spleen . . . . . . . No gross observations on tissue.

EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.

Uterus . . . . . . . No gross observations on tissue.

Tissue is unremarkable (with comment).

- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE

ESTRUS CYCLE.

Minimal.

Vagina . . . . . . . . No gross observations on tissue.

Tissue is unremarkable (with comment).

- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 1541

PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 1

Gross Observations/Comments Microscopic Observations/Comments 

ESTRUS CYCLE.

Tissues without comment under Gross Observations were within normal limits at necropsy.

The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Colon Duodenum Heart

Jejunum Kidneys Mammary-protocol Tibial Nerve Oviducts/Fallop Parathyroid Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Thyroid Thymus Trachea

Urinary bladder

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2530 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 2

THADE DOTING PHASE GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2531
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2532
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2533
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 2

PRODE DATE OF BEATH. 3V PRODE DODING PRODE PROD

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female
PHASE DAY OF DEATH: 30
PHASE: Dosing phase
GROUP: 2

Tissue
Gross Observations/Comments
Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Slight

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female

PHASE DAY OF DEATH: 30

PHASE: Dosing phase

Gross Observations/Comments

Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2537
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female

PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 2

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2540
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 2

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 2541
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 2

issue Gross Observations/Comments Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female
PHASE DAY OF DEATH: 30
PHASE: Dosing phase
GROUP: 3

Tissue
Gross Observations/Comments
Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Slight

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3531

PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3532
PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3533 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 3 Gross Observations/Comments Microscopic Observations/Comments No micropathology observations on tissue. Discolored, All lobes, Red, Foci, 0.2 - 0.5 cm, Moderate

# Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female

PHASE DAY OF DEATH: 30

PHASE: Dosing phase

GROUP: 3

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

No micropathology observations on tissue.

Discolored, All lobes, Red, Slight

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3535

PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

Extremity . . . . . . . No micropathology observations on tissue.

hair thin/absent, Both forepaws, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3536 PHASE DAY OF DEATH: 31 GROUP: 3

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Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3537
PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS:

SEX: Female

ANIMAL: 3538

PHASE DAY OF DEATH: PHASE: GROUP: 3

Tissue Gross Observations/Comments Microscopic Observations/Comments

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3539 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 3 

Tissue Gross Observations/Comments Microscopic Observations/Comments

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 3540 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 3 Tissue Gross Observations/Comments Microscopic Observations/Comments Extremity . . . . . . No micropathology observations on tissue. hair thin/absent, Both forepaws, Slight

hair thin/absent, Both forelegs, Moderate

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice

SEX: Female
PHASE DAY OF DEATH: 31

PHASE: Dosing phase

GROUP: 3

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

PHASE DAY OF DEATH:	Final phase sacrifice 30	PHASE: Dosing phase	ANIMAL: 4530 GROUP: 4
	Gross Observations/Comments	Microscopic Observations/Comments	• • • • • • • • • • • • • • • • • • • •
	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL AGGREGATES UNILATERAL, Multifocal, Minimal.	
Liver	No gross observations on tissue.	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal Minimal.	ı,
		PERIPORTAL MONONUCLEAR CELL AGGREGATES, Multifocal, Minimal.	
Mesenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Moderate.	
		PARACORTICAL LYMPHOID ACTIVITY, Moderate	€.
		SINUS HISTIOCYTES, Multifocal, Slight.	
		SINUS EDEMA, Multifocal, Moderate.	
		MEDULLARY PLASMACYTOSIS, Multifocal, Minimal.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal.	
		PARACORTICAL LYMPHOID ACTIVITY, Marked.	
		SINUS HISTIOCYTES, Multifocal, Minimal.	
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

PHASE DAY OF D	ATUS: Final phase sacrifice EATH: 30	SEX: Female ANIMAL: 4 PHASE: Dosing phase GROUP: 4		
rissue	Gross Observations/Comments	Microscopic Observations/Commen		
	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, M		
		SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifo Minimal.		
		ARTERIAL MEDIAL HYPERTROPHY, M Minimal.	ultifocal,	
		PERIVASCULAR/PERIALVEOLAR SUBA INFLAMMATORY CELL FOCI, Multif Minimal.	· · · · · · · · · · · · · · · · · · ·	
,		ALVEOLAR/INTRAALVEOLAR MACROPH BROWN PIGMENT-LADEN MACROPHAGE Multifocal, Minimal.		
		PERIBRONCHIAL/PERIVASCULAR LYM AGGREGATES, Multifocal, Slight		
		VASCULAR MINERALIZATION, Multi	focal,	
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifoc	al, Minimal.	
		EXTRAMEDULLARY HEMATOPOIESIS,	Minimal.	
hymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Slight		
rachea	No gross observations on tissue.	GLANDULAR DILATATION, Focal, M	oderate.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATE PHASE DAY OF DEA	TUS: Final phase sacrifice	SEX: Female PHASE: Dosing phase	ANIMAL: 4530 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Uterus	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Oviducts/Fallop	Ovaries	Parathyroid	Rectum/Low Colon
Cervical SC	Thoracic SC	Lumbar SC	Skin-protocol	Stomach
Thyroid	Urinary bladder		-	

# Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

		s and Microscopic Observations	
ות מה אאת מסעמת	ATUS: Final phase sacrifice EATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 4531 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	MEDULLA: MINERAL DEPOSIT(S), UNILATERA Focal, Minimal.	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifoc Minimal.	cal,
		PERIPORTAL MONONUCLEAR CELL AGGREGATES Multifocal, Minimal.	5,
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Marked	1.
		SINUS HISTIOCYTES, Multifocal, Moderat	ce.
		SINUS EDEMA, Multifocal, Slight.	
		MEDULLARY PLASMACYTOSIS, Multifocal, Minimal.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal.	
		PARACORTICAL LYMPHOID ACTIVITY, Modera	ate.
		SINUS HISTIOCYTES, Multifocal, Minimal	ı.
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Slight.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 4531 GROUP: 4
Fissue Gross Observations/Comments	Microscopic Observations/Comments	
Mediastinal LN	MEDULLARY PLASMACYTOSIS, Multifocal Slight.	
nungs No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, Multife Slight.	ocal,
	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.	
	ARTERIAL MEDIAL HYPERTROPHY, Multif	ocal,
	PERIVASCULAR/PERIALVEOLAR SUBACUTE/ INFLAMMATORY CELL FOCI, Multifocal, Minimal.	
	ALVEOLAR/INTRAALVEOLAR MACROPHAGES/ BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	golden
	PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Moderate.	
	VASCULAR MINERALIZATION, Multifocal Minimal.	,
Parathyroid No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.	
pleen No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, M	inimal.
	EXTRAMEDULLARY HEMATOPOIESIS, Multi: Minimal.	focal,

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

## Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

	Individual Animal Gro	ss and Microscopic Observations	
STATU PHASE DAY OF DEAT		SEX: Female PHASE: Dosing phase	ANIMAL: 4531 GROUP: 4
	Gross Observations/Comments	Microscopic Observations/Comme	nts
	No gross observations on tissue.	SUBMUCOSAL SUBACUTE/CHRONIC II CELL INFILTRATE, Multifocal, I	NFLAMMATORY
Uterus	No gross observations on tissue.	Tissue is unremarkable (with o	
Vagina	No gross observations on tissue.	ESTRUS CYCLE.  Tissue is unremarkable (with o	comment).
		- NORMAL PHYSIOLOGIC MORPHOLOGESTRUS CYCLE.	GY OF THE

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Oviducts/Fallop	Ovaries	Rectum/Low Colon	Cervical SC
Thoracic SC	Lumbar SC	Skin-protocol	Stomach	Thyroid
Thymus	Urinary bladder			

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STA PHASE DAY OF DE	ATUS: Final phase sacrifice BATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 4532 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.		
		- ONLY TIBIAL EPIPHYSIS PRESENT.	
Duodenum	No gross observations on tissue.	Tissue is unremarkable (with comment)	
		- SLIGHTLY AUTOLYTIC, BUT READABLE.	
Kidneys	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL AGGREGA BILATERAL, Multifocal, Minimal.	TES,
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifo	ocal,
Mesenteric LN .	No gross observations on tissue.	702777777777777777777777777777777777777	
		FOLLICULAR LYMPHOID ACTIVITY, Slight.	
		PARACORTICAL LYMPHOID ACTIVITY, Minim	mal.
		SINUS HISTIOCYTES, Multifocal, Slight	
		SINUS EDEMA, Multifocal, Slight.	
		FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS Multifocal, Minimal.	,
Mediastinal LN	No gross observations on tissue.	HEMORRHAGE, Slight.	
		CONGESTION, Slight.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

HASE DAY OF DEATH: 30		SEX: Female PHASE: Dosing phase	ANIMAL: 4532 GROUP: 4
issue	Gross Observations/Comments	Microscopic Observations/Comments	
ediastinal LN		FOLLICULAR LYMPHOID ACTIVITY, Moderate	
		PARACORTICAL LYMPHOID ACTIVITY, Minima	al.
		SINUS HISTIOCYTES, Multifocal, Slight	
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS Multifocal, Slight.	,
		SINUS EDEMA, Multifocal, Minimal.	
ungs	. No gross observations on tissue.		
•		SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.	
		ARTERIAL MEDIAL HYPERTROPHY, Multifoca Slight.	al,
		PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHI INFLAMMATORY CELL FOCI, Multifocal, Minimal.	RONIC
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GO: BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	LDEN
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal.	
		VASCULAR MINERALIZATION, Multifocal, Minimal.	

CONGESTION, BILATERAL, Moderate.

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATU PHASE DAY OF DEAT	S: Final phase sacrifice PH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 4532 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, Mi	nimal.
		EXTRAMEDULLARY HEMATOPOIESIS, Minima	1,
Thyroid	No gross observations on tissue.	HEMORRHAGE/CONGESTION, BILATERAL, Mi	nimal.
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Slight.	
Uterus	No gross observations on tissue.	Tissue is unremarkable (with comment	).
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF TESTRUS CYCLE.	не
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment	).
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF T ESTRUS CYCLE.	не

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Cecum	Colon	Heart
Tleum	Jeinnim	Mammary_protocol	Tibial Nerve	Ovriduate

Oviducts/Fallop

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP:

Tissue Gross Observations/Comments Microscopic Observations/Comments

Parathyroid Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Thymus Urinary bladder

PHASE DAY OF DE	TUS: Final phase sacrifice ATH: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 4533 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Commer	
	No gross observations on tissue.	SUBCHONDRAL/SUBFIBROUS BONE: I	
didneys	No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CELL BILATERAL, Multifocal, Minimal	•
iver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Multifocal, Minime	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Minimal.	
		PERIPORTAL MONONUCLEAR CELL AG Multifocal, Minimal.	GGREGATES,
		FIBROUS TAGS, Focal, Minimal.	
esenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Slight.
	•	PARACORTICAL LYMPHOID ACTIVITY	, Marked.
		SINUS HISTIOCYTES, Multifocal,	, Slight.
		SINUS EDEMA, Multifocal, Sligh	nt.
ediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Slight.
		PARACORTICAL LYMPHOID ACTIVITY	, Moderate.
		SINUS HISTIOCYTES, Multifocal,	, Minimal.

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

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STATUS: Final phase sacrifice

SEX: Female

PHASE DAY OF DEATH: 30

PHASE: Dosing phase

GROUP: 4

Tissue

Gross Observations/Comments

Microscopic Observations/Comments

Mediastinal LN . . . . FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS,

Multifocal, Minimal.

MEDULLARY PLASMACYTOSIS, Slight.

Lungs . . . . . . . . No gross observations on tissue.

ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES,

Multifocal, Minimal.

PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal.

Spleen . . . . . . . No gross observations on tissue.

GOLDEN-BROWN PIGMENT, Minimal.

EXTRAMEDULLARY HEMATOPOIESIS, Multifocal,

Minimal.

Thymus . . . . . . . No gross observations on tissue.

HEMORRHAGE, Multifocal, Minimal.

Trachea . . . . . . . . No gross observations on tissue.

MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Multifocal, Minimal.

GLANDULAR DILATATION, Multifocal, Slight.

SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal.

Uterus . . . . . . . No gross observations on tissue. Tissue is unrer

Tissue is unremarkable (with comment).

- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

	That vided in the close and increased to be civations					
STATUS: Final phase sacrifice PHASE DAY OF DEATH: 30		SEX: Female PHASE: Dosing phase	ANIMAL: 4533 GROUP: 4			
Tissue	Gross Observations/Comments	Microscopic Observations/Comments				
		ESTRUS CYCLE.				
Vagina .	No gross observations on tissue.	Tissue is unremarkable (with comment)				
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	3			

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

rowing crastca were	antematrable mich	scopicariy.		
Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Cecum	Colon	Duodenum
Heart	Ileum	Jejunum	Mammary-protocol	Tibial Nerve
Oviducts/Fallop	Ovaries	Parathyroid	Rectum/Low Colon	Cervical SC
Thoracic SC	Lumbar SC	Skin-protocol	Stomach	Thyroid
Urinary bladder				

PHASE DAY OF DEAT	US: Final phase sacrifice TH: 30	SEX: Female ANIMAL PHASE: Dosing phase GROUP		
Tissue	Gross Observations/Comments	Microscopic Observations/Commer		
	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY FOCUS/FOCI, Minimal.  CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Minimal.	2	
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Slight.	
		PARACORTICAL LYMPHOID ACTIVITY	Y, Marked.	
		SINUS HISTIOCYTES, Moderate.		
		SINUS EDEMA, Multifocal, Sligh	at.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	Minimal.	
		PARACORTICAL LYMPHOID ACTIVITY	7, Moderate.	
		SINUS HISTIOCYTES, Multifocal,	, Slight.	
		FREE ERYTHROCYTES/ERYTHROPHAGO Multifocal, Minimal.	OCYTOSIS,	
		SINUS EDEMA, Focal, Slight.		
Lungs	No gross observations on tissue.	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multiforminal.		
		ARTERIAL MEDIAL HYPERTROPHY, Minimal.	Multifocal,	

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Main Study Animals

Individual Allimat Gloss and Microscopic Observations				
STATUS PHASE DAY OF DEATH	3: Final phase sacrifice 1: 30	SEX: Female PHASE: Dosing phase	ANIMAL: 4534 GROUP: 4	
Tissue	Gross Observations/Comments	Microscopic Observations/Comme	ents	
Lungs		PERIVASCULAR/PERIALVEOLAR SUI INFLAMMATORY CELL FOCI, Mult: Minimal.	·	
		PERIVASCULAR/SUBPLEURAL MICRO Multifocal, Minimal.	OGRANULOMA,	
·		ALVEOLAR/INTRAALVEOLAR MACRO! BROWN PIGMENT-LADEN MACROPHAG Multifocal, Minimal.		
		PERIBRONCHIAL/PERIVASCULAR L: AGGREGATES, Multifocal, Sligh		
		VASCULAR MINERALIZATION, Mult	tifocal,	
Ovaries	No gross observations on tissue.	CONGESTION, BILATERAL, Modera	ate.	
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Minima	1.	
		EXTRAMEDULLARY HEMATOPOIESIS	, Minimal.	
	·	CAPSULE FIBROSIS, Multifocal	, Slight.	
Trachea	No gross observations on tissue.	GLANDULAR DILATATION, Slight		
		SUBMUCOSAL SUBACUTE/CHRONIC : CELL INFILTRATE, Slight.	INFLAMMATORY	
Uterus	No gross observations on tissue.	Tissue is unremarkable (with	comment).	

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

	Individual Animal Gross	and Microscopic Observations	
PHASE DAY OF	STATUS: Final phase sacrifice DEATH: 30	SEX: Female ANIMA PHASE: Dosing phase GROU	
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Vagina	No gross observations on tissue.	- NO ENDOMETRIUM PRESENT.  Tissue is unremarkable (with comme - NORMAL PHYSIOLOGIC MORPHOLOGY OF ESTRUS CYCLE.	•

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Extremity	Heart	Ileum	Jejunum
Kidneys	Mammary-protocol	Tibial Nerve	Oviducts/Fallop	Parathyroid
Rectum/Low Colon	Cervical SC	Thoracic SC	Lumbar SC	Skin-protocol
Stomach	Thuroid	Thomas	Uninary bladder	~

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4535
PHASE DAY OF DEATH: 30	PHASE: Dosing phase	GROUP: 4
Tissue Gross Observations/Comme		æ
Kidneys No gross observations o		
	INTERSTITIAL MONONUCLEAR CELL AC BILATERAL, Multifocal, Minimal.	GGREGATES,
	EOSINOPHILIC TUBULAR CASTS, UNII Focal, Minimal.	LATERAL,
Liver No gross observations o	tissue.  SUBACUTE/CHRONIC INFLAMMATORY CI FOCUS/FOCI, Multifocal, Minimal	
	CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Munimal.	ultifocal,
Mesenteric LN No gross observations o	tissue. FOLLICULAR LYMPHOID ACTIVITY, Mo	oderate.
	PARACORTICAL LYMPHOID ACTIVITY,	Moderate.
	SINUS HISTIOCYTES, Multifocal, 8	Slight.
	SINUS EDEMA, Slight.	
Mediastinal LN No gross observations o	tissue. FOLLICULAR LYMPHOID ACTIVITY, SI	light.
	PARACORTICAL LYMPHOID ACTIVITY,	Severe.
	SINUS HISTIOCYTES, Multifocal, 8	Slight.
	FREE ERYTHROCYTES/ERYTHROPHAGOCY Multifocal, Minimal.	YTOSIS,

Individual Animal Gross and Microscopic Observations			
STA PHASE DAY OF DE	TUS: Final phase sacrifice	SEX: Female PHASE: Dosing phase	ANIMAL: 4535 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Mediastinal LN		SINUS EDEMA, Multifocal, Slight.	
		MEDULLARY PLASMACYTOSIS, Multifocal, Minimal.	•
Lungs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEMA, Multifocal Minimal.	· .
		ARTERIAL MEDIAL HYPERTROPHY, Multifocal Minimal.	,
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLD. BROWN FIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	EN
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight.	•
		VASCULAR MINERALIZATION, Multifocal, Minimal.	
arathyroid	No gross observations on tissue.	Tissue is unremarkable; one-of-pair missing.	
Spleen	No gross observations on tissue.	EXTRAMEDULLARY HEMATOPOIESIS, Multifoca	1,
Trachea	No gross observations on tissue.	MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Multifocal, Minimal.	
		GLANDULAR DILATATION, Slight.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 4535 PHASE DAY OF DEATH: 30 PHASE: Dosing phase GROUP: 4 Gross Observations/Comments Microscopic Observations/Comments Uterus . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE. Vagina . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.

Tissues without comment under Gross Observations were within normal limits at necropsy.

The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Tibia Cecum Colon Duodenum Heart Ileum Jejunum Mammar

DuodenumHeartIleumJejunumMammary-protocolTibial NerveOviducts/FallopOvariesRectum/Low ColonCervical SCThoracic SCLumbar SCSkin-protocolStomachThyroid

Thymus Urinary bladder

	ATUS: Final phase sacrifice EATH: 31	SEX: Female ANIMAI PHASE: Dosing phase GROUP	
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
	No gross observations on tissue.	MEDULLA: MINERAL DEPOSIT(S), BILATERAL, Multifocal, Minimal.	
	J	CORTEX/CORTICO-MEDULLARY JUNCTION: MINERAL DEPOSIT(S), BILATERAL, Multifocal, Minimal.	
		CORTICAL TUBULAR MINERALIZATION, UNILATERAL, Minimal.	
		INTERSTITIAL MONONUCLEAR CELL AGGREGATES, UNILATERAL, Multifocal, Slight.	
Liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal.	
		FIBROUS TAGS, Multifocal, Slight.	
Mesenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minimal.	
		PARACORTICAL LYMPHOID ACTIVITY, Marked.	
		SINUS HISTIOCYTES, Multifocal, Minimal.	
		SINUS EDEMA, Multifocal, Slight.	
Mediastinal LN	No gross observations on tissue.	Tissue is inadequate and unreadable.	

#### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations STATUS: Final phase sacrifice SEX: Female ANIMAL: 4536 PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Discolored, All lobes/ (post-fixation Examined; 2 correlations found: observation) HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Slight. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight. VASCULAR MINERALIZATION, Multifocal, Minimal. Ovaries . . . . . . . No gross observations on tissue. CONGESTION, BILATERAL, Slight. Parathyroid . . . . . . No gross observations on tissue. Tissue is unremarkable; one-of-pair missing. Spleen . . . . . . . No gross observations on tissue. GOLDEN-BROWN PIGMENT, Multifocal, Minimal. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal. Thyroid . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION, UNILATERAL, Minimal.

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STA PHASE DAY OF DE	TUS: Final phase sacrifice	SEX: Female PHASE: Dosing phase	ANIMAL: 4536 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Trachea	No gross observations on tissue.	MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Slight. SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATO CELL INFILTRATE, Multifocal, Slight.	RY
Uterus	No gross observations on tissue.	Tissue is unremarkable (with comment).  - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment) NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Oviducts/Fallop	Rectum/Low Colon	Cervical SC	Thoracic SC
Lumbar SC	Skin-protocol	Stomach	Thymus	Urinary bladder

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 4537 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 Microscopic Observations/Comments Kidneys . . . . . . . No gross observations on tissue. MEDULLA: MINERAL DEPOSIT(S), UNILATERAL, Multifocal, Minimal. INTERSTITIAL MONONUCLEAR CELL AGGREGATES. UNILATERAL, Multifocal, Minimal. Liver . . . . . . . . . No gross observations on tissue. SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Multifocal, Minimal. CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multifocal, Minimal. Mesenteric LN . . . . No gross observations on tissue. FOLLICULAR LYMPHOID ACTIVITY, Moderate. PARACORTICAL LYMPHOID ACTIVITY, Minimal. SINUS HISTIOCYTES, Multifocal, Slight. SINUS EDEMA, Multifocal, Slight. RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Minimal. FREE ERYTHROCYTES/ERYTRHOPHAGOCYTOSIS, Multifocal, Minimal. Mediastinal LN . . . . No gross observations on tissue. HEMORRHAGE, Multifocal, Slight. FOLLICULAR LYMPHOID ACTIVITY, Minimal. PARACORTICAL LYMPHOID ACTIVITY, Minimal.

> Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

	Individual Animal Gross and Microscopic Observations				
PHASE DAY OF DI	ATUS: Final phase sacrifice EATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 4537 GROUP: 4		
Tissue		Microscopic Observations/Comments			
Mediastinal LN		SINUS HISTIOCYTES, Multifocal, Sl:	ight.		
		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOMULtifocal, Moderate.	osis,		
Lungs	No gross observations on tissue.	SUBPLEURAL HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.			
		ARTERIAL MEDIAL HYPERTROPHY, Mult: Minimal.	ifocal,		
		PERIVASCULAR/PERIALVEOLAR SUBACUTI INFLAMMATORY CELL FOCI, Multifoca: Minimal.			
•		PERIVASCULAR/SUBPLEURAL MICROGRANG Multifocal, Minimal.	JLOMA,		
		ALVEOLAR/INTRAALVEOLAR MACROPHAGES, BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal.	5/GOLDEN		
·		PERIBRONCHIAL/PERIVASCULAR LYMPHO: AGGREGATES, Multifocal, Slight.	ID		
		VASCULAR MINERALIZATION, Multifoca	al,		
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal,	Minimal.		
		EXTRAMEDULLARY HEMATOPOIESIS, Mult	cifocal,		

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Main Study Animals

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Trachea . . . . . . . . No gross observations on tissue. MUCOSAL EPITHELIAL EOSINOPHILIC DROPLETS/INCLUSION BODIES, Multifocal, Slight. Uterus . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE. Vagina . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:  $\frac{1}{2} \left( \frac{1}{2} \right)  

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Heart	Ileum	Jejunum	Mammary-protocol
Tibial Nerve	Oviducts/Fallop	Ovaries	Parathyroid	Rectum/Low Colon
Cervical SC	Thoracic SC	Lumbar SC	Skin-protocol	Stomach
Thursda	Thimue	Tirdnary bladdor	•	

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 4538 GROUP: 4
Tissue Gross Observations/Comments	Microscopic Observations/Comm	
Adrenal Glands No gross observations on tissue.	CORTICAL VACUOLATION, Focal,	•
Ileum No gross observations on tissue.	Tissue is unremarkable (with	comment).
	- ILEUM IS VOID OF PEYER'S P.	ATCHES.
Kidneys No gross observations on tissue.	INTERSTITIAL MONONUCLEAR CEL UNILATERAL, Multifocal, Mini	·
Liver No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATOR FOCUS/FOCI, Minimal.	Y CELL
	CENTRILOBULAR SUBACUTE/CHRON INFLAMMATORY CELL INFILTRATE Minimal.	
Mesenteric LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY	, Minimal.
•	PARACORTICAL LYMPHOID ACTIVI	TY, Minimal.
	SINUS HISTIOCYTES, Multifoca	l, Moderate.
	SINUS EDEMA, Multifocal, Mode	erate.
	RETICULOENDOTHELIAL CELL: GO. PIGMENT, Slight.	LDEN-BROWN
Mediastinal LN No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY	, Moderate.
	PARACORTICAL LYMPHOID ACTIVI	TY, Minimal.

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female PHASE DAY OF DEATH: 31 PHASE: Dosing phase Gross Observations/Comments Microscopic Observations/Comments Mediastinal LN . . . . SINUS HISTIOCYTES, Multifocal, Slight. FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal. SINUS EDEMA, Multifocal, Slight. Examined; 2 correlations found: Discolored, All lobes, Red, Foci, </= 0.1 cm, Slight HEMORRHAGE/CONGESTION/EDEMA, Multifocal, Minimal. PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHRONIC INFLAMMATORY CELL FOCI, Multifocal, Minimal. ARTERIAL MEDIAL HYPERTROPHY, Multifocal, Minimal. ALVEOLAR/INTRAALVEOLAR MACROPHAGES/GOLDEN BROWN PIGMENT-LADEN MACROPHAGES, Multifocal, Minimal. PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Slight. VASCULAR MINERALIZATION, Multifocal, Minimal. Ovaries . . . . . . . No gross observations on tissue. CONGESTION, UNILATERAL, Slight. Spleen . . . . . . . No gross observations on tissue. GOLDEN-BROWN PIGMENT, Multifocal, Minimal. EXTRAMEDULLARY HEMATOPOIESIS, Multifocal, Minimal.

Butane: Combined Repeated-Exposure Toxicity, Reproduction and
Neurotoxicity Screening in Rats
via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Female PHASE: Dosing phase	ANIMAL: 4538 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	~~~~~~~~~~~~~~~~~~
Thymus	No gross observations on tissue.	HEMORRHAGE, Multifocal, Minimal.	
Uterus	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	
Vagina	No gross observations on tissue.	Tissue is unremarkable (with comment).	
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain	Sternum
Femur	Tibia	Cecum	Colon	Duodenum
Heart	Jejunum	Mammary-protocol	Tibial Nerve	Oviducts/Fallop
Parathyroid	Rectum/Low Colon	Cervical SC	Thoracic SC	Lumbar SC
Skin-protocol	Stomach	Thyroid	Trachea	Urinary bladder

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

via Whole-Body Inhalation Exposures
Individual Animal Gross and Microscopic Observations

	1	SEX: Female	ANIMAL: 4539
ACE DAY OF DEATH. 31	al phase sacrifice	PHASE: Dosing phase	GROUP: 4
eeue (	Fross Observations/Comments	Microscopic Observations/Co	omments
	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMAT FOCUS/FOCI, Multifocal, Mi	CORY CELL
		CENTRILOBULAR SUBACUTE/CHR INFLAMMATORY CELL INFILTRA Minimal.	
senteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVI	ITY, Minimal.
		PARACORTICAL LYMPHOID ACTI	IVITY, Marked.
		SINUS HISTIOCYTES, Multifo	ocal, Slight.
diastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVI	ITY, Minimal.
		PARACORTICAL LYMPHOID ACTI	IVITY, Moderate.
		FREE ERYTHROCYTES/ERYTHROI Multifocal, Slight.	PHAGOCYTOSIS,
		SINUS EDEMA, Focal, Minima	al.
		MEDULLARY PLASMACYTOSIS, S	Slight.
ngs	No gross observations on tissue.	HEMORRHAGE/CONGESTION/EDEN Slight.	MA, Multifocal,
		SUBPLEURAL HEMORRHAGE/SUBAINFLAMMATION/FIBROSIS, Muinimal.	
		ARTERIAL MEDIAL HYPERTROPI Moderate.	HY, Multifocal,

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Female ANIMAL: PHASE: Dosing phase GROUP:		
Tissue	Gross Observations/Comments	Microscopic Observations/Comm	ents	
Lungs		PERIVASCULAR/PERIALVEOLAR SU INFLAMMATORY CELL FOCI, Mult Minimal.	BACUTE/CHRONIC	
		ALVEOLAR/INTRAALVEOLAR MACRO BROWN PIGMENT-LADEN MACROPHA Multifocal, Minimal.		
		PERIBRONCHIAL/PERIVASCULAR L' AGGREGATES, Multifocal, Mini		
Spleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multif	ocal, Minimal.	
		EXTRAMEDULLARY HEMATOPOIESIS Minimal.	, Multifocal,	
Thymus	No gross observations on tissue.	HEMORRHAGE, Focal, Minimal.		
Frachea	No gross observations on tissue.	MUCOSAL EPITHELIAL EOSINOPHI DROPLETS/INCLUSION BODIES, M Minimal.		
٠	·	GLANDULAR DILATATION, Multif	ocal, Slight.	
		SUBMUCOSAL SUBACUTE/CHRONIC CELL INFILTRATE, Multifocal,		
Uterus	No gross observations on tissue.	GLANDULAR DILATATION, BILATE Multifocal, Slight.	CRAL,	
		- NORMAL PHYSIOLOGIC MORPHOL	OGY OF THE	

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

	individual Animal Gross and Microscopic Observations					
PHASE DAY	STATUS: Final phase sacrifice OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 4539 GROUP: 4			
Tissue	Gross Observations/Comments	Microscopic Observations/Comments				
	·	ESTRUS CYCLE.				
Vagina .	No gross observations on tissue.	Tissue is unremarkable (with commen	t).			
		- NORMAL PHYSIOLOGIC MORPHOLOGY OF ESTRUS CYCLE.	THE			

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands	Sternal Marrow	Femoral Marrow	Tibial Marrow	Brain
Sternum	Femur	Tibia	Cecum	Colon
Duodenum	Heart	Ileum	Jejunum	Kidneys
Mammary-protocol	Tibial Nerve	Oviducts/Fallop	Ovaries	Parathyroid
Rectum/Low Colon	Cervical SC	Thoracic SC	Lumbar SC	Skin-protocol
Stomach	Thyroid	Urinary bladder		

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

PHASE DAY OF DE	TUS: Final phase sacrifice TATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 4540 GROUP: 4
Ci cano	Gross Observations/Comments	Microscopic Observations/Comments	
Kidneys	No gross observations on tissue.	CORTEX/CORTICO-MEDULLARY JUNCTION: M DEPOSIT(S), BILATERAL, Multifocal, Minimal.	
•		INTERSTITIAL MONONUCLEAR CELL AGGREG BILATERAL, Multifocal, Minimal.	ATES,
		- ARTIFACTUAL TISSUE ARCHITECTURE CH OF MEDULLARY REGION OF ONE KIDNEY.	ANGE
liver	No gross observations on tissue.	SUBACUTE/CHRONIC INFLAMMATORY CELL FOCUS/FOCI, Minimal.	
		CENTRILOBULAR SUBACUTE/CHRONIC INFLAMMATORY CELL INFILTRATE, Multif Minimal.	ocal,
		PERIPORTAL MONONUCLEAR CELL AGGREGAT Multifocal, Minimal.	ES,
esenteric LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, slight	
		PARACORTICAL LYMPHOID ACTIVITY, Mark	ed.
		SINUS HISTIOCYTES, Multifocal, Sligh	t.
		SINUS EDEMA, Multifocal, Slight.	
		MEDULLARY PLASMACYTOSIS, Slight.	
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY, Minima	1.

STATUS: Final phase sacrifice WASE DAY OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 4540 GROUP: 4
ssue Gross Observations/Comments	<del></del>	
diastinal LN	PARACORTICAL LYMPHOID ACTIVITY,	Moderate.
	SINUS HISTIOCYTES, Multifocal, S	Slight.
	FREE ERYTHROCYTES/ERYTHROPHAGOCY	TOSIS,
	Minimal.	
	RETICULOENDOTHELIAL CELL: GOLDEN	N-BROWN
	PIGMENT, Multifocal, Slight.	
	MEDULLARY PLASMACYTOSIS, Minimal	l.
ngs No gross observations on tissue.		
	ARTERIAL MEDIAL HYPERTROPHY, Mul Minimal.	ltifocal,
	MINIMAI.	
	PERIVASCULAR/PERIALVEOLAR SUBACT INFLAMMATORY CELL FOCI, Multifoo	•
	Minimal.	ial,
•	PERIBRONCHIAL/PERIVASCULAR LYMPI	IOTD
·	AGGREGATES, Multifocal, Slight.	1010
· ,	VASCULAR MINERALIZATION, Multifo	ogal .
	Minimal.	JCaI,
rathyroid No gross observations on tissue.	Tissue is missing.	
oleen No gross observations on tissue.		
	GOLDEN-BROWN PIGMENT, Minimal.	
	EXTRAMEDULLARY HEMATOPOIESIS, MU	ultifocal,

### Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice SEX: Female ANIMAL: 4540 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4 Tissue Gross Observations/Comments Microscopic Observations/Comments Thyroid . . . . . . . . No gross observations on tissue. HEMORRHAGE/CONGESTION, UNILATERAL, Focal, Slight. - ONLY SMALL FRAGMENT OF TISSUE ON ONE SIDE. Thymus . . . . . . . No gross observations on tissue. HEMORRHAGE, Multifocal, Minimal. Trachea . . . . . . . No gross observations on tissue. GLANDULAR DILATATION, Multifocal, Moderate. Urinary bladder . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - FOCAL MUCOSAL ARTIFACTUAL CHANGE. Uterus . . . . . . . No gross observations on tissue. LUMENAL DISTENSION, BILATERAL, Moderate. Vagina . . . . . . . No gross observations on tissue. Tissue is unremarkable (with comment). - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.

Tissues without comment under Gross Observations were within normal limits at necropsy. The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain

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Main Study Animals

Butane: Combined Repeated-Exposure Toxicity, Reproduction and Neurotoxicity Screening in Rats

		Indi		dy Inhalation Exposuss and Microscopic C		
STATUS: Final phase sacrifice SEX: Female ANIMAL: 4540 PHASE DAY OF DEATH: 31 PHASE: Dosing phase GROUP: 4						
Tissue Gross Observations/Comments Microsco				Microscopio	: Observations/Comments	
	Sternum Duodenum Tibial Nerve Thoracic SC	Femur Heart Oviducts/Fallop Lumbar SC	Tibia Ileum Ovaries Skin-protocol	Cecum Jejunum Rectum/Low Colon Stomach	Colon Mammary-protocol Cervical SC	

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Female PHASE: Dosing phase	ANIMAL: 4541 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comme	ents
Tibia No gross observations on tissue.		SUBCHONDRAL/SUBFIBROUS BONE: FIBROUS CYST, Focal, Moderate.	
Kidneys No gross observations on tissue.		CORTEX/CORTICO-MEDULLARY JUNG DEPOSIT(S), BILATERAL, Multif	
		INTERSTITIAL MONONUCLEAR CELIBILATERAL, FOCAl, Minimal.	L AGGREGATES,
		EOSINOPHILIC TUBULAR CASTS, UFOCAL, Minimal.	UNILATERAL,
Liver	No gross observations on tissue.	Tissue is unremarkable (with	comment).
		- EXTRAMEDULLARY HEMATOPOIESI MEGAKERYOCYTE.	is/single
Mesenteric LN .	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	, slight.
		PARACORTICAL LYMPHOID ACTIVIT	TY, Marked.
		SINUS HISTIOCYTES, Multifocal	l, Moderate.
		SINUS EDEMA, Multifocal, Slig	ght.
		MEDULLARY PLASMACYTOSIS, Mini	imal.
Mediastinal LN	No gross observations on tissue.	FOLLICULAR LYMPHOID ACTIVITY,	, Minimal.
	·	PARACORTICAL LYMPHOID ACTIVIT	TY, Marked.
		SINUS HISTIOCYTES, Multifocal	l, Moderate.

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31		SEX: Female PHASE: Dosing phase	ANIMAL: 4541 GROUP: 4
ri cena	Gross Observations/Comments	Migragania Observation / Comments	
Mediastinal LN		FREE ERYTHROCYTES/ERYTHROPHAGOCYTOSIS, Multifocal, Minimal.	,
		RETICULOENDOTHELIAL CELL: GOLDEN-BROWN PIGMENT, Multifocal, Slight.	N
		SINUS EDEMA, Multifocal, Minimal.	
ungs	No gross observations on tissue.	SUBPLEURAL, HEMORRHAGE/SUBACUTE INFLAMMATION/FIBROSIS, Multifocal, Minimal.	
		ARTERIAL MEDIAL HYPERTROPHY, Multifoca	al,
		PERIVASCULAR/PERIALVEOLAR SUBACUTE/CHE INFLAMMATORY CELL FOCI, Multifocal, Slight.	RONIC
		PERIBRONCHIAL/PERIVASCULAR LYMPHOID AGGREGATES, Multifocal, Minimal.	
varies	No gross observations on tissue.	CONGESTION, UNILATERAL, Moderate.	
pleen	No gross observations on tissue.	GOLDEN-BROWN PIGMENT, Multifocal, Minimal.	
		EXTRAMEDULLARY HEMATOPOIESIS, Multiforminal.	cal,
rachea	No gross observations on tissue.	GLANDULAR DILATATION, Multifocal, Slig	ght.
		SUBMUCOSAL SUBACUTE/CHRONIC INFLAMMATO CELL INFILTRATE, Multifocal, Moderate.	

Butane: Combined Repeated-Exposure Toxicity, Reproduction and

#### Neurotoxicity Screening in Rats via Whole-Body Inhalation Exposures

Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 31	SEX: Female PHASE: Dosing phase	ANIMAL: 4541 GROUP: 4
Tissue Gross Observations/Comments	Microscopic Observations/Comment	s
Uterus No gross observations on tissue.	LUMENAL DISTENSION, BILATERAL, Moderate. GLANDULAR DILATATION, BILATERAL, Slight.	
Vagina No gross observations on tissue.	Tissue is unremarkable (with comment).  - NORMAL PHYSIOLOGIC MORPHOLOGY OF THE ESTRUS CYCLE.	

Tissues without comment under Gross Observations were within normal limits at necropsy.

The following tissues were unremarkable microscopically:

Adrenal Glands Sternal Marrow Femoral Marrow Tibial Marrow Brain Sternum Femur Cecum Colon Duodenum Heart Ileum Jejunum Mammary-protocol Tibial Nerve Oviducts/Fallop Parathyroid Rectum/Low Colon Cervical SC Thoracic SC Lumbar SC Skin-protocol Stomach Thyroid Thymus Urinary bladder